STANFORD UNIVERSITY

STANFORD BULLETIN
2007-08

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ACCREDITATION

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Stanford University admits students of either sex and any race, color, religion, sexual orientation, or national and ethnic origin to all the rights, privileges, programs, and activities generally accorded or made available to students at the University. Consistent with its obligations under the law, it prohibits discrimination, including harassment, against students on the basis of sex, race, age, color, disability, religion, sexual orientation, gender identity, national and ethnic origin, and any other characteristic protected by applicable law in the administration of its educational policies, admissions policies, scholarships and loan programs, and athletic and other University-administered programs. The following person has been designated to handle inquiries regarding this policy: the Director of the Diversity and Access Office, Mariposa House, 585 Capistrano Way, Stanford University, Stanford, CA 94305-8230; (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax).

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STANFORD UNIVERSITY

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ACADEMIC CALENDAR 2007-08

AUTUMN QUARTER

Aug	20 (Mon)	Axess opens for course enrollment
Sep	14 (Fri)	Course enrollment deadline to receive stipend or refund check on first day of term
	18 (Tue)	New undergraduates arrive; Convocation
	24 (Mon)	First day of quarter; instruction begins; last day to file Leave of Absence; last day to receive full refund for Autumn Quarter
	27 (Thu)	Conferral of degrees, Summer Quarter
Oct	7 (Sun)	Study list deadline
	14 (Sun)	Add deadline (courses or units)
	21 (Sun)	Drop deadline (courses or units); last day for tuition reassessment for dropped courses or units
Nov	4 (Sun)	Change of grading basis deadline
	12 (Mon)	Term withdrawal deadline; last day to withdraw from the University with a partial refund
	18 (Sun)	Course withdrawal deadline; application deadline for Autumn Quarter degree conferral
	19-23 (Mon-Fri)	Thanksgiving recess *(holiday, no classes)*
Dec	2-8 (Sun-Sat)	Last opportunity to arrange Incomplete in a course, at last class
	3-9 (Mon-Sun)	End-Quarter Period
	7 (Fri)	Last day of classes (unless class meets on Saturday)
	10-14 (Mon-Fri)	End-Quarter examinations
	14 (Fri)	Last day to submit University thesis, D.M.A. final project, or Ph.D. dissertation

WINTER QUARTER

Nov	19 (Mon)	Axess opens for course enrollment
Dec	14 (Fri)	Course enrollment deadline to receive stipend or refund check on first day of term
Jan	7 (Mon)	Last day to file Leave of Absence; last day to receive full refund for Winter Quarter
	8 (Tue)	First day of quarter; instruction begins
	10 (Thu)	Conferral of degrees, Autumn Quarter
	21 (Mon)	Martin Luther King, Jr., Day *(holiday, no classes)*
	21 (Mon)	Study list deadline
	27 (Sun)	Add deadline (courses or units)
Feb	3 (Sun)	Drop deadline (courses or units); last day for tuition reassessment for dropped courses or units
	18 (Mon)	Presidents' Day (*holiday, no classes except Law*); change of grading basis deadline
	20 (Wed)	Term withdrawal deadline; last day to withdraw from the University with a partial refund
Mar	2 (Sun)	Course withdrawal deadline; application deadline for Winter Quarter degree conferral
	9-15 (Sun-Sat)	Last opportunity to arrange Incomplete in a course, at last class
	10-16 (Mon-Sun)	End-Quarter Period
	14 (Fri)	Last day of classes (unless class meets Saturday)
	17-21 (Mon-Fri)	End-Quarter examinations
	21 (Fri)	Last day to submit University thesis, D.M.A. final project, or Ph.D. dissertation

SPRING QUARTER

Mar	10 (Mon)	Axess opens for course enrollment
	21 (Fri)	Course enrollment deadline to receive stipend or refund check on first day of term
	31 (Mon)	Last day to file Leave of Absence; last day to receive full refund for Spring Quarter
Apr	1 (Tue)	First day of quarter; instruction begins
	3 (Thu)	Conferral of degrees, Winter Quarter
	13 (Sun)	Study list deadline; application deadline for Spring Quarter degree conferral
	15 (Tue)	Matriculated undergraduate financial aid application, deadline to file
	20 (Sun)	Add deadline (courses or units)
	27 (Sun)	Drop deadline (courses or units); last day for tuition reassessment for dropped courses or units
May	11 (Sun)	Change of grading basis deadline
	13 (Tue)	Term withdrawal deadline; last day to withdraw from the University with a partial refund
	26 (Mon)	Memorial Day (*holiday, no classes*); course withdrawal deadline
	29-June 4 (Thu-Wed)	Last opportunity to arrange Incomplete in a course, at last class
	30-June 5 (Fri-Thu)	End-Quarter Period
June	4 (Wed)	Last day of classes
	5 (Thu)	Day before finals, no classes
	6 (Fri)	Last day to submit University thesis, D.M.A. final project, or Ph.D. dissertation
	6-11 (Fri-Wed)	End-Quarter examinations
	14 (Sat)	Senior Class Day; Baccalaureate Saturday
	15 (Sun)	Commencement

SUMMER QUARTER

Apr	14 (Mon)	Axess opens for course enrollment
June	13 (Fri)	Course enrollment deadline to receive stipend or refund check on first day of term
	23 (Mon)	Last day to file Leave of Absence; last day to receive full refund for Summer Quarter
	24 (Tue)	First day of quarter; instruction begins
	29 (Sun)	Study list deadline
July	4 (Fri)	Independence Day *(holiday, no classes)*
	6 (Sun)	Add deadline (courses or units)
	13 (Sun)	Drop deadline (courses or units); last day for tuition reassessment for dropped courses or units
	25 (Fri)	Term withdrawal deadline; last day to withdraw from the University with a partial refund for 8- and 10-week sessions
	27 (Sun)	Change of grading basis deadline
Aug	3 (Sun)	Course withdrawal deadline; application deadline for Summer Quarter degree conferral
	8-14 (Fri-Thu)	Last opportunity to arrange Incomplete in a course, at last class
	9-14 (Sat-Thu)	End-Quarter Period
	14 (Thu)	Last day of classes
	15-16 (Fri-Sat)	End-Quarter examinations
	19 (Fri)	Last day to submit University thesis, D.M.A. final project, or Ph.D. dissertation

Contents

WELCOME TO STANFORD

On October 1, 1891, more than 400 enthusiastic young men and women were on hand for opening day ceremonies at Leland Stanford Junior University. They came from all over: many from California, some who followed professors hired from other colleges and universities, and some simply seeking adventure in the West. They came to seize a special opportunity, to be part of the pioneer class in a brand new university. They stayed to help turn an ambitious dream into a thriving reality. As a pioneer faculty member recalled, "Hope was in every heart, and the presiding spirit of freedom prompted us to dare greatly."

For Leland and Jane Stanford on that day, the University was the realization of a dream and a fitting tribute to the memory of their only son, who died of typhoid fever weeks before his 16th birthday, at an age when many young men and women were planning their college education.

From the beginning, it was clear that Stanford would be different. It was coeducational at a time when single-sex colleges were the norm. It was non-sectarian when most private colleges were still affiliated with a church. And it offered a broad, flexible program of study while most schools insisted on a rigid curriculum of classical studies. Though there were many difficulties during the first months (housing was inadequate, microscopes and books were late in arriving from the East), the first year foretold greatness. As Jane Stanford wrote in the summer of 1892, "Even our fondest hopes have been realized."

What manner of people were this man and this woman who had the intelligence, the means, the faith, and the daring to plan a major university in Pacific soil, far from the nation's center of culture?

ABOUT LELAND AND JANE STANFORD

Although he was trained as a lawyer, Leland Stanford came to California in 1852 to join his five brothers in their mercantile business in the gold fields; Jane Stanford followed in 1855. They established large-scale operations in Sacramento, where Mr. Stanford became a leading figure in California business and politics. One of the "Big Four" who built the western link of the first transcontinental railroad, he was elected Governor of California and later United States Senator. One of the founders of the Republican Party in California, he was an ardent follower of Abraham Lincoln and is credited with keeping California in the Union during the Civil War.

THE CASE FOR A LIBERAL EDUCATION

Despite the enormous success they achieved in their lives, Governor and Mrs. Stanford had come from families of modest means and rose to prominence and wealth through a life of hard work. So it was natural that their first thoughts were to establish an institution where young men and women could "grapple successfully with the practicalities of life." As their thoughts matured, however, these ideas of "practical education" enlarged to the concept of producing cultured and useful citizens who were well prepared for professional success. In a statement of the case for liberal education that was remarkable for its time, Leland Stanford wrote, "I attach great importance to general literature for the enlargement of the mind and for giving business capacity. I think I have noticed that technically educated boys do not make the most successful businessmen. The imagination needs to be cultivated and developed to assure success in life. A man will never construct anything he cannot conceive."

STANFORD LANDS AND ARCHITECTURE

The campus occupies what was once Leland Stanford's Palo Alto Stock Farm and the favorite residence of the Stanford family. The Stanfords purchased an existing estate in 1876 and later acquired much of the land in the local watershed for their stock farm, orchards, and vineyards.

The name of the farm came from the tree El Palo Alto, a coast redwood (Sequoia sempervirens), that still stands near the northwest corner of the property on the edge of San Francisquito Creek. Many years ago, one of the winter floods that periodically rushed down the arroyo tore off one of its twin trunks, but half of the venerable old tree lives on, a gaunt and time-scarred monument. Named in 1769 by Spanish explorers, El Palo Alto has been the University's symbol and the centerpiece of its official seal.

The Stanfords gave their farm to the University in the Founding Grant of 1885. They personally financed the entire cost of the construction and operation of the University until 1903, when surviving founder Jane Stanford, who performed heroically in keeping the University functioning during difficult times following Leland Senior's death in 1893, turned over control to the Board of Trustees. The founding gift has been estimated at $25 million, not including the land and buildings.

The general concept for the University grounds and buildings was conceived by Frederick Law Olmsted, the designer of Central Park in New York. A brilliant young Boston architect, Charles Allerton Coolidge, further developed the concept in the style of his late mentor, Henry Hobson Richardson. The style, called Richardsonian Romanesque, is a blend of Romanesque and Mission Revival architecture. It is characterized by rectilinear sandstone buildings joined by covered arcades formed of successive half-circle arches, the latter supported by short columns with decorated capitals.

More than one hundred years later, the University still enjoys 8,180 acres (almost 13 square miles) of grassy fields, eucalyptus groves, and rolling hills that were the Stanfords' generous legacy, as well as the Quadrangle of "long corridors with their stately pillars" at the center of campus. It is still true, as the philosopher William James said, during his stint as a visiting professor, that the climate is "so friendly . . . that every morning wakes one fresh for new amounts of work."

CURRENT PERSPECTIVES

In other ways, the University has changed tremendously on its way to recognition as one of the world's great universities. At the hub of a vital and diverse Bay Area, Stanford is an hour's drive south of San Francisco and just a few miles north of the Silicon Valley, an area dotted with computer and high technology firms largely spawned by the University's faculty and graduates. On campus, students and faculty enjoy new libraries, modern laboratories, sports facilities, and comfortable residences. Contemporary sculpture, as well as pieces from the Iris and B. Gerald Cantor Center for Visual Arts at Stanford University's extensive collection of sculpture by Auguste Rodin, can be found throughout the campus, providing unexpected pleasures at many turns.

The Iris and B. Gerald Cantor Center for Visual Arts at Stanford University opened in January 1999. The center includes the historic Leland Stanford Junior Museum building, the Rodin Sculpture Garden and a new wing with spacious galleries, auditorium, cafe, and bookshop. At the Stanford Medical Center, world-renowned for its research, teaching, and patient care, scientists and physicians are searching for answers to fundamental questions about health and disease. Ninety miles down the coast, at Stanford's Hopkins Marine Station on the Monterey Bay, scientists are working to better understand the mechanisms of evolution, human development, and ecological systems.

The University is organized into seven schools: Earth Sciences, Education, Engineering, the Graduate School of Business, Humanities and Sciences, Law, and Medicine. In addition, there are more than 30 interdisciplinary centers, programs, and research laboratories including: the Hoover Institution on War, Revolution and Peace; the Freeman Spogli Institute for International Studies; the Stanford Linear Accelerator Center; and the Stanford Program for Bioengineering, Biomedicine, and Biosciences (Bio-X), where faculty from many fields bring different perspectives to bear on issues and problems. Stanford's Bing Overseas Studies Program offers students in all fields remarkable opportunities for study abroad, with campuses in Australia, Beijing, Berlin, Florence, Kyoto, Madrid, Moscow, Oxford, Paris, and Santiago.

STANFORD PEOPLE

By any measure, Stanford's faculty, which numbers approximately 1,800, is one of the most distinguished in the nation. It includes 17 Nobel laureates, 4 Pulitzer Prize winners, 20 National Medal of Science winners, 134 members of the National Academy of Sciences, 228 members of the American Academy of Arts and Sciences, 83 members of the National Academy of Engineering, and 29 members of the National Academy of Education. Yet beyond their array of honors, what truly distinguishes Stanford faculty is their commitment to sharing knowledge with their students. The great majority of professors teach undergraduates both in introductory lecture classes and in small freshman, sophomore, and advanced seminars.

Enrollment in Autumn Quarter 2006 totaled 14,890, of whom 6,689 were undergraduates and 8,201 were graduate students. Like the faculty, the Stanford student body is distinguished. Approximately 12 people apply to Stanford for every student who enters the freshman class. 86 Stanford students have been named Rhodes Scholars and 74 have been named Marshall Scholars. The six-year graduation rate for freshmen who entered Stanford University full-time in 2000 was 95 percent. Stanford awarded 4,820 degrees in 2006-07, of which 1,708 were baccalaureate and 3,112 were advanced degrees.

Stanford students also shine in an array of activities outside the classroom, from student government to music, theater, and journalism. Through the Haas Center for Public Service, students participate in dozens of community service activities, such as tutoring programs for children in nearby East Palo Alto, the Hunger Project, and the Arbor Free Clinic.

In the athletic arena, Stanford students have enjoyed tremendous success as well. Stanford fields teams in 35 Division I varsity sports. Of Stanford's 94 NCAA team titles, 77 have been captured since 1980, placing Stanford at the top among the nation's most title-winning schools during that time. In 2006-07, Stanford won two NCAA team titles in women's cross country and men's golf, and won the Director's Cup, emblematic of the top overall athletic program in the country, for the 13th consecutive year. In 1999-2000, Stanford became the first school in Pac-10 history to win conference championships in football, men's basketball, and baseball in the same year. Athletic success has reached beyond The Farm, as well, with 43 Stanford athletes and coaches taking part in the 2004 Olympics in Athens. The Cardinal affiliates won 17 medals in Greece with three gold, seven silver and seven bronze. Over the last four summer Olympiads, Stanford athletes and coaches have won a combined 64 medals. Intramural and club sports are also popular; over 1,000 students take part in the club sports program, while participation in the intramural program has reached 9,000 with many active in more than one sport.

Stanford graduates can be found in an extraordinary variety of places: in space (Sally Ride, '73, Ph.D. '78, was the first American woman in space); on the news (Ted Koppel, M.A. '62, created the successful program Nightline); off-Broadway (David Henry Hwang, '79, received a Tony Award for his celebrated work, *M. Butterfly*); in San Francisco live theater (Carey Perloff, '80, artistic director of the American Conservatory Theater) ; at the helm of major corporations (Scott McNealy, '80, founded Sun Microsystems, and Chih-yuan (Jerry) Yang, '94, and David Filo, '90, founded Yahoo); and on the U.S. Supreme Court (two Stanford graduates, Anthony Kennedy, '58 and Stephen Breyer, '59, currently sit on the high court; Sandra Day O'Connor, '50, J.D. '52, recently retired from the high court and William Rehnquist, '48, J.D.'52 served until his death in 2005).

LOOKING AHEAD

In her address to the Board of Trustees in July 1904, Jane Stanford said, "Let us not be afraid to outgrow old thoughts and ways, and dare to think on new lines as to the future of the work under our care." Her thoughts echo in the words of Stanford President John Hennessy, who said in his message in the 2002 Annual Report, "Our bold entrepreneurial spirit has its roots in the founders and our location in the pioneering West. In 1904, Jane Stanford defined the challenge for the young University ... Each generation at Stanford has taken this to heart and boldly launched new efforts, from the classroom to the laboratory ... We will continue to innovate and invest in the future ... The pioneering spirit that led the founders and early leaders to 'dare to think on new lines' continues to guide us."

University Governance and Organization

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ORGANIZATION

BOARD OF TRUSTEES

Powers and Duties—The Board of Trustees is custodian of the endowment and all properties of the University. The Board administers the invested funds, sets the annual budget, and determines policies for the operation and control of the University. The powers and duties of the Board of Trustees derive from the Founding Grant, amendments, legislation, and court decrees. In addition, the Board operates under its own bylaws and a series of resolutions on major policy.

Membership—Board membership is set at 35, including the President of the University who serves ex officio and with vote. Trustees serve a five-year term and are eligible for appointment to one additional five-year term. At the conclusion of that term, a Trustee is not eligible for reelection until after a lapse of one year. Eight of the Trustees are elected or appointed in accordance with the Rules Governing the Election or Appointment of Alumni Nominated Trustees. They serve a five-year term.

Officers of the Board—The officers of the board are a chair, one or more vice chairs, a secretary, and an associate secretary. Officers are elected to one-year terms at the annual meeting in June, with the exception of the chair, who serves a two-year term. Their terms of office begin July 1.

Committees—Standing committees of the Board are Academic Policy, Planning, and Management; Alumni and External Affairs; Audit and Compliance; Development; Finance; Land and Buildings; the Medical Center; and Trusteeship. Special committees include Athletics, Compensation, Investment Responsibility, and Litigation.

Meetings—The Board generally meets five times each year.

THE PRESIDENT

The Founding Grant prescribes that the Board of Trustees shall appoint the President of the University and that the Board shall give to the President the following powers:

To prescribe the duties of the professors and teachers.

To prescribe and enforce the course of study and the mode and manner of teaching.

Such other powers as will enable the President to control the educational part of the University to such an extent that the President may justly be held responsible for the course of study therein and for the good conduct and capacity of the professors and teachers.

The President is also responsible for the management of financial and business affairs of the University, including operation of the physical plant.

The President appoints the following, subject to confirmation by the Board: Provost, Vice President for Business Affairs and Chief Financial Officer, Chief Executive Officer of Stanford Management Company, Vice President for Alumni Affairs and President of Stanford Alumni Association, Vice President for Development, Vice President for Public Affairs, Vice President and General Counsel, and Vice President for Land, Buildings, and Real Estate.

COMMITTEES AND PANELS

University Committees are appointed by and are primarily responsible to the President. Such committees deal with matters on which the responsibility for recommendation or action is clearly diffused among different constituencies of the University. In accordance with the *Report on the Committee Structure of the University*, Academic Council members are appointed to University Committees on nomination of the Senate Committee on Committees and student members on nomination of the Associated Students of Stanford University (ASSU) Committee on Nominations. The President takes the initiative in the appointment of staff members to such committees. Although immediately responsible to the President, University Committees may be called upon to report to the Senate of the Academic Council or the ASSU. Charges to such committees are set by the President on recommendation of the Committee on Committees and others. There are five University Committees, as follows:

Advisory Panel on Investment Responsibility and Licensing (AP-IRL)
Committee on Athletics, Physical Education, and Recreation (C-APER)
Committee on Environmental Health and Safety (C-EH&S)
Committee on Faculty Staff Human Resources (C-FSHR)
Panel on Outdoor Art (P-OA)

Additionally there are ten standing administrative panels which are appointed by the Vice Provost and Dean of Research, and which report through her to the President:

Administrative Panel on Biosafety
Administrative Panel on Human Subjects in Medical Research-01
Administrative Panel on Human Subjects in Medical Research-03
Administrative Panel on Human Subjects in Medical Research-04
Administrative Panel on Human Subjects in Medical Research-05
Administrative Panel on Human Subjects in Medical Research-06
Administrative Panel on Human Subjects in Medical Research-07
Administrative Panel on Human Subjects in Non-Medical Research-02
Administrative Panel on Laboratory Animal Care
Administrative Panel on Radiological Safety

THE PROVOST

The Provost, as the chief academic and budget officer, administers the academic program (instruction and research in schools and other academic units) and University services in support of the academic program (including budgeting and planning, land and buildings, libraries and information resources, and student affairs). In the absence or inability of the President to act, the Provost becomes the Acting President of the University. The Provost shares with the President conduct of the University's relations with other educational institutions, groups, and associations.

Schools of the University—The program of instruction in the University is organized into seven schools: Graduate School of Business, School of Earth Sciences, School of Education, School of Engineering, School of Humanities and Sciences, School of Law, School of Medicine.

The deans of the schools report to the Provost.

THE ACADEMIC COUNCIL

According to the Articles of Organization of the Faculty, originally adopted by the Board of Trustees in 1904 and revised in 1977, the powers and authority of the faculty are vested in the Academic Council consisting of: (1) the President of the University; (2) tenure-line faculty: Assistant, Associate, and Full Professor; (3) nontenure-line faculty: Associate and Full Professor followed by the parenthetical notation (Teaching), (Performance), (Applied Research), or (Clinical); (4) nontenure-line research faculty: Assistant Professor (Research), Associate Professor (Research), Professor (Research); (5) Senior Fellows in specified policy centers and institutes; and (6) certain specified officers of academic administration.

In the Spring of 1968, the Academic Council approved the charter for a Senate to be composed of 55 representatives elected by the Hare System of Proportional Representation and, as ex officio nonvoting members, deans of the academic schools and certain major officers of academic administration.

In the allocation of representation, each school constitutes a major constituency. The Senate may create from time to time other major constituencies as conditions warrant. Approximately one-half of the representatives are allocated to constituencies on the basis of the number of students in those constituencies and the remainder on the basis of the number of members of the Academic Council from each constituency.

COMMITTEES

Committees of the Academic Council are created by and responsible to the Senate of the Academic Council and are appointed by the Committee on Committees of the Senate. Such committees deal with academic policy matters on which the primary responsibility for action and decision lies with the Academic Council or, by delegation, the Senate. Pursuant to the Senate's acceptance on September 25, 1969 of the *Report from the Committee on Committees on the Committee Structure of the University* and subsequent Senate action, the Senate has established seven standing Committees of the Academic Council, as follows:

Committee on Academic Computing and Information Systems (C-ACIS)
Committee on Graduate Studies (C-GS)
Committee on Libraries (C-Lib)
Committee on Research (C-Res)
Committee on Review of Undergraduate Majors (C-RUM)
Committee on Undergraduate Admissions and Financial Aid (C-UAFA)
Committee on Undergraduate Standards and Policy (C-USP)

The Senate has also created a Planning and Policy Board of the Senate to consider long-range strategic issues of concern to the faculty. Information regarding charges to these committees is available from the Office of the Academic Secretary to the University.

ASSOCIATED STUDENTS OF STANFORD UNIVERSITY (ASSU)

Web Site: http://assu.stanford.edu

All registered students are members of the ASSU. They are governed by the ASSU Constitution and Bylaws, which was last revised and approved by student vote in April 1999.

Executive—The President and Vice President serve as the chief executives and representatives for the Association. The Financial Manager acts as business manager of the ASSU, CEO of Stanford Student Enterprises (SSE), and controller of the Students' Organizations Fund in which ASSU and student organization funds are deposited.

Legislative—There are two legislative bodies, an Undergraduate Senate and a Graduate Student Council, that work together to determine the Association's budgetary, financial, investment, business, and operating policies. In addition, each entity provides funding for student organizations, participates in recommending student appointments to University Committees and advocates on behalf of its constituents. Each body has 15 elected representatives and an elected chair. Both meet regularly to conduct Association business and discuss and act on issues pertinent to student life at Stanford.

Admission and Financial Aid

ADMISSION

UNDERGRADUATE

MATRICULATED STUDY

Stanford's undergraduate community is drawn from throughout the United States and the world. It includes students whose abilities, intellectual interests, and personal qualities allow them to benefit from and contribute to the University's wide range of teaching and research programs in the humanities, natural sciences, social sciences, and engineering. The University admits students who derive pleasure from learning for its own sake; who exhibit energy, creativity, and curiosity; and who have distinguished themselves in and out of the classroom.

Stanford welcomes a diverse community that cuts across many dimensions. The University does not use quotas of any kind in its admission process: it does not favor particular schools or types of schools, nor any geographic region, nor does it have any racial, religious, ethnic, or gender-related targets. The University believes that a student body that is both highly qualified and diverse in terms of culture, socioeconomic status, race, ethnicity, gender, work and life experiences, skills, and interests is essential to the educational process. Applications are encouraged from those who would take the initiative and responsibility for their own education and who would provide additional dimensions to the University and its programs.

In order to preserve the residential character of the University and to maintain a favorable student-faculty ratio, Stanford has a limited undergraduate enrollment. The anticipated size of the freshman class is approximately 1,600 students. Fewer than 80 transfer students, entering either the sophomore or junior class, are also typically admitted for Autumn enrollment if space allows. Each year, the University receives many more applications from qualified students than there are places available.

Stanford is committed to meeting the University-computed financial need of each admitted student, and admission decisions are made without regard to the applicant's financial status, except in the case of international students who are neither U.S. citizens nor permanent residents.

Application procedures, requirements, and deadlines vary from year to year. See the Undergraduate Admission web site at http://admission.stanford.edu for the most recent information and to begin an application online; or call the Office of Undergraduate Admission at (650) 723-2091.

NONMATRICULATED STUDY

Permission to enroll at Stanford as a nonmatriculated student during Autumn, Winter, and Spring quarters is not routinely approved except under extenuating circumstances. Nonmatriculated students authorized to enroll at Stanford University are not admitted to any Stanford degree program and are permitted to register for a specific period, usually one, two, or three quarters. Financial assistance from Stanford University is not available. Permission to enroll as a nonmatriculated student does not imply subsequent admission as a matriculated student. Students interested in nonmatriculated status during the Autumn, Winter, and Spring quarters should contact the Office of the University Registrar, not the Office of Undergraduate Admission.

High School Nonmatriculated Students—Local high school students are eligible to be considered to attend Stanford as nonmatriculated students on a limited basis when they have exhausted all of the courses in a given discipline offered by their high school. Nonmatriculated high school students are permitted to enroll in one course per quarter and are required to pay the applicable tuition. Permission from the academic department and the Registrar is required.

Summer Session—Students wishing to enroll as nonmatriculated students during Summer Quarter should contact the Summer Session Office for more information about the Summer Visitor Program. Admission to the Summer Visitor Program does not imply regular admission to Stanford for subsequent quarters or to one of Stanford's regular degree programs.

GRADUATE

MATRICULATED STUDY

Applicants from colleges and universities of recognized standing who hold a U.S. bachelor's degree or its equivalent are eligible to be considered for admission for graduate study. Details regarding degrees offered in specific departments are given in the *Guide to Graduate Admission* or at http://gradadmissions.stanford.edu. The number of applicants who can be admitted for work in a particular field of study at any time is limited by the facilities and programs of the school or department and by the number of matriculated students who continue their work in that field.

As with its undergraduate program, Stanford believes that a graduate student body that is both highly qualified and diverse in terms of culture, socioeconomic status, race, ethnicity, gender, work and life experience, skills, and interests is essential to the graduate educational process. It particularly welcomes applications from African Americans, Latinos, and Native Americans, as well as from others whose backgrounds and experiences would add additional dimensions to the University's educational programs.

The Coterminal Degree Program—This program permits matriculated Stanford undergraduates to study for bachelor's and master's degrees simultaneously in the same or different departments. Application policies and procedures are established by each master's department. Applicants must have earned a minimum of 120 units toward graduation (UTG) as shown on the undergraduate unofficial transcript. This includes allowable Advanced Placement (AP) and transfer credit. Applicants must submit their application no later than the quarter prior to the expected completion of their undergraduate degree. This is normally the Winter Quarter prior to Spring Quarter graduation. Students who decide to apply for admission to master's programs after these deadlines are not eligible for the coterminal program and must apply through the regular graduate admission process.

APPLICATION PROCESS

Specific information regarding test requirements, other application procedures and requirements, and closing dates for filing applications and supporting credentials for admission and financial aid are listed in the *Guide to Graduate Admission*.

Graduate fellowship funds and assistantships are generally committed in March for the entire period comprising Autumn, Winter, and Spring quarters of the next academic year. Awards are seldom made to students who enter the University in Winter, Spring, and Summer quarters; such applicants must meet the same financial aid application requirements as those entering in Autumn Quarter.

Applications are to be submitted electronically for graduate programs in the schools of Earth Sciences, Education, Engineering, Humanities and Sciences, and the Biosciences (non-M.D. programs in Medicine). Application instructions may be found at http://gradadmissions.stanford.edu.

The *Guide to Graduate Admission* may be obtained from Graduate Admissions, Office of the University Registrar, 630 Serra Street, Suite 120, Stanford University, Stanford, California 94305-6032; the Guide outlines application policies except for the programs listed following this paragraph. Applicants who are unable to apply online may send a written request for a paper admissions packet from Graduate Admissions, Office of the University Registrar, 630 Serra Street, Suite 120, Stanford University, Stanford, CA 94305-6032. The cost for this packet is $20. For admission to the following programs, please apply directly at the address listed.

Business—Applicants should write to Director of Admissions of the M.B.A., Ph.D., or Sloan program, Graduate School of Business, Stanford University, Stanford, CA 94305-5015 for information and application forms.

Law—Applicants should write to Director of Admissions, School of Law, Stanford University, Stanford, CA 94305-8610. The Law School Admissions Test is required.

M.D. Program—Applicants should see the M.D. admissions web site at http://med.stanford.edu/md/admissions/ or, for additional information about the M.D. program, write to Stanford University School of Medicine, Office of M.D. Admissions, 251 Campus Drive, MSOB X3C01, Stanford, CA 94305-5404. The American Medical College Application Service (AMCAS) application is available at http://www.aamc.org. Applications and transcripts must be received by AMCAS by October 15. The Medical College Admissions Test is required.

Coterminal Master's Program—Interested Stanford undergraduates should contact directly the department in which they wish to pursue a master's degree and must adhere to the application deadlines described in the "Coterminal Degree Program" above.

NONMATRICULATED STUDY

Eligibility for consideration for nonmatriculated status is restricted to two groups of applicants:

1. Stanford alumni who wish to return to Stanford to take courses that are prerequisites for Medical School admission, such as undergraduate Biology or Chemistry courses, are eligible to apply for nonmatriculated status. An application form, application fee, statement of purpose, and three letters of recommendation are required. The decision to admit or deny is made by the Director of Graduate Admissions on the basis of relevant factors, including a 3.0 GPA and positive letters of recommendation.

   Applicants who graduated from other universities are not eligible to take the prerequisites for Medical School at Stanford.
2. Individuals who hold a bachelor's degree or equivalent and wish to take courses in a specific department that allows non-degree students are eligible to apply for nonmatriculated status. An application form, application fee, statement of purpose, original transcripts, and three letters of recommendation are required. The decision to admit or deny is made by the chair of the department in which they wish to take courses and conveyed in writing to the Graduate Admissions Office. Applicants are notified of the decision by Graduate Admissions in the Office of the University Registrar.

Students who are granted nonmatriculated status may register for a maximum of one academic year. Nonmatriculated status is a privilege and not a right; the nonmatriculated status may be revoked at the University's discretion (and after consideration of such factors as the University considers relevant in the particular case) at the end of any quarter of enrollment.

Nonmatriculated students are not permitted to enroll in certain courses, such as those in the following departments or programs: film and broadcasting courses in Art; all courses in Computer Science, Economics, Electrical Engineering, International Policy Studies, and the School of Medicine. Nonmatriculated students receive academic credit for courses satisfactorily completed and may obtain an official transcript. They may use University facilities and services. In classes of limited enrollment, students in degree programs have priority. Nonmatriculated students may apply for housing but have a low priority for assignment. No fellowships, assistantships, or Stanford loans are available for nonmatriculated students.

Nonmatriculated students who later apply for admission to a degree program must meet the standard admission requirements and should not anticipate special priority because of work completed as a nonmatriculated student. Students who are admitted to a degree program may apply a maximum of 15 units of nonmatriculated study toward the residency requirement for a master's degree and 30 units for the Engineer or Ph.D. degree.

Application forms for nonmatriculated status during the regular academic year are available from Graduate Admissions, Office of the University Registrar, 630 Serra Street, Suite 120, Stanford, CA 94305-6032. Deadlines for applying are included with the forms and are generally required two months before the start of the quarter.

Applicants interested in nonmatriculated student status for the Summer Quarter only should contact the Summer Session Office, 482 Galvez Mall, Stanford, CA 94305-6079.

POSTDOCTORAL SCHOLARS

Postdoctoral scholars are trainees in residence at Stanford University pursuing advanced studies beyond the doctoral level in preparation for an independent career. Postdoctoral scholars are appointed for a limited period of time and may participate in Stanford research projects and/or may be supported by external awards or fellowships. In all cases, their appointment at Stanford is for the purpose of advanced studies and training under the sponsorship of a Stanford faculty member.

Postdoctoral appointments require initial full-time engagement in the designated research or study and are generally restricted to those who have earned a terminal degree such as Ph.D. or J.D. within the last three years or a medical degree such as M.D., M.B.B.S., or D.D.S. within the last six years. Requests for exceptions for individuals who are beyond these limits, or have not been actively engaged in research as their primary effort, must include a written statement from the sponsoring faculty member indicating what additional training outside the primary area of effort the individual plans to receive, and the reasons for which the exception is requested. Postdoctoral scholars are appointed at Stanford for fixed terms, typically one year but that may eventually total up to four years, and are subject to a strict five-year rule (that is that the total postdoctoral appointment period is not to exceed a total of five years of postdoctoral research experience at all institutions combined). In cases of combined training, only the years of active research at the postdoctoral level are counted for salary and other purposes. Postdoctoral scholars who begin a second postdoctoral appointment in a new field may have training extended to a maximum total of up to six years. Postdoctoral scholars may request temporary reductions in effort and pay due to temporary family or other conditions.

All postdoctoral scholars appointed at Stanford must be supported by Stanford grants and contracts, training grants, departmental or school fellowship funds, or external fellowships, or by a combination of these sources. Scholars may not be self-supporting. In addition, all postdoctoral scholars are eligible for a benefits package including medical, dental, life, and disability insurance. Postdoctoral scholars are normally appointed for 100% time.

Postdoctoral scholars must be registered at Stanford during every academic quarter of their appointment. Registration entails payment of a quarterly postdoctoral fee by the academic department or school appointing the scholar.

Prospective postdoctoral scholars should write directly to the department in which they wish to study or check for postdoctoral openings at http://postdocs.stanford.edu/prospects/index.htm. For more information, see http://postdocs.stanford.edu/.

VISITING RESEARCHERS

In limited instances, it is to the benefit of Stanford faculty to permit persons who have not yet obtained a Ph.D. (or its foreign equivalent) or who are not recognized experts in their fields to engage in research on the Stanford campus using Stanford research facilities. Such instances include students at other universities who are engaged in graduate-level research in a field of interest to the faculty member, a person doing a laboratory rotation as part of a larger research study or grant, or employees of companies who are conducting research which requires specialized equipment available only at Stanford.

In these instances, since these individuals are not eligible for Visiting Scholar status, they may be eligible to apply to register as nonmatriculated graduate students in the visiting researcher category for one year. Invited persons must be qualified to conduct research at a level comparable to that of other Stanford graduate students, and the research must be of benefit to Stanford as well as to the visitor. Application for Admission forms for visiting researchers are submitted to the Registrar's Office by the department issuing the invitation.

Visiting researchers are charged the TGR (Terminal Graduate Registration) tuition rate quarterly and may waive the University's student medical insura.nce plan only if they have comparable coverage with another carrier and submit proof of the comparable coverage prior to the term start date. They may not enroll in or audit any courses, but in quarters they are registered are eligible for the usual student benefits of nonmatriculated student status. Visiting researchers may apply for housing, but have a low priority for assignments. No fellowships, assistantships, or Stanford loans are available for visiting researchers. Stanford cannot certify visiting researchers for deferment of U.S. educational loans. Citizens of other countries who enter the United States to be visiting researchers at Stanford must have a DS 2019 Certificate (to apply for a J-1 visa) issued by the Bechtel International Center and must register each quarter, including Summer Quarter, to maintain their visa status.

VISAS

In order to register as students, Stanford University requires that all those who are not U.S. citizens or U.S. registered permanent residents must obtain and maintain an appropriate visa status for their stay in the United States. The types of student visas sponsored by Stanford include the following:

1. Student Visa (F-1), obtained with an I-20 Certificate of Eligibility issued by Stanford University. The graduate student on an F-1 visa must enroll in a full course of study. The accompanying spouse or child enters on an F-2 visa. F-2 visa holders may not work.
2. Exchange Visitor Visa (J-1), obtained with a DS-2019 Certificate of Eligibility issued by Stanford University or a sponsoring agency. This visa is required for graduate students sponsored by certain agencies, foundations, and governments. In some cases, Exchange Visitors must leave the United States at the conclusion of their programs, may not change visa status, and may not apply for permanent residency in the United States until they have returned to their home countries for at least two years. The spouse of an Exchange Visitor enters on a J-2 visa and may, in some cases, obtain permission to work.

The Certificate of Eligibility is issued to a student accepted for admission only upon receipt of evidence of satisfactory proficiency in the English language and certification of adequate financial support. A student transferring from another U.S. school must obtain a new visa with a Stanford Certificate of Eligibility.

Information on visas is sent to admitted graduate students from the Graduate Admissions Office. Information on visas for postdoctoral scholars and visiting researchers may be obtained from the Bechtel International Center.

FINANCIAL AID

UNDERGRADUATE

The University has a comprehensive need-based financial aid program for its undergraduate students (except some international students) who meet various conditions set by federal and state governments, the University, and other outside agencies.

In awarding its own funds, the University assumes that students and their parents accept the first and primary responsibility for meeting educational costs. Stanford's policy generally is to exclude undergraduates from being considered financially independent of their parents for University-administered scholarship aid unless a student is an orphan, a ward of the court, or at least 25 years of age. Spouses of married undergraduate students share in the responsibility to meet educational costs.

Stanford expects financial aid applicants to apply for and use resources from state, federal, and private funding sources, contribute from their earnings during nonenrollment periods (for example, summer), and use student loans and earnings from part-time employment during the academic year to meet educational expenses. If Stanford determines that an applicant and his or her family cannot meet these expenses, the University may offer financial aid funds to help meet these costs.

In awarding financial aid funds to meet computed need (that is, any gap remaining after subtracting the calculated family contribution and government grants from the standard student budget), Stanford first offers self-help, which consists of student loans and/or an academic-year earnings expectation. If computed need is greater than the self-help expectation, Stanford awards institutional scholarship to meet the remaining need.

Scholarships from outside sources may change the University's financial aid award. When a student receives outside scholarships, these funds reduce or eliminate the student's self-help expectation. If the total in outside scholarships exceeds the self-help expectation, the University then reduces institutional scholarship, dollar for dollar, by any additional amount.

Students are considered for University scholarship eligibility during their first four years of undergraduate enrollment. The Financial Aid Office (FAO) considers applicants for University scholarship eligibility beyond the twelfth quarter only if enrollment is essential in order to complete the minimum requirements for the first baccalaureate degree or major. Students who enroll for a fifth year in pursuit of a coterminal program, a minor, a second major, a second degree, or the B.A.S. degree are not eligible for University scholarship consideration but may apply for student loans and federal grants. Eligibility for federal student aid is limited to the equivalent of 15 quarters of full-time undergraduate enrollment, including course work taken at other colleges and universities.

APPLICATION AND AWARD NOTIFICATION PROCESS

FINANCIAL AID PRIORITY FILING DEADLINES

Prospective freshmen	Restrictive Early Action, November 15, 2007
Prospective freshmen	Regular Decision, February 15, 2008
Prospective transfers	March 15, 2008
Returning students	April 15, 2008

APPLICANT DOCUMENTS

U.S. citizens and U.S. permanent residents who wish to be considered for all available funding administered by Stanford should submit the following documents:

1. Free Application for Student Aid (FAFSA): file online at http://fafsa.ed.gov. California residents must file the FAFSA and submit a GPA Verification Form to the California Student Aid Commission (CSAC) by March 2, 2008, for Cal Grant consideration.
2. CSS PROFILE application: file online at http://profileonline.collegeboard.com.
3. Copies of parents' 2007 W-2 forms. Continuing students should submit copies directly to the FAO. New applicants should submit signed copies of their parents' 2007 federal tax returns and W-2 forms to the CSS IDOC service.

U.S. citizens and U.S. permanent residents who wish to apply only for federal aid consideration do not need to file the CSS PROFILE; they should file the FAFSA and submit tax documents directly to the FAO.

International students (except Canadians) should complete and submit the International Student Financial Aid Application and Certification of Finances directly to the FAO. Canadians should file the CSS PROFILE and submit tax documents as listed above.

Students whose application materials are filed after the priority filing deadlines, who have not borrowed or worked in prior years, or who have not secured all external funds such as Pell and Cal Grants, can expect higher levels of self-help in their financial aid packages.

Applicants and their parents are required to submit accurate and complete information on all application documents. The University participates in the U.S. Department of Education's Quality Assurance Program to evaluate the accuracy of aid application data. As part of this program, the FAO may request additional documentation to verify reported data. Students who fail to submit the requested documentation have their financial aid funds withheld or canceled and their future registration placed on hold. Financial aid awards may change as a result of the verification process.

NOTIFICATION DATES

In December, the FAO notifies Restrictive Early Action applicants who apply by the November filing date of their financial aid award. The FAO notifies freshman applicants who apply by the February 15 filing date in early April. Transfer applicants who apply by the March 15 filing date are normally notified of their financial aid award within five days of their notice of admission.

The FAO begins mailing award notices to continuing and returning applicants in early August. Applicants who file after the priority filing date may not have a financial aid award or funds secured for disbursement by the Autumn Quarter payment due date.

FINANCING OPTIONS

The federal Parent Loan for Undergraduate Students (PLUS) program is available to help parents cover all or part of the expected family contribution through a low-interest, long-term loan. PLUS loans are available to all parents who meet credit requirements regardless of their computed financial need. See the Financial Aid Office web site at http://financialaid.stanford.edu for details on the PLUS program. Parents should also contact their employers for information about programs that may be available to them as employees' benefits to help meet college costs.

GRADUATE

Graduate students at Stanford receive funding from a variety of sources. University fellowships, research assistantships, and teaching assistantships are offered primarily to doctoral students. In some cases, master's students also may receive fellowships and assistantships. In addition, outside agencies provide fellowships to many graduate students at Stanford. Students without fellowships or assistantships, and those whose funding does not cover all of their costs, may need to use student loans, savings, other personal assets, a spouse's earnings, or parental support to meet their educational expenses.

FELLOWSHIPS AND ASSISTANTSHIPS

Fellowships, research assistantships, and teaching assistantships are important parts of the educational program for graduate students at Stanford. Schools and/or departments determine eligibility for University fellowships and assistantships on the basis of academic merit, program, and the availability of funds. Some departments admit only those students to whom they can offer support or who have guaranteed funds from outside sources. Other departments may offer admission without being able to provide fellowship or assistantship funding.

Fellowship and assistantship funding is provided so that students may focus on their studies; concurrent employment is therefore limited. Students with full assistantships are limited to eight additional hours of employment per week. Students on full fellowships may be paid for up to eight additional hours per week, or may hold a supplemental assistantship appointment up to a maximum of 25% with no additional hourly employment. International students who have Stanford assistantships may not work more than 20 hours per week, including the time required for their assistantship appointments. In Summer Quarter, graduate students who are not required to enroll full-time may be allowed additional employment.

Application procedures and deadlines for admission and University funding are described in the *Guide to Graduate Admission* and at http://gradadmissions.stanford.edu. Fellowships and assistantships are normally awarded to incoming students between March 15 and April 15, in accordance with the Council of Graduate Schools resolution. Acceptance of University funding obliges the student to inform the department of any additional funds received; in such cases, Stanford funding may be adjusted (see "Outside Fellowships" below). Recipients of all graduate fellowships and assistantships must enroll in courses for each quarter of their appointment. Students may make arrangements with Student Financial Services to have their assistantship salary credited directly to the University bill through a payroll deduction plan.

OUTSIDE FELLOWSHIPS

Many graduate students hold fellowships won in national competition from outside agencies such as the National Science Foundation. Information on application procedures and terms of such fellowship programs may be obtained from the applicant's current academic institution or the national office of the agency administering the program. A student who receives support from an outside source must notify his or her Stanford academic department immediately; Stanford funding may be adjusted.

STUDENT LOANS

Graduate students can apply for federal and private student loans through the University's Financial Aid Office (FAO). Available programs include federal Stafford loans, federal Perkins loans, and federal graduate/professional PLUS loans. Information on these loan programs is available at http://financialaid.stanford.edu or by calling the FAO at (888) 326-3773 or (650) 723-3058. Students who are not U.S. citizens or U.S. permanent residents are not eligible for federal student loans.

*Application—*Students in the Schools of Business, Law, and Medicine (M.D. program) should consult their schools for loan application instructions. The following loan application requirements apply to graduate students in the Schools of Earth Sciences, Education, Engineering, Humanities and Sciences, and Medicine (Ph.D. only):

1. Free Application for Federal Student Aid (FAFSA); file online at http://fafsa.ed.gov.
2. Stanford Graduate Student Loan and Federal Work-Study Application; file online at http://financialaid.stanford.edu.

Students should complete the application process at least two months prior to the beginning of the quarter in which they need the funds. The FAO determines eligibility for student loans based on a review of FAFSA and application data, satisfactory academic progress, level of indebtedness, credit history, and availability of funds. Student loan eligibility is affected by fellowship, assistantship, and other funding; total funding, including student loans, may not exceed the standard expense budget as determined by the FAO.

Emergency funds—Students may request a cash advance from Student Financial Services. Cash advances may not be used to pay University bills.

COTERMINAL STUDENTS

Coterminal students, who are concurrently pursuing bachelor's and masters degrees, may receive University fellowships and assistantships only after completing 180 units. Most private and federal graduate fellowships are awarded only to students who have received their bachelor's degrees. Stanford undergraduate scholarships and grants are reserved for students in their first four years of undergraduate study.

HONORS COOPERATIVE PROGRAM

The Honors Cooperative Program (HCP) is a part-time graduate program offered by Stanford University. It allows working professionals, who may be eligible for tuition support through their employer, an opportunity to earn a graduate degree in any of the engineering programs, applied physics, statistics, or biomedical informatics, on a part-time basis.

Prospective HCP students apply to the department in which they would like to pursue a graduate degree through the normal graduate admissions process, and compete with all other applicants for admission to the program. Once admitted, HCP students arrange their part-time status and tuition payment options through the Stanford Center for Professional Development (SCPD). Courses are delivered online and broadcast locally. HCP students are also welcome to attend classes on campus, and some on-campus attendance may be required depending on the degree track.

To participate, industry students must have the support of their employer as a participating company of the Stanford Center for Professional Development. For more information, see http://scpd.stanford.edu, or phone (650) 725-3000.

VETERANS' EDUCATIONAL BENEFITS

Liaison between the University, its students, and the various federal, state, and local agencies concerned with veterans' educational benefits is provided by the Office of the University Registrar. All students eligible to receive veterans' educational benefits while attending the University are urged to complete arrangements with the appropriate agency well in advance of enrollment. In addition, students must have their department approve their study lists as meeting graduation requirements before the Office of the University Registrar can certify the courses for Veterans Affairs.

To comply with federal regulations concerning credit for previous training (38 CFR 21.4253), Stanford University is required to evaluate all previous education and training completed elsewhere to determine what credit, if any, should be granted to students eligible to receive Veterans Administration (VA) educational benefits. Stanford is required to complete an evaluation; credit is granted when appropriate. Credit is evaluated toward the degree program registered with Veterans Affairs as determined by the Office of the University Registrar in conjunction with the relevant academic department(s) or program(s). All relevant University policies regarding transfer credit apply. In addition, this evaluation occurs again each time a student's degree program is changed.

Subject to current federal and University guidelines, students eligible for receipt of VA educational benefits have their prior education and training evaluated up to the credit limits outlined in the "Residency Policy for Graduate Students" section of this bulletin. As an exception to that policy, students in master's programs in the schools of Earth Sciences, Education, Engineering, Humanities and Sciences, Law, Medicine, and Graduate Business are allowed a maximum of 6 transfer (quarter) units.

Stanford University is required to certify only those courses that meet minimum graduation requirements. Courses not directly related to a student's degree program or courses beyond those required for a specific degree program are not certified.

Tuition, Fees, and Housing

ASSESSMENTS

TUITION

Regular tuition for the 2007-08 academic year, payable Autumn, Winter, and Spring quarters, is as follows:

All departments and schools (except those below)	$11,600
Graduate Division in Engineering	12,370
Graduate School of Business, first year	15,307
Graduate School of Business, second year	14,460
School of Medicine (M.D. Program)	13,873
School of Law (payable Autumn and Winter semesters)	19,750
J.D./M.B.A. Program (payable Autumn and Winter semesters)	20,440

Regular tuition fees apply to the undergraduate Overseas Studies and Stanford in Washington programs. For Summer Quarter tuition rates and policies, see http://summer.stanford.edu/ or the Summer Quarter *Time Schedule.*

A coterminal student is subject to graduate tuition assessment and adjustment policies once graduate standing is reached. Coterminal students should see the student policies and procedures for tuition assessment, as described under Residency and Unit Requirements in Coterminal Programs in the "Graduate Degrees" section of this bulletin.

Eligibility for registration at reduced tuition rates is described below. Tuition exceptions may also be made for illness, disability, pregnancy, new-parent relief, or other instances at the discretion of the University Registrar. No reduction in tuition charges is made after the first two weeks of the quarter.

All students are strongly advised, before registering at less than the regular full-tuition rate, to consider the effects of that registration on their degree progress and on their eligibility for financial aid and awards, visas, deferment of student loans, and residency requirements.

The University reserves the right to change at any time, without prior notice, tuition, room fees, board fees, or other charges.

UNDERGRADUATES

During Autumn, Winter, and Spring quarters, undergraduates are expected to register at the regular full-tuition rate. Undergraduates who have completed at least twelve full-time quarters may petition to register at a reduced tuition rate for their final quarter, but must register for at least eight units. Undergraduate dual degree students must complete at least fifteen full-time quarters before petitioning for reduced tuition in their final quarter.

Permit to Attend status can be granted for one quarter on a one-time basis to those for whom it is academically appropriate. The Permit to Attend rate is $2,760 per quarter in 2007-08. Undergraduates in the terminal quarter who are completing honors theses or clearing incomplete grades may petition, on a one-time basis, for Permit to Attend for Services Only (PSO) registration. That rate is $2,760 per quarter in 2007-08 and does not permit any course enrollment or auditing. Further information about the Permit to Attend status is available from the Office of the University Registrar.

During Summer Quarter, all Stanford undergraduates may register on a unit-basis (minimum 3 units).

GRADUATE STUDENTS

Matriculated graduate students are expected to enroll for at least eight units. Schools and departments may set a higher minimum.

The following reduced-tuition categories can be requested by matriculated graduate students in the final stages of their degree programs:

1. *Terminal Graduate Registration (TGR):* doctoral students who have been admitted to candidacy, completed all required courses and degree requirements other than the University oral exam and dissertation, completed 135 units or 10.5 quarters of residency (if under the old residency policy), and submitted a Doctoral Dissertation Reading Committee form may request Terminal Graduate Registration status to complete their dissertations. Students pursuing Engineer degrees may apply for TGR status after admission to candidacy, completion of all required courses, and completion of 90 units or six quarters of residency (if under the old residency policy). Students enrolled in master's programs with a required project or thesis may apply for TGR status upon completion of all required courses and completion of 45 units.

   TGR status may also be granted for one quarter only to a graduate student who is returning after a leave of absence or after reinstatement, or to graduate students who register for one final term to take a University Oral Examination, submit a thesis or dissertation, or file an Application to Graduate. Doctoral students applying for one quarter TGR status must also meet the doctoral criteria above except that they need only nine quarters of residency. Requirements for one quarter TGR for master's and Engineer students are as above.

   Each quarter, all TGR students must enroll in the 801 (for master's and Engineer students) or 802 (for doctoral students) course in their department for zero units, in the appropriate section for their adviser. TGR students register at a special tuition rate: $2,760 in 2007-08. TGR students may enroll in up to 3 units of course work at this tuition rate. Within certain restrictions, TGR students may enroll in additional courses at the appropriate unit rate. The additional courses cannot be applied toward degree requirements since all degree requirements must be complete in order to earn TGR status.
2. *Graduate Tuition Adjustment:* graduate students who need only a few remaining units to complete degree requirements or to qualify for TGR status, may register for one quarter on a unit basis (3 to 7 units) to cover the deficiency. This status may be used only once during a degree program.

Additional information on these registration categories is available from the Office of the University Registrar at 630 Serra Street, Suite 120.

Matriculated graduate students who have Stanford fellowships or assistantships that require less than full-tuition registration may register at the unit rate required by their award. Honors Cooperative students register at the unit rate.

During the Autumn, Winter, and Spring quarters, matriculated graduate students in most departments may register at the 8-, 9-, or 10-unit rate if their enrollment plans are accepted by their departments. Students in the School of Engineering may register at the 8-, 9-, or 10-unit rate. Students in the schools of Law and Business, or the M.D. program in the School of Medicine, should consult appropriate school officers about tuition reduction eligibility.

Tuition exceptions may also be available for students who are faculty spouses, regular Stanford employees, or full-time educators in the Bay Area.

During Summer Quarter, most matriculated graduate students may register on the unit basis for 3 or more units. Students in schools and departments affiliated with the Honors Cooperative Program, as listed above, may not register for fewer than 11 units (8-unit minimum in Statistics only).

Nonmatriculated graduate students pay the same tuition rates as matriculated students, but must register for at least 8 units. Visiting researchers pay the TGR rate; they may not enroll in or audit courses. Within certain restrictions, postdoctoral students may enroll in courses if the appropriate unit rate for tuition is paid.

INTERNATIONAL STUDENTS

F-1 or J-1 visas are required by the U.S. Department of Homeland Security. International students must be registered as full-time students during the academic year. Summer Quarter registration is not required. International graduate students comply with immigration regulations while enrolled for partial tuition if their Stanford fellowships or assistantships require part-time enrollment, if they are in TGR status, or if they are in the final quarter of a degree program. Nonmatriculated international students must register for at least 8 units.

FEES

APPLICATION FEE

Contact the Undergraduate Admission Office for information about the undergraduate application fee and the Graduate Admission section of the Office of the University Registrar for the current graduate application fee. Application fees for the School of Law, the School of Medicine, and the Graduate School of Business vary by program. Fees are payable at the time of application and are not refundable.

ASSU FEES

The Associated Students of Stanford University (ASSU) fees are established by student vote in Spring Quarter. Fees directly fund activities of student organizations and not operations of ASSU. The 2007-08 fees are:

Undergraduates—Autumn, $96; Winter, $96; Spring, $97
Graduates—Autumn, $29; Winter, $30; Spring, $30
Law—Autumn, $29; Winter, $60

Fees are assessed each term. All fees are refundable. Refunds can be requested during the first three weeks of each quarter on the ASSU web site at http://assu.stanford.edu. Those eligible are mailed refund checks by the eighth week of the quarter.

DOCUMENT FEE

Stanford charges a one-time Document Fee to all students admitted to new degree or non-degree programs in 1993 or later. The fee is paid once only, regardless of the number of degrees a student may ultimately pursue. It covers the cost of a variety of University administrative services such as enrollment and degree certification, course drops and adds done before published deadlines, diplomas, official transcripts and their production, and credential files maintained by the Career Development Center.

HEALTH INSURANCE FEE

The University requires all registered students to carry medical insurance to provide coverage for services not provided by Vaden Health Center. Students are enrolled in and charged for the Stanford student health insurance plan, unless they have completed waiver procedures by the second day of instruction waiver deadline. See http://vaden.stanford.edu/insurance/using_your_own.html#waive for details. Those who carry medical insurance through an alternate carrier are generally eligible for waiver of the health insurance fee.

SPECIAL FEES

New Student Orientation Fee—A fee is charged to all entering undergraduates for the costs of orientation, including room and board, and for the cost of class dues to provide funds for later activities of the class.

School of Law Course Materials Fee—A fee is charged each semester to School of Law students for supplementary course materials.

Graduate School of Business M.B.A. Course Reader Fee—A fee is charged each quarter to M.B.A. students in the Graduate School of Business to cover the cost of in-class handouts and copyrights.

Late Fees—Charges are imposed for late submission of study lists. Charges are imposed for late submission of study lists. The amount is listed in the quarterly Time Schedule.

Laboratory Fee—Students in chemistry laboratory courses are charged a nonrefundable fee.

Music Practice; Athletics, Physical Education, Recreation; and Dance—Courses for which special fees are charged are indicated in the *Time Schedule*.

Dissertation Fee—Each Ph.D. and D.M.A. candidate is charged a fee to cover the cost of microfilming and binding the dissertation and the cost of publishing the abstract.

International Scholar Service Fee—A one-time fee for visa authorization documents is charged to international postdoctoral and visiting scholars.

HOUSING

Bulletins with further information on housing rates are *School of Law* for Law School and *Overseas Studies* for Overseas Centers. See http://summer.stanford.edu for Summer Session rates.

Campus housing rates are generally below local area market rents. The approximate room rates for the 2007-08 academic year are as follows:

Residences	*Room Rates**			
	Aut	*Win*	*Spr*	*Total*
Undergraduate Single Student Residences:				
Residence Halls and University-operated houses	$2,146	1,871	1,846	5,863
Theme or self-operated houses	2,664	2,245	2,215	7,123
Theme house, non-Row (EAST)	2,574	2,245	2,215	7,034
Co-ops, Fraternity, Sorority, or student-cleaned houses with professional cooks	2,377	2,003	1,977	6,357
Mirrielees (apartments)	2,425	2,115	1,087	6,627
Suites	2,339	2,093	2,065	6,557

Graduate Single Student Residences:	
Dormitories (single occupancy)	$640 per month
Dormitories (double occupancy)	$452 per month
Rains Houses (apartments)	$790 per month
Richard W. Lyman (apartments)	$790 per month
Schwab Residential Center (apartments)	$1,193 per month
Escondido Village (single student apartments)	
Studio (single occupancy)	$994 per month
1 bedroom (single occupancy	$1,335 per month
1 bedroom (double occupancy)	$536 per month
2 bedroom (double occupancy)	$790 per month
2 bedroom (triple occupancy)	$536 per month
3 bedroom (triple occupancy)	$714 per month
Couples without Children:	
Escondido Village	
1 bedroom	$1,335 per month
1 bedroom plus den	$1,519 per month
Students with Children:	
Escondido Village	
1 bedroom	$1,285 per month
2 bedroom	$1,471 per month
3 bedroom	$1,779 per month
4 bedroom	$2,111 per month

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* All rates are approximate and subject to change.

All rates are per student and include utilities and coinless laundry. Room rates are charged quarterly on the University Bill. Information on payment options and procedures is discussed in housing assignment information from Housing Assignments and is available in complete detail from the Student Financial Services office, 632 Serra Street, Suite 150, Stanford University, Stanford, CA 94305-6036.

A quarterly house dues fee for students is generally determined by the local residence staff and/or residents of the house and may be included with room and board charges on their University Bill.

Students who live in housing are automatically assessed a telecommunications fee on their University Bill that covers in-room network connections and a land-line phone with basic telephone service.

MEAL PLANS

Stanford's Residential Education program promotes the philosophy that living and learning are integrated, and that formal teaching, informal learning, and personal support in residences are integral to a Stanford education. Meals play a key role in this mission of community building, leading, and learning. Therefore residents of University-managed housing with an attached Stanford Dining facility (Branner, Florence Moore, Lakeside, Manzanita, Murray, Ricker, Stern, Wilbur, and Yost) are required to participate in a meal plan. Stanford Dining is committed to providing Meal Plans that offer maximum flexibility of dining locations across campus.

Stanford Dining serves 19 meals each week: breakfast, lunch and dinner, Monday thru Friday, and brunch and dinner on the weekends. There are three meal plans to choose from: 19 meals/week, 14 meals/week plus Cardinal Dollars, and 10 meals/week plus Cardinal Dollars.

Enhancements to the meal plans this year include the following. The 10 meals/week plan allows for one roll-over meal per week; the 14 meals/week plan allows two roll-over meals per week. The 19 meals/week plan now includes an additional three guest meals per quarter, for a total of eight guest meals per quarter; the 14 meal/week and 10 meal/week plans continue to provide five guest meals per quarter. The 10 meal plan allows one roll-over meal to be carried over to following week, allowing for a maximum of 11 meals in a given week. With the 14 meal plan, up to two roll-over meals may carry over to following weeks, for a maximum of 16 all-you-care-to-eat meals in any one week. Roll-over meals carry over from week to week until the extra meal is used, or until the end of the meal plan quarter.

The ASSU and Stanford Dining have partnered in increasing the number of meal plan Cardinal Dollars that carry over each quarter from to 75 from the former 50. This carry-over applies to Autumn to Winter quarters and to Winter to Spring quarters. At the end of Spring Quarter, any remaining Meal Plan Cardinal Dollars are forfeited.

	Aut	*Win*	*Spr*	*Total*
Total Meal Plan Cost	$1,796	$1,606	$1,543	$4,945
Meal Plan Cardinal Dollars				
14 Meals/week	155	135	130	420
10 Meals/week	270	245	235	750
Yost/Murray: 11 meals/week and Open Kitchen	125	115	105	345

19 Meals/week Meal Plan—Students on this meal plan are able to partake of every meal that Stanford Dining serves. Students enter the dining hall and swipe their ID cards once. During this visit, they may make unlimited trips through the food service lines, and eat as much as they want. This plan offers 8 bonus guest meals per quarter.

14 Meals/week plus Meal Plan Cardinal Dollars—Students begin each week on Sunday with 14 all-you-care-to-eat meals available to them. Each quarter, a set amount of Cardinal Dollars is added to a student's ID card. Two unused meals may be rolled over into the following weeks for a maximum of 16 meals per week.

10 Meals/week plus Meal Plan Cardinal Dollars—Students begin each week on Sunday with 10 all-you-care-to-eat meals available to them. Each quarter, a set amount of Cardinal Dollars is added to a student's ID card. One unused meal may be rolled over into the following weeks for a maximum of 11 meals per week.

Open Kitchen—Yost and Murray residents have 10 meals/week cooked and served in their house, one meal that can be used in another dining hall, and each resident is given a set amount of Cardinal Dollars each quarter. Each house also has a discretionary budget to purchase snacks or other food items as agreed upon by the house, available to residents in the open kitchen. Students at Yost and Murray houses are responsible for the cleanliness of the kitchens outside Stanford Dining's hours of operation.

CARDINAL DOLLARS

A maximum of 75 unused meal plan Cardinal Dollars carry over to the next quarter. Cardinal Dollars are not available for use during the period between quarters. These Cardinal Dollars expire on the last day of Spring Quarter when the meal plan ends. Cardinal Dollars can be used in all of Stanford Dining's locations.

Cardinal Dollars may also be added to a Stanford ID card and can be used in any Stanford Dining location, all residence dining halls to purchase meals, and in Stanford Dining's cafés and late night locations including: CoHo, Subway, Peet's Coffee, and Union Square at Tresidder; Olives at Building 160; the Café at the Alumni Center; Late Night at Lakeside; and Stern's Cyber Café. Cardinal Dollars that are purchased in addition to a meal plan carry over from quarter to quarter, and from year to year.

Enrolled students can purchase Cardinal Dollars by logging into their account using the Manage Your Account option. Online orders via are charged to the University bill. Students can also submit an order via email from the student's SUNet account to diningplans@stanford.edu; students must include a SUNet ID number and the amount being purchased. Email orders are billed to the University bill. Anyone with a Stanford ID may purchase Cardinal Dollars with cash, check, or credit card at Stanford Dining's customer service office on the second floor of Tresidder Memorial Union, Suite 5, off the Meeting Services lobby. The office is open Monday to Friday, 9 a.m. to 5 pm. For additional information, see http://dining.stanford.edu, email diningplans@stanford.edu, or phone at 650-723-4751.

PAYMENTS

All charges and credits from offices within the University are aggregated in a student's individual account and presented on the University Bill. Student Financial Services sends the University Bill to students monthly. Students may view their account online 24 hours a day, seven days a week, via Stanford ePay at http://axess.stanford.edu. Payments can be made online through Stanford ePay or the bill and a payment stub may be printed.

Term fees, such as tuition, fees, room, board, and health insurance, are due and must be received on the 15th of the month. Online payments via Stanford ePay can be made up to midnight PST on the 15th of the month. Mailed payments must be postmarked by 5:00 p.m. on the 15th of the month.

After the start of the term, adding units may result in additional tuition charges. Other fees, such as room damage repair charges, petition fees, late fees, lab fees, and other miscellaneous fees, are due after they are billed.

Fees may be paid: via Stanford ePay (preferred); by mail at 632 Serra Street, Room 150, Stanford, CA 94309-6036; in person at the Cashier's Office, Maude Modular, 632 Serra Street, Room 150; or at the 24-hour secure drop box on the wall outside the staff entrance to Maude. The Cashier's Office is open from 8:00 a.m. to 5:00 p.m., Monday through Friday, excluding University holidays and the second Tuesday of the month. Payments received in the drop box after 5:00 p.m. are processed the following business day.

ACCOUNT PENALTIES

Late Fees—The University must receive the full amount due on or before the due date indicated on the bill. If full payment is not received by the due date, a late fee of 1.5% of the amount past due is assessed. Anticipated aid (aid that has been accepted but not disbursed and is shown on the student account) reduces the total amount due prior to late fees being applied.

Holds—Accounts that become past due more than 30 days are subject to financial holds. A financial hold blocks transcripts, diplomas, and enrollment eligibility.

Nonsufficient Funds—Checks or eCheck payments returned due to insufficient funds have already been submitted twice to the bank. A non-refundable $25.00 administrative fee is assessed. In addition, student accounts are subject to holds and late payment penalties may apply.

FORMS OF PAYMENT

The preferred method of payment is electronic check (eCheck) using the online service, Stanford ePay. Stanford ePay accepts eCheck or credit cards (AMX, Discover, MasterCard). There is no fee associated with eCheck; however, a non-refundable convenience fee of 2.75 percent applies to credit card payments. In addition to Stanford ePay, Stanford accepts the following forms of payment: personal check, cashier's check, money order, travelers checks in U.S. funds drawn on U.S. banks, cash, wire transfer (recommended for foreign students), and scholarship or loan proceeds endorsed to Stanford University. Stanford does not accept postdated checks. See http://sfs.stanford.edu/wiretransfer for wire transfer instructions.

REFUNDS

TUITION

Students who withdraw from the University before the end of a term may be eligible to receive refunds of portions of their tuition as described below.

ANNULLED REGISTRATION

Students who take a leave of absence from the University voluntarily before the first day of instruction may have their registrations annulled. Tuition is refunded in full. Such students are not included in University records as having registered for the term and new students do not secure any privileges for admission for any subsequent quarter as returning students. An annulment does not automatically cancel health coverage unless the annulment is granted before the first day of instruction. Financial aid recipients should be aware that a proportion of any refund is returned to the various sources of aid.

CANCELLATION OF REGISTRATION OR SUSPENSION FOR CAUSE

Students who have their registrations canceled or are suspended from the University for cause receive refunds on the same basis as those receiving leaves of absence unless otherwise specified in the disciplinary action taken. A student whose registration is canceled less than one week after the first day of instruction for an offense committed during a preceding quarter receives a full refund of tuition fees.

INSTITUTIONAL INTERRUPTION OF INSTRUCTION

It is the University's intention to do everything reasonably possible to avoid taking the actions described in this paragraph. However, should the University determine that continuation of some or all academic and other campus activities is impracticable, or that their continuation involves a high degree of physical danger to persons or property, activities may be curtailed and students requested or required to leave the campus. In such an event, arrangements are made as soon as possible to offer students the opportunity to complete their courses, or substantially equivalent work, so that appropriate credit may be given. Alternatively, the University may determine that students receive refunds on the same basis as those receiving leaves of absence, or on some other appropriate basis.

LEAVES OF ABSENCE

A student in good standing who desires to take a leave of absence from the University after the first day of instruction, but before the end of the first 60 percent of the quarter, may file a petition for a leave of absence and tuition refund with the Office of the University Registrar. A leave of absence after the first 60 percent of the quarter is only granted for approved health and emergency reasons. For more information on leaves of absence, undergraduates should see page 37 of this bulletin, and graduate students should see page 29 of this bulletin.

TUITION REFUND SCHEDULE

Students who take an approved leave of absence are eligible for a tuition refund during the first 60 percent of the quarter. Refunds are calculated on a per diem basis (including weekends and University holidays) starting the first day of instruction of each quarter. Tuition is charged on a daily basis (including weekends and holidays) through the first 60 percent of the quarter. After the first 60 percent of the quarter, students are liable for the full amount of tuition that they were charged. Health insurance charges are not refundable after the first day of instruction.

Per Diem Tuition Charges for Students Who Take a Leave of Absence

Quarter	*Undergraduate/ Graduate Full Tuition*	*Graduate 8-9-10 Unit Rate*	*Graduate Engr. Full Tuition*	*Graduate Engr. 8-9-10 Unit Rate*	*Last Date for Tuition Refund*
Autumn	$141.46	$ 92.32	$150.85	$ 98.05	Nov. 12
Winter	$156.76	$102.30	$167.16	$108.65	Feb. 20
Spring	$161.11	$105.14	$171.81	$111.67	May 13
Summer	$214.81	$140.19	$229.07	$148.89	July 25

For example: an undergraduate, who was charged the tuition rate of $11,600 for Autumn Quarter, becomes ill and informs the Registrar's Office on the 17th day of the quarter that he or she wants to take a leave of absence. If the petition is approved, the student is charged for 17 days of tuition (17 days x $141.46 per day) or $2,404.82.

Separate schedules exist for students paying the medical, law, graduate business, or summer session rates. These schedules are available at the Office of the University Registrar or at http://registrar.stanford.edu/students/finances/.

Tuition refunds are calculated based on the date that the student last attended classes.

Students may not be entitled to any financial aid credits such as federal loans or University scholarships or grants that were previously placed on their accounts. The Financial Aid Office can confirm any amounts that may have been withdrawn from a student's account as a result of not being enrolled.

The amount refundable based on the criteria outlined above, an overpayment of fees, or financial aid awards in excess of fees is presented on the University Bill in Stanford ePay or on Axess. Refunds are processed routinely throughout the term. Refunds may be requested via HelpSU (https://helpsu.stanford.edu, request category Student Services, request type University Bill/Student Account), in person at Student Financial Services (Maude Modular, 632 Serra Street), or by phone at (650) 723-2181. Student Financial Services office hours are Monday through Friday, 8 a.m. to 5 p.m., except University holidays.

A student can receive a refund by direct deposit. Students are advised to maintain up-to-date direct deposit details in Axess. Students who have not established direct deposit receive a check mailed to the mailing address as recorded in Axess. Checks for those without a mailing address are sent to the permanent home address.

Tuition payments made to the University under certain specific tax benefit programs prohibit tuition refunds to the student or donor. For more information about these programs, contact Student Financial Services.

ROOM AND MEAL PLAN REFUNDS

Students assigned to a University residence are subject to the terms of the University Residence Agreement, and are required to live in University Housing for the full duration of their signed contract. The text of the University Residence Agreement is available at http://housing.stanford.edu/resagree/0708/.

Room refunds are made only when students move out of the residence system and graduate from or cease to be enrolled at the University. Eligibility for refunds is listed in the Residence Agreement and in the online termination form at http://onlinetoc.stanford.edu. Filing a termination of occupancy form and moving out of Student Housing does not necessarily entitle a student to a refund. Students in all-male fraternities or all-female sororities are billed directly by the fraternity or sorority, and refunds are arranged between the student and the fraternity or sorority.

A meal plan refund is based on the date when a student moves out of University residence and is approved under conditions as specified in the Residence Agreement. If a student uses the meal plan after that date, an additional daily charge incurs.

Any decision to refund prepaid room and meal plan charges or to waive liability for deferred charges is made at the sole discretion of the University. Students with questions about refunds should contact Housing Assignments for room refunds or the central office of Stanford Dining for residential meal plan refunds.

HOUSING

University housing is available to enrolled Stanford students. Student Housing, a division of Residential and Dining Enterprises, is responsible for: managing, maintaining, and cleaning the physical plant of student residences; assigning students to housing; and operating the regional housing service centers. Information on University housing assignments, options, policies, application procedures, and deadlines may be obtained from Housing Assignments online at http://housing.stanford.edu, by mail or in person at 630 Serra Street, Suite 110, Stanford University, Stanford, CA 94305-6034, by telephone at (650) 725-2810, or by email at housingassignments@lists.stanford.edu. Information regarding off-campus housing may be obtained from Community Housing at http://offcampus.stanford.edu, by mail or in person at 630 Serra Street, Suite 110, Stanford University, Stanford, CA 94305-6034, by telephone at (650) 723-3906, or by email at communityhousing@lists.stanford.edu. For other housing related information, see http://studenthousing.stanford.edu or phone the main student housing office at (650) 725-1600.

The department of Residential Education (http://www.stanford.edu/dept/resed/, 650-725-2800) and the Graduate Life Office (http://www.stanford.edu/group/glo/, 650-723-1171) are responsible for planning educational programs, counseling, and crisis intervention by residence deans. In addition, Residential Education is responsible for administration of local undergraduate residence offices.

UNDERGRADUATE STUDENT RESIDENCES

ASSIGNMENT TO UNDERGRADUATE RESIDENCES

Approximately 95 percent of undergraduates live in University housing, not counting students studying abroad during the academic year. All freshmen and transfers are required to live in University residences for educational reasons and are automatically assigned housing following admission. Undergraduates are guaranteed four years of housing.

Residence assignments for continuing undergraduates are made on the basis of an annual lottery, called the Draw, and quarterly waiting lists. Undergraduates who enter Stanford as freshmen are guaranteed four years of University housing if they apply by the appropriate Draw deadlines and are willing to live anywhere on campus. Transfer students are guaranteed two or three years of housing, based on their entering class standing.

Undergraduate residences include traditional residence halls, language and culture residences, crosscultural theme houses, student-managed and cooperative houses, apartments, suites, fraternities, and sororities.

GRADUATE STUDENT RESIDENCES

ASSIGNMENT TO GRADUATE RESIDENCES

Over 50 percent of matriculated graduate students live in Stanford student housing. Residence assignments are made on the basis of an annual lottery and quarterly waiting lists. New matriculated students are guaranteed housing if they apply by the first round application deadline for the Autumn term and are willing to live in any residence for which they are eligible. At Stanford University, new matriculated students are students who are in a graduate program for the first time. Students starting a second graduate degree are not considered new students and therefore are not guaranteed housing.

After the first year, continuing matriculated graduate students are given priority for housing for a specified number of years based on their academic degree program. Master's students are given one additional year of limited priority for housing. Doctoral students are given five additional years of limited priority for housing. Limited priority years are not cumulative, so students do not receive additional years of limited priority for subsequent degrees. If a student completes a master's program and then moves to a doctoral program, they receive four additional limited priority years, which is the difference between the allocation for a master's and a doctoral program. Students who live in residences that are open year-round and who remain in continuous occupancy in their rooms or apartments may renew their contracts annually if they meet certain eligibility requirements. Students who live in residences that are open only during the academic year or who want to change residences, re-enter the lottery each year. Approximately 90% of continuing student applicants are assigned housing each year. Additional housing is under construction to better meet demand.

Single graduate students may request assignment to graduate apartments and residence halls, or to spaces in six undergraduate cooperative houses.

Couples without children may request assignment to either furnished or unfurnished one-bedroom apartments. Couple housing is available to students who are married and to students who have a same-sex or opposite-sex domestic partner. At Stanford University, a domestic partnership is defined as an established, long-term partnership with an exclusive mutual commitment in which the partners share the necessities of life and ongoing responsibility for their common welfare.

One-, two-, and three-bedroom apartments (furnished and unfurnished) are provided for students with children, based on the number of dependents. Housing for students with children is available to married couples, domestic partners, and single parents who have dependent children living with them. Housing is not provided for extended families, including the parents and siblings of students, or live-in day care staff.

COMMUNITY HOUSING

Community Housing maintains computerized listings of private rooms, houses, and apartments in surrounding communities that are available to students who want to live off-campus. Students must make rental arrangements directly with landlords. Information on community housing may be obtained from Community Housing at http://offcampus.stanford.edu, by mail or in person at 630 Serra Street, Suite 110, Stanford University, Stanford, CA 94305-6034, by telephone at (650) 723-3906, or by email at communityhousing@lists.stanford.edu. During early September, temporary accommodations are available in student residence halls at a modest charge for students searching for off-campus housing for Autumn Quarter. Contact Stanford Conference Services for more information at (650) 725-1429.

Undergraduate Degrees and Programs

DEGREE PROGRAMS

BACHELOR OF ARTS (B.A.), BACHELOR OF SCIENCE (B.S.)

Stanford University confers the degree of Bachelor of Arts (B.A.) or the degree of Bachelor of Science (B.S.) on those candidates who have been recommended by the Committee on Undergraduate Standards and Policy (C-USP), who have applied in advance for conferral of the degree, and who have fulfilled the following requirements:

1. A minimum of 180 units of allowable University work. (As described below, units above the allowable limits for activity courses and for courses taken on a satisfactory/no credit and credit/no credit basis cannot be counted towards the 180-unit minimum.)
2. The Writing, General Education, and Language Requirements (see below).
3. Curricular requirements of at least one major department or program and the recommendation of the department(s). (Descriptions of curricular and special degree requirements are included in each department's section of this bulletin.)
4. *Students admitted as freshmen Autumn 2001 and thereafter*—A minimum of 135 units (including the last quarter in residence) at Stanford. In special cases, students who have earned at least 135 units in resident work may petition for a waiver of the last quarter-in-residence requirement.
5. *Students admitted as freshmen prior to Autumn 2001 and students admitted as transfers*—A minimum of 90 units (including the last quarter in residence) at Stanford. In special cases, students who have earned at least 90 units in resident work may petition for a waiver of the last quarter-in-residence requirement.

Stanford confers the Bachelor of Science degree on candidates who fulfill these requirements in the School of Earth Sciences, in the School of Engineering, or in the departments of Applied Physics, Biological Sciences, Chemistry, Mathematics, or Physics in the School of Humanities and Sciences. The University also awards B.S. degrees to candidates in the Program in Science, Technology, and Society; in the Program in Mathematical and Computational Science; in the Program in Symbolic Systems; and, when appropriate, in the Program for Individually Designed Majors. Candidates who fulfill these requirements in other schools or departments receive the Bachelor of Arts degree.

Students who complete the requirements for two or more majors, which ordinarily would lead to the same degree (B.A. or B.S.), should review "The Major" section of this bulletin to ensure that they have an understanding of the requirements for multiple or secondary majors.

BACHELOR OF ARTS AND SCIENCE (B.A.S.)

The University confers the degree of Bachelor of Arts and Science (B.A.S.) on candidates who have completed, with no overlapping courses, the curricular requirements of two majors which ordinarily would lead to different bachelor's degrees (that is, a Bachelor of Arts degree and a Bachelor of Science). These students must have applied in advance for graduation with the B.A.S. degree instead of the B.A. or B.S. degree, been recommended by the C-USP, and have fulfilled requirements 1, 2, and 4/5 above in addition to the requirements for multiple majors.

Students who cannot meet the requirements for both majors without overlapping courses are not eligible for the B.A.S., but may apply to have a secondary major recorded on their transcripts. (See "The Major" section below.)

DUAL BACHELOR'S DEGREES (CONCURRENT B.A. AND B.S.)

A Stanford undergraduate may work concurrently toward both a B.A. and a B.S. degree. To qualify for both degrees, a student must complete:

1. A minimum of 225 units of University work. (As described below, units above the allowable limits for activity courses and for courses taken on a satisfactory/no credit and credit/no credit basis cannot be counted towards the 225 minimum.)
2. The Writing, General Education, and Language Requirements.
3. The curricular requirements of two majors (one of which leads to a Bachelor of Arts degree and the other to a Bachelor of Science degree).
4. *Students admitted as freshmen Autumn Quarter 2001 and thereafter*—A minimum of 180 units (including the last quarter in residence) at Stanford. In special cases, students who have earned at least 180 units in resident work may petition for a waiver of the last quarter-in-residence requirement.
5. *Students admitted as freshmen prior to Autumn Quarter 2001 and students admitted as transfers*—A minimum of 135 units (including the last quarter in residence) at Stanford. In special cases, students who have earned at least 135 units in resident work may petition for a waiver of the last quarter-in-residence requirement.

A student interested in dual bachelor's degrees should declare them in Axess no later than two quarters in advance of completing the program.

Students who do not meet the higher unit and residence requirements of the dual degree option may be eligible instead for the B.A.S. degree as described above.

SECOND BACHELOR'S DEGREE

Stanford does not award a second Bachelor of Arts degree to an individual who already holds a Bachelor of Arts, nor a Bachelor of Science degree to an individual who already holds a Bachelor of Science degree. However, the holder of a Bachelor of Arts degree from Stanford may apply to the C-USP Subcommittee on Academic Standing for admission to candidacy for a Bachelor of Science degree, and the holder of a Bachelor of Science degree from Stanford may apply for candidacy for a Bachelor of Arts degree. The C-USP Subcommittee on Academic Standing may determine whether the application for a second degree may be approved and/or the conditions a student must meet in order to be allowed to earn a second degree. A recommendation of the major department for the second bachelor's degree must accompany the application.

Generally, a holder of a B.A. or B.S. degree may not apply for the Bachelor of Arts and Sciences degree, although a student may submit a petition for exception. The Office of the University Registrar's Degree Progress section reviews these petitions. A student approved for this program may register as an undergraduate and is subject to the current rules and regulations affecting undergraduates. Requirements for a second Stanford bachelor's degree are the same as those described above for dual bachelor's degrees.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

The coterminal degree program allows undergraduates to study for a master's degree while completing their bachelor's degree(s) in the same or a different department. Undergraduates with strong academic records may apply for admission to a coterminal master's program upon completion of 120 units, but no later than the quarter prior to the expected completion of the undergraduate degree. Full-time enrollment during Summer Quarters, as well as allowable undergraduate transfer credit, are also counted towards quarters of undergraduate study. Students who wish to apply for a master's program after these deadlines must apply through the regular graduate admissions process.

To apply for admission to a coterminal master's program, students must submit to the prospective graduate department the following: coterminal application, statement of purpose, preliminary program proposal, two letters of recommendation from Stanford professors, and a current Stanford transcript. Graduate Record Examination (GRE) scores or other requirements may be specified by the prospective department.

For coterminal students, the quarter following completion of 12 full-tuition undergraduate quarters is identified as the first graduate quarter for tuition assessment. Beginning with this quarter, coterminal students are subject to graduate student policies and procedures (including those described in the "Graduate Degrees" section of this bulletin) in addition to undergraduate minimum progress standards. These policies include continuous registration or leaves of absence for quarters not enrolled and minimal progress guidelines.

In the first graduate quarter, a coterminal student is assigned an adviser in the master's department for assistance in planning a program of study to meet the requirements for the master's degree. The plan is outlined on the Program Proposal for a Master's Degree, which is approved by the master's department by the end of the first graduate quarter. Authorizations for master's programs expire three calendar years from the first graduate quarter. An extension requires review of academic performance by the department.

The specific University residency, unit requirement, and additional policies for a bachelor's/master's program are described under Residency and Unit Requirements in Coterminal Programs in the "Graduate Degrees" section of this bulletin.

Conferral of each degree is applied for separately by the deadlines given in the University *Time Schedule*. The master's degree must be conferred simultaneously with, or after, the bachelor's degree.

DEGREE REQUIREMENTS

A LIBERAL EDUCATION

As do all major universities, Stanford provides the means for its undergraduates to acquire a liberal education, an education that broadens the student's knowledge and awareness in each of the major areas of human knowledge, that significantly deepens understanding of one or two of these areas, and that prepares him or her for a lifetime of continual learning and application of knowledge to career and personal life.

The undergraduate curriculum at Stanford allows considerable flexibility. It permits each student to plan an individual program of study that takes into account personal educational goals consistent with particular interests, prior experience, and future aims. All programs of study should achieve some balance between depth of knowledge acquired in specialization and breadth of knowledge acquired through exploration. Guidance as to the limits within which that balance ought to be struck is provided by the University's General Education Requirements and by the requirements set for major fields of study.

These educational goals are achieved through study in individual courses that bring together groups of students examining a topic or subject under the supervision of scholars. Courses are assigned credit units. To earn a bachelor's degree, the student must complete at least 180 allowable units and, in so doing, also complete the Writing Requirement, the General Education Requirements, the Language Requirement, and the requirements of a major.

The purpose of the Writing Requirement is to promote effective communication by ensuring that every undergraduate can write clear and effective English prose. Words are the vehicles for thought, and clear thinking requires facility in writing and speech.

The Language Requirement ensures that every student gains a basic familiarity with a foreign language. Foreign language study extends the student's range of knowledge and expression in significant ways, providing access to materials and cultures that otherwise would be out of reach.

The General Education Requirements provide guidance toward the attainment of breadth and stipulate that a significant share of a student's work must lie outside an area of specialization. These requirements ensure that every student is exposed to different ideas and different ways of thinking. They enable the student to approach and to understand the important ways of knowing to assess their strengths and limitations, their uniqueness, and, no less important, what they have in common with others.

Depth, the intensive study of one subject or area, is provided through specialization in a major field. The major relates more specifically to a student's personal goals and interests than do the general requirements outlined above. Stanford's curriculum provides a wide range of standard majors through its discipline-oriented departments, a number of interdisciplinary majors in addition to department offerings, and the opportunity for students to design their own major programs.

Elective courses, which are not taken to satisfy requirements, play a special role in tailoring the student's program to individual needs. For most students, such courses form a large portion of the work offered for a degree. Within the limitations of requirements, students may freely choose any course for which previous studies have prepared them.

Following are more detailed descriptions of these various requirements and the rationales upon which they are based.

THE GENERAL EDUCATION REQUIREMENTS

PURPOSE

The General Education Requirements are an integral part of undergraduate education at Stanford. Their purpose is: 1) to introduce students to a broad range of fields and areas of study within the humanities, social sciences, natural sciences, applied sciences, and technology; and 2) to help students prepare to become responsible members of society. Whereas the concentration of courses in the major is expected to provide depth, the General Education Requirements have the complementary purpose of providing breadth to a student's undergraduate program. The requirements are also intended to introduce students to the major social, historical, cultural, and intellectual forces that shape the contemporary world.

Fulfillment of the General Education Requirements in itself does not provide a student with an adequately broad education any more than acquiring the necessary number of units in the major qualifies the student as a specialist in the field. The major and the General Education Requirements are meant to serve as the nucleus around which the student is expected to build a coherent course of study by drawing on the options available among the required and elective courses.

Information regarding courses that have been certified to fulfill the General Education Requirements, and regarding a student's status in meeting these requirements, is available at the Office of the University Registrar. Course planning and advising questions related to the General Education Requirements should be directed to Undergraduate Advising and Research.

It is the responsibility of each student to ensure that he or she has fulfilled the requirements by checking in Axess within the Undergraduate Progress function or by checking with the Office of the University Registrar. This should be done at least two quarters before graduation.

Students should be very careful to note which set of General Education Requirements apply to them. The date of matriculation at Stanford determines which requirements apply to an individual student.

During Autumn Quarter 2004-05, the Academic Senate approved modifications to undergraduate General Education Requirements that became effective Autumn Quarter 2005-06 for all matriculated undergraduates who entered Stanford in Autumn Quarter 2004-05 or later.

The purpose of these modifications was 1) to give students a fuller and more articulate understanding of the purposes of the requirements and of a liberal arts education that these requirements embody; 2) to make a place in the curriculum for ethical reasoning to help make students aware of how pervasive ethical reasoning and value judgments are throughout the curriculum, and 3) to provide some greater freedom of choice by reducing the GERs by one course.

AREA REQUIREMENTS

The following structure for General Education Requirements became effective with the 2005-06 entering freshman and transfer class:

Introduction to the Humanities—one quarter introductory courses followed by two quarter thematic sequences.

Introduction to the Humanities builds an intellectual foundation in the study of human thought, values, beliefs, creativity, and culture. Courses introduce students to methods of inquiry in the humanities: interdisciplinary methods in Autumn Quarter and discipline-based methods in Winter and Spring quarters.

Disciplinary Breadth—requirement satisfied by completing five courses of which one course must be taken in each subject area.

Disciplinary Breadth gives students educational breadth by providing experience in the areas of Engineering and Applied Sciences, Humanities, Mathematics, Natural Sciences, and the Social Sciences.

Education for Citizenship—requirement satisfied by completing two courses in different subject areas; or completing two Disciplinary Breadth courses which also satisfy different Education for Citizenship subject areas.

Education for Citizenship provides students with some of the skills and knowledge that are necessary for citizenship in contemporary national cultures and participation in the global cultures of the 21st century. Education for Citizenship is divided into four subject areas: Ethical Reasoning, the Global Community, American Cultures, and Gender Studies.

Ethical Reasoning—Courses introduce students to the pervasiveness, complexity, and diversity of normative concepts and judgments in human lives, discuss skeptical concerns that arise about normative practices, review ways in which people have engaged in ethical reflection, and consider ethical problems in light of diverse ethical perspectives.

The Global Community—Courses address the problems of the emerging global situation. They may compare several societies in time and space or deal in depth with a single society, either contemporary or historical, outside the U.S. Challenges of note: economic globalization and technology transfer; migration and immigration; economic development, health; environmental exploitation and preservation; ethnic and cultural identity; and international forms of justice and mediation.

American Cultures—Courses address topics pertaining to the history, significance, and consequences of racial, ethnic, or religious diversity in the culture and society of the U.S. Challenges of note: equity in education; employment and health; parity in legal and social forms of justice; preserving identity and freedom within and across communities.

Gender Studies—Courses address gender conceptions, roles, and relations, and sexual identity in a contemporary or historical context; they critically examine interpretations of gender differences and relations between men and women. Challenge of note: changing sexual and physiological realities in contemporary and historical perspective.

Courses certified as meeting the General Education Requirements must be taken for a letter grade and a minimum of 3 units of credit. A single course may be certified as fulfilling only one subject area within the General Education Requirements; the one exception is that a course may be certified to fulfill an Education for Citizenship subject area in addition to a Disciplinary Breadth subject area.

Courses that have been certified as meeting the requirements are identified throughout this bulletin with the notational symbols listed below. A comprehensive list of certified courses also appears in the *Time Schedule of Classes* for that quarter.

Introduction to the Humanities
  IHUM-1 (formerly GER:1a): first-quarter course
  IHUM-2 (formerly GER:1b): second-quarter course
  IHUM-3 (formerly GER:1c): third-quarter course

Disciplinary Breadth
  DB-EngrAppSci (formerly GER:2b): Engineering and Applied Sciences
  DB-Hum (formerly GER:3a): Humanities
  DB-Math (formerly GER:2c): Mathematics
  DB-NatSci (formerly GER:2a): Natural Sciences
  DB-SocSci (formerly GER:3b): Social Sciences

Education for Citizenship
  EC-AmerCul (formerly GER:4b): American Cultures
  EC-GlobalCom (formerly GER:4a): Global Community
  EC-Gender (formerly GER:4c):Gender Studies
  EC-EthicReas (GER:4d): Ethical Reasoning

Students who matriculated Autumn Quarter 2004-05 or later are subject to the revised General Education Requirements effective Autumn Quarter 2005-06. Students who matriculated Autumn Quarter 2003-04 or earlier remain on the old General Education Requirements, but may elect to change to the new system. Students interested in electing the revised GER system should contact the Office of the University Registrar. No further changes are allowed once a student has elected to move to the new system.

CREDIT TRANSFER

Students may propose that work taken at another college or university be accepted in fulfillment of a General Education Requirement. In such cases, the Office of the University Registrar's External Credit Evaluation staff determines, after appropriate faculty consultation, whether the work is comparable to any of the specifically certified courses or course sequences.

THE WRITING AND RHETORIC REQUIREMENT

All instructors at Stanford University expect students to express themselves effectively in writing and speech. The Writing and Rhetoric requirement helps students meet those high expectations.

All candidates for the bachelor's degree, regardless of the date of matriculation, must satisfy the Writing and Rhetoric requirement. Transfer students are individually advised at the time of matriculation by the Office of the University Registrar's External Credit Evaluation section and, if necessary, the Program in Writing and Rhetoric (PWR) as to their status with regard to the requirement.

The current Writing and Rhetoric requirement, effective beginning 2003, includes courses at three levels. The first two levels are described in more detail below. Writing-intensive courses that fulfill the third level, the Writing in the Major (WIM) requirement, are designated under individual department listings.

All undergraduates must satisfy the first-level Writing and Rhetoric requirement (WR 1) in one of three ways:

1. PWR 1: a course emphasizing writing and research-based argument.
2. SLE: writing instruction in connection with the Structured Liberal Education program.
3. Transfer credit approved by the Office of the University Registrar's External Credit Evaluation section for this purpose.

All undergraduates must satisfy the second-level Writing and Rhetoric Requirement (WR 2) in one of four ways:

1. PWR 2, a course emphasizing writing, research, and oral presentation.
2. SLE: writing and oral presentation instruction in connection with the Structured Liberal Education program.
3. A course offered through a department or program certified as meeting the WR 2 requirement by the Writing and Rhetoric Governance Board. These courses are designated as Write-2.
4. Transfer credit approved by the Office of the University Registrar's External Credit Evaluation section for this purpose.

A complete listing of PWR 1 courses is available each quarter on the PWR web site at http://pwr.stanford.edu, and at the PWR office in Building 460, Room 223. Complete listings of PWR 2 and DWR 2 courses are available to students on the PWR web site the quarter before they are scheduled to complete the WR 2 requirement.

For a full description of the Program in Writing and Rhetoric (PWR), see the "Writing and Rhetoric" section of this bulletin under the Vice Provost of Undergraduate Education.

Students who matriculated prior to Autumn 2003 should consult previous issues of the *Stanford Bulletin* and the "Writing and Rhetoric, Program in" section of this bulletin under the School of Humanities and Sciences to determine what requirements apply.

THE LANGUAGE REQUIREMENT

To fulfill the Language Requirement, undergraduates who entered Stanford in Autumn 1996 and thereafter are required to complete one year of college-level study or the equivalent in a foreign language. Students may fulfill the requirement in any one of the following ways:

1. Complete three quarters of a first-year, 4-5 units language course at Stanford or the equivalent at another recognized post-secondary institution subject to current University transfer credit policies.
2. Score 4 or 5 on the Language Advanced Placement (AP) test in one of the following languages: Chinese, French, German, Japanese, Latin, or Spanish. Advanced Placement (AP) tests in foreign literature do not fulfill the requirement.
3. Achieve a satisfactory score on the SAT II Subject Tests in the following languages taken prior to college matriculation:

Chinese	630	Italian	630
French	640	Japanese	620
German	630	Korean	630
Latin	630	Hebrew	540
Spanish	630		

4. Take a diagnostic test in a particular language which either:
   a) Places them out of the requirement, *or*
   b) Diagnoses them as needing one, two, or three additional quarters of college-level study. In this case, the requirement can then be fulfilled either by passing the required number of quarters of college-level language study at Stanford or the equivalent elsewhere, or by retaking the diagnostic test at a later date and placing out of the requirement.

Written placements are offered online throughout the summer in Chinese, French, German, Italian, Japanese, Russian, Spanish, and Spanish for home background speakers.

For a full description of Language Center offerings, see the "Language Center" section of this bulletin under the school of Humanities and Sciences.

CREDIT

ADVANCED PLACEMENT

Stanford University allows up to 45 units of external credit toward graduation including work completed in high school as part of the College Entrance Examination Board (CEEB) Advanced Placement curriculum. The awarding of such credit is based on CEEB Advanced Placement test scores and is subject to University and department approval.

The faculty of a given department determine whether any credit toward the 180-unit requirement can be based on achievement in the CEEB Advanced Placement Program in their discipline. Stanford departments electing to accept the Advanced Placement (AP) credit are bound by these University policies:

1. Credit is usually granted for an AP score of 4 or 5. Usually, 10 quarter units are awarded (but occasionally fewer than 10). No more than 10 quarter units may be given for performance in a single examination.
2. Whether credit is to be given for an AP score of 3 is a matter for departmental discretion; up to 10 units may be awarded.
3. No credit may be authorized for an AP score lower than 3.

Performance on an AP exam can indicate the appropriate placement for continuing course work in that subject at Stanford. Students may not enroll in courses at Stanford for which they received equivalent credit through the AP program. The chart below shows the current AP credit and placement policies. Further information is available from the Office of the University Registrar's External Credit Evaluation section.

A maximum of 45 quarter units of Advanced Placement (AP), transfer credit, and/or other external credit (such as International Baccalaureate) may be applied toward the undergraduate degree. More than 45 units of AP, transfer, and other external credit may appear on the Stanford University transcript; however, only 45 units can be applied to the minimum units required for the undergraduate degree. Stanford University policies on AP and other external credit are subject to review and change on an annual basis. Subjects not listed on this chart are not eligible for AP credit at Stanford University.

AP SCORES AND PLACEMENT

Test Subject	*Score*	*Placement*	*Quarter Units*
Chemistry[1]	4,5	CHEM 33 or above	4
Chinese (Language & Culture)[2]	5	Take placement exam if continuing in this language	10
Computer Science AB	4,5	CS 106B, 106X, or 107	5
Computer Science A	4,5	CS 106B or 106X	5
French (Language)[2]	5	Take placement exam if continuing in this language	10
German (Language)[2]	5	Take placement exam if continuing in this language	10
Japanese (Language & Culture)[2]	5	Take placement exam if continuing in this language	10
Math AB	5	MATH 51	10
	4	MATH 42	5
Math BC	4,5	MATH 51	10
	3	MATH 42	5
Math AB subscore	5	MATH 51	10
	4	MATH 42	5
Physics B	5	PHYSICS 25	8
	4	PHYSICS 23 and 25	4
Physics C (2 parts)			
Mechanics only	4,5	PHYSICS 43 and 45 *or* PHYSICS 23 and 25	4
	3	PHYSICS 41, 43, and 45 *or* PHYSICS 23 and 25	4
E&M only	4,5	PHYSICS 41 and 45 *or* PHYSICS 21 and 25	5
	3	PHYSICS 41, 43, and 45 *or* PHYSICS 21 and 25	4
Both Parts	4,5	PHYSICS 45 *or* PHYSICS 25	9
	3	PHYSICS 41, 43, and 45 *or* PHYSICS 25	8
Spanish (Language)[2]	5	Take placement exam if continuing in this language	10

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[1] Effective for students matriculating Autumn 2008-09 and thereafter, Chemistry receives 4 units for a score of 5 with placement into CHEM 31X or above; see http://chemistry.stanford.edu/academic/under/choosing.html.

[2] A score of 4 or 5 on this test fulfills the Language Requirement. A score of 5 is required to receive 10 units of credit.

Stanford University awards advanced placement credit for certain international advanced placement subject examinations. The international test subjects must match the content of the College Entrance Examination Board (CEEB) Advanced Placement test subjects that receive advanced placement credit.

ACTIVITY COURSES

For undergraduates who entered Autumn 1996 and thereafter, a maximum of 8 units of credit earned in activity courses, regardless of the offering department or if accepted as transfer units, count towards the 180 (225 if dual degrees are being pursued) units required for the bachelor's degree. All activity courses are offered on a satisfactory/no credit basis.

COURSES TAKEN ON SATISFACTORY/NO CREDIT OR CREDIT/NO CREDIT BASIS

For undergraduates who entered Autumn 1996 and thereafter, a maximum of 36 units of credit (including activity courses) taken at Stanford or its overseas campuses for a "CR" or "S" grade may be applied towards the 180 (225 if dual degrees are being pursued) units required for the bachelor's degree. For those who entered Stanford as transfer students in Autumn 1996 and thereafter, the maximum is 27 units.

Departments may also limit the number of satisfactory or credit courses accepted towards the requirements for a major. Satisfactory/credit courses applied towards a minor may be similarly limited. Courses not letter-graded are not accepted in fulfillment of the General Education Requirements applicable to undergraduate students who entered Stanford in Autumn 1996 and thereafter. Writing in the Major courses are usually offered letter grade only. In those instances where the course is offered for a letter grade or CR/NC, the course must be taken for a letter grade to fulfill the Writing in the Major requirement.

INTERNSHIP GUIDELINES

Undergraduate internships should not by themselves carry any credit. However, an individual student may arrange with a faculty member for a research or other academic project to be based on the internship. Arrangements between students and faculty regarding credit are expected to be made well in advance of the internship. Credit should be arranged within departmental rules for directed reading or independent study and should meet the usual department standards. No transfer credit is awarded for internships.

TRANSFER WORK

Academic credit for work done elsewhere may be allowed toward a Stanford bachelor's degree under the following rules and conditions:

1. Credit may be granted for work completed at institutions in the U.S. only if the institutions are accredited.
2. Study in institutions outside the U.S., when validated by examination results, tutorial reports, or other official evidence of satisfactory work, may be credited toward a Stanford bachelor's degree, subject to the approval of the credit evaluator and the appropriate departments.
3. Credit is officially allowed only after the student has been unconditionally admitted to Stanford.
4. Credit is allowed for work completed at institutions in the U.S. only on the basis of an official transcript received by the Registrar at Stanford directly from the institution where the credit was earned.
5. Credit from another institution may be transferred for courses which are substantially equivalent to those offered at Stanford University on the undergraduate level, subject to the approval of the credit evaluator. A maximum of 20 quarter units may represent courses which do not parallel specific courses at Stanford, again, subject to the approval of the credit evaluator as to quality and suitability.
6. The credit allowed at Stanford for one quarter's work may not exceed the number of units that would have been permissible for one quarter if the work had been done at Stanford; for work done under a system other than the quarter system, the permissible maximum units are calculated at an appropriate ratio of equivalence.
7. Credit is allowed at Stanford for work graded 'A,' 'B,' 'C,' or 'Pass' (where 'Pass' is equivalent to a letter grade of 'C' or above), but not for work graded 'D' or below.
8. No more than 45 (90 for transfer students) quarter units of credit for work done elsewhere may be counted toward a bachelor's degree at Stanford.
9. Credit earned in extension, correspondence, and online courses is transferable only if the university offering the courses allows that credit toward its own bachelor's degree. Such credit is limited to a maximum of 45 quarter units for extension courses, a maximum of 15 quarter units for correspondence and online study, and a maximum of 45 quarter units for the combination of extension, correspondence, and online courses.
10. Credit earned in military training and service is not transferable to Stanford, unless offered by an accredited college or university in the U.S. and evaluated as above by the credit evaluator.

CONCURRENT ENROLLMENT

Students may enroll concurrently at Stanford and at another college or university. The following policies apply to Concurrent Enrollment:

1. Students may not exceed 20 quarter units between both schools. This is the same unit maximum for undergraduate students at Stanford. (One semester credit or hour generally equals 1.5 quarter units.)
2. Satisfactory academic progress is determined only by Stanford courses and units. Transfer work completed at other institutions is not considered in this calculation.
3. Students are expected to consult with Transfer/External Credit Evaluation (630 Serra Street, Suite 120) if planning to transfer the work back to Stanford. Consultations should be completed prior to enrolling in the transfer institution.

THE MAJOR

The primary purpose of the major is to encourage each student to explore a subject area in considerable depth. This in-depth study complements the breadth of study promoted by the General Education Requirements and, in many cases, by a student's choice of electives. Work in depth permits practice in critical analysis and the solving of problems. Because of its depth, such study also provides a sense of how knowledge grows and is shaped by time and circumstances.

The structure of a major should be a coherent reflection of the logic of the discipline it represents. Ideally, the student should be introduced to the subject area through a course providing a general overview, and upper-division courses should build upon lower-division courses. The course of study should, if feasible, give the student the opportunity and responsibility of doing original, creative work in the major subject. Benefits of the major program are greatest when it includes a culminating and synthesizing experience such as a senior seminar, an undergraduate thesis, or a senior project.

REQUIREMENTS

Undergraduates must select a major by the end of their sophomore year. All undergraduate major programs listed in this bulletin, except for certain honors degree programs that require application and admission in advance, are open to all students. Students may use Axess to declare, drop or exchange a major at any time. In some departments or programs, though, a late change could easily result in extending the period of undergraduate study. Students who have applied to graduate or who wish to declare an individually designed major, and coterminal students must use printed forms to select or change a major. Students requiring assistance should contact the Office of the University Registrar.

Check individual department or program listings in this bulletin for the undergraduate degrees offered and for specific major requirements. If an area of study has no baccalaureate degree, that discipline is not available as a regular undergraduate major.

Faculty set the minimum requirements for the major in each department. These requirements usually allow latitude for tailoring a major program to a student's specific educational goals. The responsibility for developing a major program within department or program requirements lies ultimately with the individual student working in consultation with the major adviser.

MULTIPLE MAJORS

Although most students declare only one major, a student may formally declare more than one major within a single bachelor's degree (B.A., B.S., or B.A.S.) program. The student may do that either at the time of initial major declaration or, as may be more advisable given the planning required to complete more than one major, by amending the original declaration. The student's major departments or programs have access routinely to all information pertinent to that student's academic record (for example, course and grade information), and each is expected to provide advising and other assistance. Students may pick up appropriate information regarding major declarations from the Office of the University Registrar. To be awarded a bachelor's degree with multiple majors, the student must fulfill the following requirements:

1. Formally declare all majors to the Office of the University Registrar.
2. Satisfy the requirements of each major without applying any course towards the requirements of more than one major or any minor unless:
   a) overlapping courses constitute introductory skill requirements (for example, introductory math or a foreign language);
   b) overlapping courses enable the student to meet school requirements (for example, for two majors within the School of Engineering). Currently, only the School of Engineering has school requirements for its undergraduate majors.

Students pursuing multiple majors must complete a multiple major program form indicating which courses they plan to apply toward each major and any minor(s). Departments must certify that the plan of study meets all requirements for the majors and any minor(s) without unallowable overlaps in course work; the School of Engineering Dean's office

UNDERGRADUATE MAJOR UNIT REQUIREMENTS

Major Department	Units required outside the dept./program	Units required within the dept./program	Total # of units	Notes/Special Requirements	WIM Course
School of Earth Sciences					
Earth Systems	76-107	26	102-133	internship, senior seminar	EARTHSYS 210
Energy Resources Engineering	83-90	36	119-126		ENERGY 180
Geological & Environmental Sciences	31-45	40-56	68-90	advanced summer field experience	GES 150
Engr. Geol. & Hydrogeology	44-47	45-55	71-102		
Geophysics	43-45	15	min. 58		GEOPHYS 185
School of Engineering					
Atmosphere/Energy	50	51-53	101-103		STS 110
Aeronautics and Astronautics	56-58	39	95-97		AA 190
Architectural Design	50-52	48-50	98-102		CEE 100
Biomechanical Engineering	42-63	49-64	103-116		BIOSCI 44X
Biomedical Computation	51-65	47-56	109-114		ENGR 199W, CS 191W, 272
Chemical Engineering	min. 70	50	min. 120		CHEMENG 185A
Civil Engineering	min. 57	min. 59	min. 116		CEE 100
Computer Systems Engineering	43-52	57-66	97-112	senior project	CS 191W,194,201,294W
Computer Science	33-57	47-66	97-112	senior project	CS 191W,194,201,294W
Electrical Engineering	45	68	113		ENGR 102E *and* EE 108A
Engineering Physics	50-59	46-58	96-117		EE 108A/ENGR 102E,M ME 203, MATSCI 161 PHYSICS 107
Environmental Engineering	min. 57	min. 59	min. 116		CEE 100
Individually Designed Major	41	40	90-107		see adviser
Management Science and Engineering	46-79	45-60	96-134	senior project	MS&E 152W,193W,197
Material Science and Engineering	53-59	50	103-109		MATSCI 161
Mechanical Engineering	61-65	45	106-110		ENGR 102M *and* ME 203
Product Design	58-59	48	106-107		ENGR 102M, ME 203
School of Humanities and Sciences					
African and African American Studies	50	10	60	CSRE senior sem.	AFRICAAM 105
American Studies	20-25	35-40	60		AMSTUD 160
Anthropological Sciences	—	45	65		ANTHSCI 190
Anthropology (formerly CASA)	25	40	65	foreign language 1st qtr. at 2nd-year level	CASA 90
Archaeology	45	20	65		ARCHLGY 103
Art					ARTHIST 1
Art History	—	56	56	library orientation, junior seminar	
Film and Media Studies	8	65	65	library orientation, senior seminar	FILMSTUD 102
Studio Art	—	64	64	library orientation, advanced seminar	
Asian American Studies	55	5	60	CSRE senior sem.	See CSRE
Asian Languages					
Chinese	0-16	27-43	min. 43		CHINGEN 133
Japanese	0-20	23-43	min. 43		JAPANGEN 138

Major Department	**Units required outside the dept./program**	**Units required within the dept./program**	**Total # of units**	**Notes/Special Requirements**	**WIM Course**
Biological Sciences	46-56	47-48	93-104		BIOSCI 44X,44Y, 145 BIOHOPK 44Y, 165H, 175H, 176H
Chemistry	34	52	86		CHEM 134
Chicana/o Studies	55	5	60	CSRE senior sem.	See CSRE
Classics	—	—	60-65		CLASSGEN 176
Communication	5	min. 60	65		COMM 104W
Comparative Literature	—	37	65		COMPLIT 101
Comparative Studies in Race & Ethnicity	55	5	60	CSRE senior sem.	CSRE 200X
Drama	—	65	65		DRAMA 161H,168H
East Asian Studies	75	1	75	seminar overseas studies; E. Asian country 1 quarter; senior essay	CHINGEN 133; JAPANGEN 138; HISTORY 256
Economics	—	80	80	—	ECON 101
English		60	60		ENGLISH 160
w/ Creative Writing		65	65	dept. approval	
w/ Interdisciplinary Emphasis	20	50	70	dept. approval and interdisciplinary paper	
w/ Interdepartmental Emphasis	20	45	65	20 units in foreign lang. lit.; dept. approval	
w/Philosophy	30	40	70		
Feminist Studies	45	17 core	62	focus statement; practicum	FEMST 253, 260B
French and Italian					
French	max. 24	32 above #100	56 above #100	—	FRENLIT 130,131,132,133
French and English Literatures	max. 24	32 above #100	56 above #100	4 Eng. Lit. courses	
French and Italian Literatures	max. 24	32 above #100	56 above #100	4 Ital. Lit. courses	
French and Philosophy	min. 21	32 above #100	65	Gateway course; Capstone	
Italian	max. 28	32 above #100	60 above #100	—	ITALLANG 127,128,129
Italian and English Literatures	max. 28	32 above #100	60 above #100	4 Eng. Lit. courses	
Italian and French Literatures	max. 28	32 above #100	60 above #100	4 Fr. Lit. courses	
Italian and Philosophy	min. 21	32 above #100	65	Gateway course; Capstone	
German Studies	0-25	35-60	60	3 above #130	GERLIT 123N,127,132
German and Philosophy	min. 21	min. 39	65	Gateway course; Capstone	
History	—	58-60	58-60	3 above #130	HISTORY 102,145B,150B, 163,204G,205B,206, 208A,217B,232F,239E, 239E,248,251,256,275F, 276,279,299A,B,C,S,W
Human Biology	min. 13	min. 39	min. 84	Internship	HUMBIO 4B
Interdisciplinary Studies in Humanities					
	approx. 60	28 (honors)	approx. 88	honors required with major	HUMNTIES 200A,B,C
Option for Premeds	approx. 110 (incl. premed requirements)	28 (honors)	approx. 138	honors required with major	HUMNTIES 200A,B,C
International Relations	55-70	0-10	70	2 yr. foreign lang.; Overseas studies 1 qtr.	HISTORY 102 POLISCI 110C,D,247R INTNLREL 140A,C, 163
Jewish Studies (Individually Designed)	75-77	—	75-77		See CSRE
Linguistics	—	50	50	foreign lang. @ 6th-quarter level, junior research paper	LINGUIST 150
Mathematical & Computational Science			73-78		MATH 109,110,120 STATS 166
Mathematics	up to 15 units	49	64		MATH 109,110,120,171
Music	—	67	66-76	piano-proficiency & ear-training exam	2 from: MUSIC 140-145, 148,151

Major Department	Units required outside the dept./program	Units required within the dept./program	Total # of units	Notes/Special Requirements	WIM Course
Music, Science, and Technology	—	66	66-76	piano-proficiency & ear-training exam	MUSIC 151
Native American Studies	55	5	60	CSRE Senior Sem.	See CSRE
Philosophy	—	55	55	course in 194 series	PHIL 80
Philosophy and Literature	min. 15	min. 47	65	Gateway course; 194	
Philosophy and Religious Studies	—	60	60	3 seminars; 20 units in each dept. + 20 advanced units from both depts.	PHIL 80 or RELIGST 290
Physics	18-21	56-61	77-79		PHYSICS 107
Political Science	0-10	60-70	70		POLISCI 110C,D,120C, 124R, 236,247R
Psychology	10	60	70		PSYCH 55,70,75,110
Public Policy	59	28	87 Senior Seminar	min. 15 concentration units;	PUBLPOL 106
Religious Studies	—	60	60	introductory course, majors' seminar, senior essay or honors thesis, senior colloquium	RELIGST 290
Science, Technology, & Society					STS 110
B.A.	37	32	69	min. 15 units in technical literacy min. 20 units in concentration	
B.S.	50	32	82	min. 50 units in technical depth	
Slavic Languages and Literatures					SLAVLIT 146
Russian Language and Literature	0-10	42-52	52	1st- and 2nd- year Russian	
Russian Language, Culture, & History	12-16	35-39	52	1st- and 2nd- year Russian	
Russian Literature and Philosophy	21	40	67	Gateway course; Capstone	
Sociology	—	60	65		SOC 200, 202
Spanish and Portuguese		26	56	Core coures	SPANLANG 102,102B, SPANLIT 120, 278, 278A
Symbolic Systems	66-81	4	70-85	—	PHIL 80
Urban Studies	36	37	73	25 units in concentration; capstone courses	URBANST 201,202

certifies this information in any case involving an Engineering major or minor. To facilitate advance planning, multiple major program forms are available at any time from http://registrar. stanford.edu. This must be submitted to the Office of the University Registrar by the application to graduate deadline for the term in which the student intends to graduate.

When students cannot meet the requirements of multiple majors without overlaps, the secondary major, outlined below, may be relevant.

SECONDARY MAJOR

In some cases, students may complete course requirements for more than one major, but they may not meet the requirements outlined for the multiple major option. For example, the student may develop a course plan in which courses requisite for one major overlap with requirements for another. In these cases, the student may declare a secondary major which results in the transcript bearing an annotation that the course requirements for that major have also been met. Secondary majors are not listed on the diploma.

LIMITS OF THE MAJOR

In order to achieve the values of study in depth, a well-structured major should constitute at least one-third of a student's program (55-65 units). To ensure the values of breadth, a major should comprise no more than two-thirds of a student's program (115-125 units). And, to avoid intellectual parochialism, a major program should not require a student to take more than about one-third of his or her courses from within a single department.

Major requirements in cognate subjects essential to the structure of a given major should be counted as part of the major program in applying these guidelines. Department or school requirements designed to provide extra disciplinary breadth should not be counted.

For a limited number of qualified students, many departments and programs offer special programs leading to degrees with honors. A student may apply to the major department or program for acceptance into the honors program. Demands on the student may vary, but all honors programs encourage creative, independent work at an advanced level in addition to the major requirements.

The guidelines set forth here are deliberately general; implementation must take into account the specific needs of a student's program and the nature of the discipline or disciplines involved. The exercise of responsibility in achieving the desired educational balance belongs first with the student, who, after all, has the strongest interest in the value of his or her education. It belongs secondarily to departments and major programs, which must set the requirements of competence in the many majors offered.

DEGREES, HONORS, AND MINORS

CONFERRAL OF DEGREES

Upon recommendation to the Senate of the Academic Council by the faculty of the relevant departments or schools and the Committee on Undergraduate Standards and Policy, degrees are awarded four times each year, at the conclusion of Autumn, Winter, Spring, and Summer quarters. All diplomas, however, are prepared and awarded in Spring Quarter. Stanford University awards no honorary degrees.

Students must apply for conferral of an undergraduate or graduate degree by filing an Application to Graduate by the deadline for each term. The deadlines are published in the *Time Schedule of Classes*. A separate application must be filed for each degree program and for each conferral term. Applications are filed through Axess, the online service which allows students to update their administrative/academic records.

Requests for conferral are reviewed by the Office of the University Registrar and the student's department, to verify completion of degree requirements. Registration is required in the conferral term. Students with unmet financial obligations resulting in the placement of a hold on their registration cannot receive a transcript, statement of completion, degree certificate, or diploma until the hold is released by the Office of Student Financial Services.

Students are typically expected to apply to graduate during the term in which they expect to be awarded a degree. The University, however, reserves the right to confer a degree on a student who has completed all of the requirements for a degree even though the student has not applied to graduate; such an individual would then be subject to the University's usual rules and restrictions regarding future enrollment or registration.

Students who wish to withdraw a request for conferral or make changes to the Application to Graduate should notify the Office of the University Registrar in writing. Students who withdraw their graduation applications or fail to meet degree requirements must reapply to graduate in a subsequent term.

THE UNDERGRADUATE MINOR

Students completing a bachelor's degree may elect to complete one or more minors in addition to the major. Minors must be officially declared by students no later than the deadline for their application(s) to graduate, according to declaration procedures developed and monitored by the Registrar. Earlier deadlines for declaration of the minor may be set by the offering school or department. Satisfactory completion of declared minors is noted on the students' transcripts after degree conferral.

A minor is a coherent program of study defined by the department or degree program. It may be a limited version of a major concentration or a specialized subset of a field. A minor consists of no fewer than six courses of 3 or more units to a maximum of 36 units of letter-graded work, except where letter grades are not offered. Departments and degree programs establish the structure and requirements of each minor in accordance with the policy above and within specific guidelines developed by the deans of schools. Programs which do not offer undergraduate degrees may also make proposals to their cognizant deans to establish a minor. Requirements for each minor are described in the individual department or program listings in this bulletin.

Students may not overlap (double-count) courses for completing major and minor requirements, unless:

1. Overlapping courses constitute introductory skill requirements (for example, introductory math or a foreign language), *or*
2. Overlapping courses enable the student to meet school requirements (for example, for a major within the School of Engineering and a minor). Currently, only the School of Engineering has school requirements for its undergraduate majors.

Undergraduates use Axess to declare or drop a minor.

Students with questions about declaring minors or double-counting courses towards combinations of majors and/or minors should consult with the departments or programs involved or the Office of the University Registrar, 630 Serra Street, Suite 120.

BACCALAUREATE HONORS

With Distinction—In recognition of high scholastic attainment, the University, upon recommendation of a major department or program, awards the Bachelor's Degree with Distinction. Distinction is awarded to 15% of the graduating class based on cumulative grade point averages. Distinction is calculated at the end of the Winter Quarter for each graduating class.

Students are also urged to consider the departmental honors programs that may give depth to their major study and to consider, as well, how the interdisciplinary honors programs might contribute to the quality of their undergraduate education.

Departmental Honors Programs—In recognition of successful completion of special advanced work, departments may recommend their students for honors in the major. Departmental honors programs demand independent creative work at an advanced level in addition to major requirements.

Interdisciplinary Honors Programs—In recognition of successful completion of honors program requirements, the following interdisciplinary programs can recommend students majoring in any field for honors in their program:

Education
Environmental Science, Technology, and Policy
Ethics in Society
Feminist Studies
International Security Studies
Humanities
Latin American Studies
Science, Technology, and Society

The interdisciplinary honors programs are designed to complement study in a department major. The requirements for these honors programs are described in the department sections of this bulletin.

Foreign Language Proficiency—The notation "proficiency in (language)" appears on the official transcripts of those students whose levels of achievement are found by procedures established by the language department to be roughly equivalent to knowledge an excellent student can be expected to demonstrate late in the third quarter of the third year of study in that language.

Graduate Degrees

GENERAL REQUIREMENTS

For each Stanford advanced degree, there is an approved course of study which meets University and department requirements. The University's general requirements, applicable to all graduate degrees at Stanford, are described below. University requirements pertaining to only a subset of advanced degrees are described in the "Degree-Specific Requirements" section.

See the "Graduate Programs" section of each department's listing for specific department degree requirements. Additional information on professional school programs is available in the bulletins of the Graduate School of Business, the School of Law, and the School of Medicine.

ENROLLMENT REQUIREMENTS

Graduate students must enroll in courses for all terms of each academic year (Autumn, Winter, and Spring quarters or, for Law students, Autumn and Spring semesters) from the admission term until conferral of the degree. The only exception to this requirement occurs when the student is granted an official leave of absence. Failure to enroll in courses for a term during the academic year without taking a leave of absence results in denial of further enrollment privileges unless and until reinstatement to the degree program is granted and the reinstatement fee paid. Registration in Summer Quarter is not required and does not substitute for registration during the academic year. Students possessing an F1 or J1 student visa may be subject to additional course enrollment requirements in order to retain their student visas.

In addition to the above requirement for continuous registration during the academic year, graduate students are required by the University to be registered:

1. In each term during which any official department or University requirement is fulfilled, including qualifying exams or the University oral exam.
2. In any term in which a University dissertation/thesis is submitted or at the end of which a graduate degree is conferred, unless the student was registered the prior term.
3. Normally, in any term in which the student receives financial support from the University.
4. In any term for which the student needs to use University facilities.
5. For international students, in any term of the academic year (summer may be excluded) for which they have non-immigrant status (i.e., a J-1 or F-1 visa).

Individual students may also find themselves subject to the registration requirements of other agencies (for example, external funding sources such as federal financial aid). Course work and research are expected to be done on campus unless the department gives prior approval for study in absentia.

LEAVES OF ABSENCE AND REINSTATEMENT

Graduate students who do not meet the requirement for continuous registration during the academic year must obtain an approved leave of absence, in advance, for the term(s) they will not be registered. The leave of absence must be reviewed for approval by the chair or director of graduate studies of the student's major department and, if the student is in the United States on a foreign student visa, by the Bechtel International Center. The granting of a leave of absence is at the discretion of the department and subject to review by the Office of the University Registrar.

New graduate students and approved coterminal students may not take a leave of absence during their first quarter. Coterminal students are required to register their first graduate quarter. However, new Stanford students may request a deferment from the department.

Leaves of absence are granted for a maximum of one calendar year. Leaves requested for a longer period are approved only in exceptional circumstances (for example, mandatory military service). An extension of leave (a maximum of one year) for students in master's programs or for doctoral students is approved only in unusual circumstances. Extension requests must be made before the expiration of the original leave of absence. Leaves of absence for graduate students may not exceed a cumulative total of two years.

Students on leave of absence are not registered at Stanford and, therefore, do not have the rights and privileges of registered students. They cannot fulfill any official department or University requirements during the leave period.

Students on leave may complete course work for which an 'Incomplete' grade was awarded in a prior term and are expected to comply with the maximum one-year time limit for resolving incompletes; a leave of absence does not stop the clock on the time limit for resolving incompletes.

When a student is granted a leave of absence after the beginning of the term, courses in which the student was enrolled after the drop deadline appear on the student's transcript and show the symbol 'W' (withdrew).

Students who fail to be either enrolled by the study list deadline or approved for a leave of absence by the start of a term are required to apply for reinstatement through the Graduate Admissions Office before they can return to the same degree program. The decision to approve or deny reinstatement is made by the student's department or program. Departments are not obliged to approve reinstatements of students. Reinstatement decisions are made at the discretion of the department or the program and may be based on the applicant's academic status when last enrolled, activities while away from campus, the length of the absence, the perceived potential for successful completion of the program, and the ability of the department to support the student both academically and financially, as well as any other factors or considerations regarded as relevant by the department or program.

Reinstatement information is available from the Graduate Admissions Office. A fee is required. Reinstatement applications must be submitted prior to the first day of the term for which reenrollment is requested if the student is registering for courses.

RESIDENCY POLICY FOR GRADUATE STUDENTS

Each type of graduate degree offered at Stanford (for example, Master of Science, Doctor of Philosophy) has a residency requirement based on the number of academic units required for the degree. These residency requirements and the maximum allowable transfer units for each degree type are listed below.

The unit requirements for degrees can represent solely course work required for the degree or a combination of course work, research, and a thesis or dissertation. Academic departments and schools offering degrees may establish unit requirements that are higher than the minimum University residency requirement, but they may not have a residency requirement that is lower than the University standard. In addition to the University's residency requirement based on a minimum number of units for each degree, the School of Medicine and the Graduate School of Business may establish residency requirements based on the number of quarters of full-time registration in which students are enrolled to earn a degree. However, in no case may a student earn fewer units than the University minimum for each degree. All residency requirements are published in the *Stanford Bulletin*. Students should consult the *Stanford Bulletin* or their academic department to determine if their degree program has residency requirements that exceed the minimum.

Students eligible for Veterans Affairs educational benefits should refer to the Veterans Educational Benefits section of "Admissions and Financial Aid" above.

It continues to be Stanford University's general policy that units are applicable toward only one degree. Units may not normally be duplicated or double-counted toward the residency requirement for more than one degree. Exceptions to this general policy for specified combinations of degree types may be approved by agreement of the Faculty Senate and the deans of the schools affected, with review by the Committee on Graduate Studies.

Only completed course units are counted toward the residency requirement. Courses with missing, incomplete, in progress, or failing grades do not count toward the residency requirement.

Terminal Graduate Registration (TGR) is available to graduate students who have met all of the following criteria: (1) completion of the University's residency requirement; (2) completion of all course work required for the degree with grades recorded in all courses; (3) completion of any qualifying examinations or research work required by the school or department; (4) establishment of a reading committee for the dissertation; and (5) completion of any other requirements stipulated by the students' academic department.

This policy is effective for students who enter graduate programs beginning in the Autumn Quarter of the 2001-02 academic year. (For information about the residency policy in effect for students who entered prior to Autumn Quarter 2001, see the *Stanford Bulletin* 2000-01.)

UNIVERSITY MINIMUM RESIDENCY REQUIREMENTS FOR GRADUATE DEGREES

Degree Type	*Minimum # of Units*	*Maximum Allowable External Transfer Units*
M.A., M.S., M.F.A., M.L.A.	45	0[4]
Engineer[1]	90	45
Ed.S.	90	45
M.B.A.	90	0[4]
Ph.D., D.M.A.[2,3]	135	45
M.D.	235	90
J.D.	86 (semester)	30
M.L.S.	30 (semester)	0[4]
J.S.M.	26 (semester)	0[4]
J.S.D.	26 (semester)	0[4]
L.L.M.	26 (semester)	0[4]
M.P.P.	90	0[4,5]

1. Units completed at Stanford toward a master's degree or accepted as transfer credit in an Engineering discipline may be used toward the 90-unit residency requirement for the Engineer degree.
2. Students in the Ph.D. programs in the Biomedical Sciences usually require substantially more than 135 units.
3. Up to 45 units completed at Stanford toward a master's degree or accepted as transfer credit may be used toward the 135 required for the doctoral degree. At least 90 units of work at Stanford are necessary to complete the 135 units.
4. Students eligible for Veterans Affairs educational benefits should refer to the Veterans Benefits section of "Admissions and Financial Aid" above.
5. The M.P.P. (as well as the Masters of Arts in Public Policy) is awarded only as part of a joint degree program.

RESIDENCY REQUIREMENT IN COTERMINAL PROGRAMS

The University minimum requirements for the coterminal bachelor's/master's program are 180 units for the bachelor's degree plus 45 (or higher departmental requirement, as determined by each graduate department) unduplicated units for the master's degree. The requirements for the coterminal program with dual undergraduate degrees are 225 units for the two bachelor's degrees, and 45 units for the master's degree. For the 45-unit University minimum for the master's degree, all courses must be at or above the 100 level and 50 percent must be courses designated primarily for graduate students (typically at least at the 200 level). Department requirements may be higher. Units for a given course may not be counted to meet the requirements of more than one degree, that is, no units may be double-counted. No courses taken more than two quarters prior to admission to the coterminal master's program may be used to meet the 45-unit University minimum requirement for the master's degree.

Tuition Rate for Graduate Engineering—The tuition rate for graduate Engineering is higher than for undergraduate programs. Students enrolled in a coterminal program in the School of Engineering begin to pay the higher graduate Engineering tuition rate after 12 full-tuition undergraduate quarters.

Coterminal students in the School of Engineering, with two undergraduate degrees, are assessed the graduate Engineering tuition rate in the quarter *after* they have been enrolled for 15 full-tuition quarters.

Engineering coterminal students would also start paying the graduate Engineering tuition rate if any undergraduate degree is conferred or if they are granted any graduate aid. Once charged under the graduate Engineering tuition schedule, the tuition will not revert thereafter to the undergraduate rate.

For additional information on the coterminal bachelor's/master program, see Coterminal Bachelor's and Master's Degrees in the "Undergraduate Degrees" section of this bulletin.

TRANSFER CREDIT FOR GRADUATE WORK DONE ELSEWHERE

After at least one quarter of enrollment, students pursuing an Engineer, D.M.A., or Ph.D. may apply for transfer credit for graduate work done at another institution. Engineer candidates who also earned their master's at Stanford are not eligible for transfer residency credit, nor are any master's degree students.

Students enrolled at Stanford who are going to study elsewhere during their degree program should obtain prior approval of any transfer credit sought before their departure. (One semester unit or hour equals 1.5 quarter units.)

The following criteria are used by the department in determining whether, in its discretion, it awards transfer credit for graduate-level work done at another institution:

1. Courses should have comparable Stanford counterparts that are approved by the student's department. A maximum of 12 units of courses with no Stanford counterparts and/or research units may be granted transfer credit.
2. The student must have been enrolled in a student category which yields graduate credit. The maximum amount of credit given for extension and nonmatriculated (non-degree) courses is one quarter. No transfer credit is given for correspondence work.
3. Courses must have been taken after the conferral of the bachelor's degree. The only exception is for work taken through programs structured like the Stanford coterminal bachelor's/master's program.
4. Courses must have been completed with a grade point average (GPA) of 3.0 (B) or better. Pass grades are accepted only for courses for which letter grades were not an option and for which the standard of passing is 'B' quality work.
5. Courses must have been taken at a regionally accredited institution in the U.S. or at an officially recognized institution in a foreign country. Courses taken at foreign universities must be at the level of study comparable to a U.S. graduate program.

The Application for Graduate Residency Credit is reviewed by the department and the Office of the University Registrar.

GRADUATE UNITS REQUIREMENTS

The University's expectation is that the units counted towards all graduate degrees are primarily in graduate courses. All units must be in courses at or above the 100 level and at least 50 percent of those must be courses designated primarily for graduate students (typically at least the 200 level). Units earned in courses below the 100 level may not be counted towards the minimum unit requirement for the master's degree. Department specifications for the level of course work accepted for a particular master's degree program may be higher than the University's specifications.

POLICY ON MINIMUM PROGRESS REQUIREMENTS FOR GRADUATE STUDENTS

The academic requirements for graduate students include timely completion of University, department, and program requirements, such as admission to candidacy, successful completion of qualifying exams, and so on. Graduate students must also meet the following standards of minimum progress as indicated by units and grades. (These standards apply to all advanced degree programs except the School of Business Ph.D., and the M.B.A., J.D., L.L.M., J.S.M., J.S.D., M.D., and M.L.A., which follow guidelines issued by the respective schools and are described in their respective school bulletins.)

Graduate students enrolled for 11 or more units must pass at least 8 units per term by the end of each term. Those registered for fewer than 11 units must pass at least 6 units per term by the end of each term, unless other requirements are specified in a particular case or for a particular program.

In addition, graduate students must maintain a 3.0 (B) grade point average overall in courses applicable to the degree.

Department requirements for minimum progress that set a higher standard for units to be completed, or a higher or lower standard for grade point average to be maintained, take precedence over the University policy; any such different standards must be published in the *Stanford Bulletin*.

Students identified as not meeting the requirements for minimum progress are reviewed by their departments to determine whether the problem lies with administrative matters such as reporting of grades or with academic performance. Students have the opportunity to explain any special circumstances. Approval for continuation in the degree program is contingent on agreement by the student and department to a suitable plan to maintain appropriate progress in subsequent quarters. Dismissal of graduate students is addressed in separate guidelines.

Graduate students who have been granted Terminal Graduate Registration (TGR) status must enroll each term in the TGR course (801 for master's and Engineer programs or 802 for doctoral programs) in their department in the section appropriate for the adviser. An 'N' grade signifying satisfactory progress must be received each quarter to maintain registration privileges. An 'N-' grade indicates unsatisfactory progress. The first 'N-' grade constitutes a warning. A second consecutive 'N-' grade normally causes the department to deny the student further registration until a written plan for completion of degree requirements has been approved by the department. Subsequent 'N-' grades are grounds for dismissal from the program.

The Childbirth Policy—Women graduate students, including students in professional schools, anticipating or experiencing a birth are eligible for an academic accommodation period of up to two consecutive academic quarters (in total) before and after the birth, during which the student may postpone course assignments, examinations, and other academic requirements. During this period, they are eligible for full-time enrollment and retain access to Stanford facilities, Cardinal Care, and Stanford housing. Such students are granted an automatic one quarter extension of University and departmental requirements and academic milestones, with the possibility of up to three quarters by petition under unusual circumstances. Women graduate students supported by fellowships, teaching assistantships, and/or research assistantships are excused from regular TA or RA duties for a period of six weeks during which they continue to receive support. Students do not receive a stipend or salary if none was received previously, but are eligible for the academic accommodation period and the one quarter extension of academic milestones. For more information and a complete statement of the policy, see http://www.stanford.edu/dept/DoR/GSH/childbirth.html.

GUIDELINES FOR DISMISSAL OF GRADUATE STUDENTS FOR ACADEMIC REASONS

Admission to graduate programs at Stanford is highly selective. It is anticipated that every admitted student will be able to fulfill the requirements for the advanced degree. This document provides guidelines to be used in the unusual circumstance that a department must consider dismissal of a graduate student for academic reasons. These guidelines apply to all advanced degree programs except those in the schools of Law and Business and the M.D. program in the School of Medicine, which follow guidelines issued by the respective schools.

The principal conditions for continued registration of a graduate student are the timely completion of the University, department, and program requirements for the degree, and fulfillment of minimum progress requirements. The guidelines that follow specify procedures for dismissal of graduate students who are not meeting these conditions. In such cases, a departmental committee (hereafter "the committee"), whether the department's committee of the faculty or other committee authorized to act on the department's behalf such as the departmental graduate studies committee, will:

1. Where possible and as early as possible, warn the student, in writing, of the situation and deficiency. A detailed explanation of the reason for the warning should be provided.
2. Consider extenuating circumstances communicated by the student.
3. Decide the question of dismissal by majority vote of the committee (with at least three faculty members participating in the committee's deliberation), and communicate the decision to the student in writing.
4. Place a summary of department discussions, votes, and decisions in the student's file.
5. Provide students the opportunity to examine their department files, if requested.
6. Provide students with information on their rights to appeal under the Student Academic Grievance Procedures. (These are included in the *Stanford Bulletin.*)

Careful records of department decisions safeguard the rights of both students and faculty.

ADDITIONAL SPECIFICS FOR DEGREES WITH CANDIDACY

Before Candidacy—The committee may vote to dismiss a student who is not making minimum progress or completing requirements in a timely way before review for admission to candidacy. Before considering dismissal, the committee should communicate with the student (which may include a meeting with the student) concerning his or her academic performance and how to correct deficiencies**,** where such deficiencies are deemed correctable.

In a review for admission to candidacy, if the committee votes not to recommend the student for admission to candidacy, the vote results in the dismissal of the student from the program. The department chair, or Director of Graduate Studies, or the student's adviser shall communicate the department's decision to the student in writing and orally. The student may submit a written request for reconsideration. The committee shall respond in writing to the request for reconsideration; it may decline to reconsider its decision.

During Candidacy—When a student admitted to candidacy is not making minimum progress or not completing University, department, or program requirements in a timely manner, the student's adviser, the Director of Graduate Studies, or department chair, and other relevant faculty should meet with the student. A written summary of these discussions shall be sent to the student and the adviser and added to the student's department file. The summary should specify the student's academic deficiencies, the steps necessary to correct them (if deemed correctable), and the period of time that is allowed for their correction (normally one academic quarter). At the end of the warning period, the committee should review the student's progress and notify the student of its proposed actions. If the student has corrected the deficiencies, he or she should be notified in writing that the warning has been lifted.

If the deficiencies are not deemed correctable by the committee (for example, the failure of a required course or examination, or a pattern of unsatisfactory performance) or if, at the end of the warning period, the student has not in the view of the committee corrected the deficiencies, the committee may initiate proceedings for dismissal. The student shall be notified, in writing, that the case of dismissal will be considered at an impending committee meeting. The student has the right to be invited to attend a portion of the scheduled meeting to present his or her own case; a student may also make this case to the committee in writing.

After full discussion at the committee meeting, the committee, without the student present, shall review the case and vote on the issue of dismissal. The student shall be sent a written summary of the discussion, including the committee's decision and the reasons for it. The student may submit a written request for reconsideration. The committee's response to the request for reconsideration shall be made in writing; it may decline to reconsider its decision.

CONFERRAL OF DEGREES

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Students must apply for conferral of a graduate degree by filing an Application to Graduate by the deadline for each term. The deadlines are published in the *Time Schedule of Classes*. A separate application must be filed for each degree program and for each conferral term. Applications are filed through Axess, the online service which allows students to update their administrative/academic records.

Requests for conferral are reviewed by the Office of the University Registrar and the student's department to verify completion of degree requirements. Students must be registered in the term of degree conferral. Students with unmet financial obligations resulting in the placement of a hold on their registration cannot receive a transcript, statement of completion, degree certificate, or diploma until the hold is released by the Office of Student Financial Services.

Students are typically expected to apply to graduate during the term in which they expect to be awarded a degree. The University, however, reserves the right to confer a degree on a student who has completed all of the requirements for a degree even though the student has not applied to graduate; such an individual would then be subject to the University's usual rules and restrictions regarding future enrollment or registration.

Students who wish to withdraw a request for conferral or make changes to the Application to Graduate should notify the Office of the University Registrar in writing. Students who withdraw their graduation applications or fail to meet degree requirements must reapply to graduate in a subsequent term.

CHANGES OF DEGREE PROGRAMS

Graduate students are admitted to Stanford for a specific degree program. Students who have attended Stanford for at least one term and who are currently enrolled or on an approved leave of absence may submit a Graduate Program Authorization Petition to make one of the following changes: (1) change to a new degree program in the same department; (2) change to a new degree program in a different department; (3) add a new degree program in the same or a different department to be pursued with the existing program. Coterminal students must have the bachelor's degree conferred before adding a second advanced degree program. Summer term enrollment is optional for students beginning a new degree program in the Autumn term provided that they have been enrolled the prior Spring term.

It is important that the attempt to add or change degree programs be made while enrolled. Otherwise, a new Application for Graduate Admission must be submitted and an application fee paid. The Graduate Program Authorization Petition is submitted directly to the department in which admission is requested. If applying for a higher degree program, students may also be required to submit other application materials such as GRE Subject Test scores, a statement of purpose, or new letters of recommendation. Decisions on the petitions are made by the programs or departments to which they are directed, and are at the discretion of those programs or departments.

International students changing departments or degree programs must also obtain the approval of the Foreign Student Adviser at the Bechtel International Center. If the requested change lengthens their stay, they also are required to submit verification of sufficient funding to complete the new degree program.

Students who wish to terminate study in a graduate program should submit a properly endorsed Request to Permanently Withdraw from Degree Program form to the Office of the University Registrar. To return to graduate study thereafter, the student is required to apply for reinstatement (if returning to the same degree program) or admission (if applying to a different program). Both applications require payment of a fee.

DEGREE-SPECIFIC REQUIREMENTS

MASTER OF ARTS AND MASTER OF SCIENCE

In addition to completing the general requirements for advanced degrees and the requirements specified by their department, candidates for a Master of Arts (M.A.) or Master of Science (M.S.) degree must complete their degree requirements within the time limit specified below and must outline an acceptable program of study on the Master's Degree Program Proposal.

MASTER'S PROGRAM PROPOSAL

Students pursuing an M.A., M.F.A., or M.S. are required to submit an acceptable program proposal to their department during the first quarter of enrollment. Coterminal students must submit the proposal during the first quarter after admission to the coterminal program. The program proposal establishes a student's individual program of study to meet University and department degree requirements. Students must amend the proposal formally if their plans for meeting degree requirements change.

In reviewing the program proposal or any subsequent amendment to it, the department confirms that the course of study proposed by the student fulfills all department course requirements (for example, requirements specifying total number of units, course levels, particular courses, sequences, or substitutes). The department confirms that all other department requirements (for example, required projects, foreign language proficiency, or qualifying exams) are listed on the form and that all general University requirements (minimum units, residency, and so on) for the master's degree will be met through the proposed program of study.

TIME LIMIT FOR COMPLETION OF THE MASTER'S DEGREE

All requirements for a master's degree must be completed within three years after the student's first term of enrollment in the master's program (five years for Honors Cooperative students). Students pursuing a coterminal master's degree must complete their requirements within three years of their first quarter of graduate standing.

The time limit is not automatically extended by a student's leave of absence. All requests for extension, whether prompted by a leave or some other circumstance, must be filed by the student before the conclusion of the program's time limit. Departments are not obliged to grant an extension. The maximum extension is one additional year. Extensions require review of academic progress and any other factors regarded as relevant by the department, and approval by the department; such approval is at the department's discretion.

MASTER IN PUBLIC POLICY AND MASTER OF ARTS IN PUBLIC POLICY

The Master in Public Policy (M.P.P.), a two-year program leading to a professional degree, and the Master of Arts in Public Policy (M.A.P.P.), a one-year program not intended as a professional degree, are awarded only as part of a joint degree program. See the "Public Policy Program" section of this bulletin for details.

MASTER OF BUSINESS ADMINISTRATION

The degree of Master of Business Administration (M.B.A.) is conferred on candidates who have satisfied the requirements established by the faculty of the Graduate School of Business and the general requirements for advanced degrees. Full particulars concerning the school requirements are found in the *Graduate School of Business M.B.A. Handbook*. The M.B.A. must be completed within the time limit for completion of the master's degree.

MASTER OF FINE ARTS

In addition to completing the general requirements for advanced degrees and the program requirements specified in the "Art and Art History" section of this bulletin, candidates for the degree of Master of Fine Arts (M.F.A.) must fulfill the requirements for a master's program proposal and complete their degrees within the time limit for completion of the master's degree, as specified above.

ENGINEER

In addition to completing the general requirements for advanced degrees and the requirements specified by their department, candidates for the degree of Engineer must be admitted to candidacy and must complete a thesis per the specifications below.

CANDIDACY

The Application for Candidacy for Degree of Engineer is an agreement between the student and the department on a specific program of study to fulfill degree requirements. Students must apply for candidacy by the end of the second quarter of the program. Honors Cooperative students must apply by the end of the fourth quarter of the program. Candidacy is valid for five calendar years.

THESIS

A University thesis is required for the Engineer degree. Standards for professional presentation of the thesis have been established by the Committee on Graduate Studies and are detailed in *Directions for Preparing Theses for Engineer Degrees*, available from the Office of the University Registrar, 630 Serra Street, Suite 120.

The deadline for submission of theses for degree conferral in each term is specified by the University academic calendar. Three copies of the thesis, bearing the approval of the adviser under whose supervision it was prepared, must be submitted to the Office of the University Registrar before the quarterly deadline listed on the University academic calendar. A fee is charged for binding copies of the thesis.

Course enrollment is required for the term, or the immediately preceding term, in which the thesis is submitted. The period between the last day of final exams of one term and the first day of the subsequent term is considered an extension of the earlier term. Students submitting a thesis during this period would meet the registration requirement but would be eligible for degree conferral only in the subsequent term.

MASTER OF LEGAL STUDIES

Admission to study for the Master of Legal Studies degree (M.L.S.), a nonprofessional degree, is granted to students who hold the Doctor of Philosophy (Ph.D.) or other nonlaw doctoral degree, or who have been admitted to a nonlaw doctoral program and have completed a program of study amounting to 45 quarter units or 30 term units of work toward the doctorate, and who meet an admission standard equivalent to that required of candidates for the Doctor of Jurisprudence degree.

The M.L.S. degree is conferred upon candidates who, in not fewer than two academic terms in residence and in not more than two consecutive academic years, successfully complete 30 term units of work in the School of Law, including three first-year courses in the first Autumn term and at least one course or seminar requiring a research paper. All work shall conform to the rules and regulations of the University and the School of Law.

MASTER OF LAWS

The degree of Master of Laws (L.L.M.) is conferred upon candidates who have completed one academic year (26 semester units) in residence in accordance with the rules of the University and the School of Law. The degree is designed for foreign graduate students trained in law and is available only to students with a primary law degree earned outside the United States. The L.L.M. program offers students a choice of two areas of specialization: Corporate Governance and Practice, or Law, Science, and Technology.

MASTER OF THE SCIENCE OF LAW

The degree of Master of the Science of Law (J.S.M.) is conferred upon candidates who have completed one academic year (26 term units) with distinction in accordance with the rules of the University and the School of Law.

The degree is primarily designed for those qualified students who hold a J.D. or its equivalent and who are at the Stanford School of Law for independent reasons (for example, as teaching fellows) and who wish to combine work toward the degree with their primary academic activities. Specially qualified lawyers, public officials, academics, and other professionals who have worked outside the United States may apply for the degree through the Stanford Program in International Legal Studies (SPILS). Full particulars concerning requirements may be found at http://www.law.stanford.edu/program/degrees/advanced/.

DOCTOR OF JURISPRUDENCE

The degree of Doctor of Jurisprudence (J.D.) is conferred on candidates who satisfactorily complete courses in law totaling the number of units required under the current Faculty Regulations of the School of Law over not less than three academic years and who otherwise have satisfied the requirements of the University and the School of Law.

DOCTOR OF THE SCIENCE OF LAW

The degree of the Doctor of the Science of Law (J.S.D.) is conferred upon candidates who hold a J.D. or its equivalent, who complete one academic year in residence, and who, as a result of independent legal research, present a dissertation that is, in the opinion of the faculty of the School of Law, a contribution to knowledge. Such work and dissertation shall conform to the rules of the School of Law and the University, as described below in the "Doctor of Philosophy" section.

Candidacy is limited to students of exceptional distinction and promise. Full particulars concerning requirements may be found at http://www.law.stanford.edu/program/degrees/advanced/.

DOCTOR OF MUSICAL ARTS

The degree of Doctor of Musical Arts (D.M.A.) is conferred on candidates who have satisfied the general requirements for advanced degrees, the program requirements specified in the "Music" section of this bulletin, and the candidacy requirement as described below in the "Doctor of Philosophy" section.

DOCTOR OF MEDICINE

Candidates for the degree of Doctor of Medicine (M.D.) must satisfactorily complete the required curriculum in medicine. The requirements for the M.D. degree are detailed online at http://med.stanford.edu/md/.

DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy (Ph.D.) is conferred on candidates who have demonstrated to the satisfaction of their department or school substantial scholarship, high attainment in a particular field of knowledge, and ability to do independent investigation and present the results of such research. They must satisfy the general requirements for advanced degrees, the program requirements specified by their departments, and the doctoral requirements described below. The option for a Ph.D. minor is also described below, though it is not a Ph.D. requirement.

CANDIDACY

Admission to a doctoral degree program is preliminary to, and distinct from, admission to candidacy. Admission to candidacy for the doctoral degree is a judgment by the faculty of the student's potential to successfully complete the requirements of the degree program. Students are expected to complete department qualifying procedures and apply for candidacy by the end of their second year in the Ph.D. program. Honors Cooperative students must apply by the end of their fourth year.

The Application for Candidacy specifies a departmentally approved program of study to fulfill degree requirements, including required course work, language requirements, teaching requirements, dissertation (final project and public lecture-demonstration for D.M.A.), and University oral examination (for Ph.D.). At least 3 units of work must be taken with each of four Stanford faculty members.

If the Ph.D. student is pursuing a minor, approval by the department awarding the minor is also required on the Application for Candidacy.

TIME LIMIT FOR COMPLETION OF A DEGREE WITH CANDIDACY

All requirements for the degree must be completed before candidacy expires. Candidacy is valid for five years unless terminated by the department (for example, for unsatisfactory progress). The time limit is not automatically extended by a student's leave of absence. All requests for extension, whether prompted by a leave or some other circumstance, must be filed by the student before the conclusion of the program's time limit. Departments are not obligated to grant an extension. Students may receive a maximum of one additional year of candidacy per extension. Extensions require review by the department of a dissertation progress report, a timetable for completion of the dissertation, any other factors regarded as relevant by the department, and approval by the department; such approval is at the department's discretion.

TEACHING AND RESEARCH REQUIREMENTS

A number of departments require their students to teach (serving as a teaching assistant) or assist a faculty member in research (serving as a research assistant) for one or more quarters as part of their doctoral programs. Detailed information is included in the department sections of this bulletin.

FOREIGN LANGUAGE REQUIREMENT

Some departments require a reading knowledge of one or more foreign languages as indicated in department sections of this bulletin. Fulfillment of language requirements must be endorsed by the chair of the major department.

UNIVERSITY ORAL EXAMINATION

Passing a University oral examination is a requirement of the Ph.D. degree. The purpose of the examination is to test the candidate's command of the field of study and to confirm fitness for scholarly pursuits. Departments determine when, after admission to candidacy, the oral examination is taken and whether the exam will be a test of knowledge of the field, a review of a dissertation proposal, or a defense of the dissertation.

Students must be registered in the term in which the University oral examination is taken. The period between the last day of final exams of one term and the day prior to the first day of the following term is considered an extension of the earlier term. Candidacy must also be valid.

The University Oral Examination Committee consists of at least five Stanford faculty members: four examiners and the committee chair from another department. All members are normally on the Stanford Academic Council, and the chair must be a member. Emeritus faculty are also eligible to serve as examiners or chair of the committee. (A petition for appointment of an examining committee member who is not on the Academic Council may be approved if that person contributes an area of expertise that is not readily available from the faculty.) The chair of the examining committee may not have a full or joint appointment in the adviser's or student's department, but may have a courtesy appointment in the department. The chair can be from the same department as any other member(s) of the examination committee and can be from the student's minor department provided that the student's adviser does not have a full or joint appointment in the minor department.

The University Oral Examination form must be submitted to the department graduate studies administrator at least two weeks prior to the proposed examination date. The examination is conducted according to the major department's adopted practice, but it should not exceed three hours in length, and it must include a period of private questioning by the examining committee.

Responsibility for monitoring appointment of the oral examination chair rests with the candidate's major department. Although the department cannot require the candidate to approach faculty members to serve as chair, many departments invite students and their advisers to participate in the process of selecting and contacting potential chairs.

The candidate passes the examination if the examining committee casts four favorable votes out of five or six, five favorable votes out of seven, or six favorable votes out of eight. Five members present and voting constitute a quorum. If the committee votes to fail a student, the committee chair sends within five days a written evaluation of the candidate's performance to the major department and the student. Within 30 days and after review of the examining committee's evaluation and recommendation, the chair of the student's major department must send the student a written statement indicating the final action of the department.

DISSERTATION

An approved doctoral dissertation is required for the Ph.D. and J.S.D. degrees. The doctoral dissertation must be an original contribution to scholarship or scientific knowledge and must exemplify the highest standards of the discipline. If it is judged to meet this standard, the dissertation is approved for the school or department by the doctoral dissertation reading committee. Each member of the reading committee signs the signature page of the dissertation to certify that the work is of acceptable scope and quality. One reading committee member reads the dissertation in its final form and certifies on the Certificate of Final Reading that department and University specifications have been met.

Dissertations must be in English. Approval for writing the dissertation in another language is normally granted only in cases where the other language or literature in that language is also the subject of the discipline. Such approval is routinely granted for dissertations in the Division of Literatures, Cultures, and Languages, in accordance with the policy of the individual department. Dissertations written in another language must include an extended summary in English.

Directions for preparation of the dissertation are available from the Office of the University Registrar, 630 Serra Street, Suite 120, or at http://registrar.stanford.edu/shared/publications.htm#GradStud. The signed dissertation copies and accompanying documents must be submitted to the Office of the University Registrar on or before the quarterly deadline indicated in the University's academic calendar. A fee is charged for the microfilming and binding of the dissertation copies.

Students must either be registered or on graduation quarter in the term they submit the dissertation; see "Graduation Quarter" below in this section of this Bulletin. At the time the dissertation is submitted, an Application to Graduate must be on file, all of the department requirements must be complete, and candidacy must be valid through the term of degree conferral.

DOCTORAL DISSERTATION READING COMMITTEE

The doctoral dissertation reading committee consists of the principal dissertation adviser and two other readers. At least one member must be from the student's major department. Normally, all members are on the Stanford Academic Council. The student's department chair may, in some cases, approve the appointment of a reader who is not on the Academic Council, if that person is particularly well qualified to consult on the dissertation topic and holds a Ph.D. or equivalent foreign degree. Former Stanford Academic Council members, emeritus professors, and non-Academic Council members may thus on occasion serve on a reading committee. If they are to serve as the principal dissertation adviser, however, the appointment of a co-adviser who is currently on the Academic Council is required.

The reading committee, as proposed by the student and agreed to by the prospective members, is endorsed by the chair of the major department on the Doctoral Dissertation Reading Committee form. This form must be submitted before approval of Terminal Graduate Registration (TGR) status or before scheduling a University oral examination that is a defense of the dissertation. The reading committee may be appointed earlier, according to the department timetable for doctoral programs. All subsequent changes to the reading committee must be approved by the chair of the major department.

PH.D. MINOR

Students pursuing a Ph.D. may pursue a single minor in another department or program to complement their Ph.D. program. This option is not available to students pursuing other graduate degrees. Ph.D. candidates cannot pursue a minor in their own major department or program.

Except for a Ph.D. minor in Applied Linguistics, only departments that offer a Ph.D. may offer a minor, and those departments are not required to do so. The minor should represent a program of graduate quality and depth, including core requirements and electives or examinations. The department offering the minor establishes the core and examination requirements. Elective courses are planned by the students in conjunction with their minor and Ph.D. departments.

The minimum University requirement for a Ph.D. minor is 20 units of course work at the graduate level (courses numbered 200 and above). If a minor department chooses to require those pursuing the minor to pass the Ph.D. qualifying or field examinations, the 20-unit minimum can be reduced. All of the course work for a minor must be done at Stanford.

Units taken for the minor can be counted as part of the overall requirement for the Ph.D. of 135 units of graduate course work done at Stanford. Courses used for a minor may not be used also to meet the requirements for a master's degree.

A Ph.D. minor form outlining a program of study must be approved by the major and minor departments. This form is submitted at the time of admission to candidacy and specifies whether representation from the minor department on the University oral examination committee is required.

GRADUATION QUARTER

Registration is required for the term in which a student submits a dissertation or has a degree conferred. Students who meet all the following conditions are eligible to be assessed a special tuition rate for the quarter in which they are receiving a degree:

1. All course work, degree requirements, and residency requirements have been completed.
2. A graduate or professional student must have enrolled or have been on an approved leave of absence in the term immediately preceding the term chosen as the graduation quarter.
3. The student has formally applied to graduate.
4. The student has only to submit the dissertation, project, or master's thesis by the deadline for submission in the term designated as the graduation quarter. Or, if enrolled in a joint degree program, the student will complete all requirements for the joint degree by the end of the term designated as the graduation quarter.
5. The student has filed all necessary forms regarding graduation quarter before the first day of the term chosen as graduation quarter.

Students on graduation quarter are registered at Stanford and, therefore, have the rights and privileges of registered students. Only one graduation quarter may be requested. There is a registration fee of $100 for the graduation quarter.

ADVISING AND CREDENTIALS

ADVISING

By the start of their first term, students should be paired by the department with faculty advisers who assist them in planning a program of study to meet degree requirements. The department should also ensure that doctoral students are informed in a timely fashion about procedures for selecting a dissertation adviser, reading committee members, and orals committee members. Departments should make every effort to assist doctoral students who are not admitted to candidacy in finding an appropriate adviser.

Students are obliged to follow department procedures for identifying advisers and committee members for their dissertation reading and orals examinations.

Occasionally, a student's research may diverge from the area of competence of the adviser, or irreconcilable differences may occur between the student and the faculty adviser. In such cases, the student or the faculty adviser may request a change in assignment. If the department decides to grant the request, every reasonable effort must be made to pair the student with another suitable adviser. This may entail some modification of the student's research project.

In the rare case where a student's dissertation research on an approved project is in an advanced stage and the dissertation adviser is no longer available, every reasonable effort must be made to appoint a new adviser, usually from the student's reading committee. This may also require that a new member be added to the reading committee before the draft dissertation is evaluated, to keep the reconstituted committee in compliance with the University requirements for its composition.

PUBLIC SCHOOL CREDENTIALS

Stanford University is accredited by the California Commission on Teacher Credentialing and the National Council for Accreditation of Teacher Education and is authorized to recommend candidates for credentials. The University offers a complete training program for the Single and Multiple Subject Teaching Credential. Upon completion of a Stanford approved program, the credentials allow teachers to serve in California public schools.

Current Stanford undergraduates wishing to complete the requirements for a teaching credential should apply to the coterminal program at the School of Education. All other applicants should apply directly to the Stanford Teacher Education Program (STEP) at the School of Education.

ACADEMIC POLICIES AND STATEMENTS

COMPLIANCE WITH UNIVERSITY POLICIES

Registration as a student constitutes a commitment by the student to abide by University policies, rules, and regulations, including those concerning registration, academic performance, student conduct, health and safety, use of the libraries and computing resources, operation of vehicles on campus, University facilities, and the payment of fees and assessments. Some of these are set forth in this bulletin while others are available in relevant University offices.

Students should take responsibility for informing themselves of applicable University policies, rules, and regulations. A collection is available on the Stanford University policy web site at http://www.stanford. edu/home/administration/policy.html. Many are also set forth in the *Research Policy Handbook* and the *Graduate Student Handbook*.

The University reserves the right to withhold registration privileges or to cancel the registration of any student who is not in compliance with its policies, rules, or regulations.

REGISTRATION AND RECORDS

REGISTRATION AND STUDY LISTS

As early as possible, but no later than the second Sunday of the quarter, students (including those with TGR status) must submit to the Office of the University Registrar, via Axess, a study list to enroll officially in classes for the quarter. Students may not enroll in more units than their tuition charge covers, nor enroll in courses for zero units unless those courses, like TGR, are defined as zero-unit courses. Undergraduates are subject to academic load limits described in the "Amount of Work" section below.

The University reserves the right to withhold registration from, and to cancel the advance registration or registration of, any student having unmet obligations to the University.

For full registration procedures, see the quarterly *Time Schedule*.

STUDY LIST CHANGES

Students may add courses or units to their study lists through the end of the third week of classes. (Individual faculty may choose to close their classes to new enrollments at an earlier date.) Courses or units may be added only if the revised program remains within the normal load limits.

Courses or units may be dropped by students through the end of the fourth week of classes, without any record of the course remaining on the student's transcript. No drops are permitted after this point.

A student may withdraw from a course after the drop deadline through the end of the eighth week of each quarter. In this case, a grade notation of 'W' (withdraw) is automatically recorded on the student's transcript for that course. Students who do not officially withdraw from a class by the end of the eighth week are assigned the appropriate grade or notation by the instructor to reflect the work completed.

Through the end of the sixth week of classes, students may choose the grading option of their choice in courses where an option is offered.

If the instructor allows a student to take an 'I' (incomplete) in the course, the student must make the appropriate arrangements for that with the instructor by the last day of classes.

These policies reflect changes adopted by the Faculty Senate on June 2, 1994 which were effective Autumn Quarter 1995-96. The deadlines described above follow the same pattern each quarter but, due to the varying lengths of Stanford's quarters, they may not always fall in exactly the week specified. Students should consult the *Time Schedule* or the University's academic calendar for the deadline dates each term. Other deadlines may apply in Law, Graduate Business, Medicine, and Summer Session.

REPEATED COURSES

Students may not enroll in courses for credit for which they received either Advanced Placement or transfer credit.

Some Stanford courses may be repeated for credit; they are specially noted in this bulletin. Most courses may not be repeated for credit. Under the general University grading system, when a course which may not be repeated for credit is retaken by a student, the following special rules apply:

1. A student may retake any course on his or her transcript, regardless of grade earned, and have the original grade, for completed courses only, replaced by the notation 'RP' (repeated course). When retaking a course, the student must enroll in it for the same number of units originally taken. When the grade for the second enrollment in the course has been reported, the units and grade points for the second course count in the cumulative grade point average in place of the grade and units for the first enrollment in the course. Because the notation 'RP' can only replace grades for completed courses**,** the notation 'W' cannot be replaced by the notation 'RP' in any case.
2. A student may not retake the same course for a third time unless he or she received a 'NC' (no credit) or 'NP' (not passed) when it was taken and completed the second time. A student must file a petition for approval to take the course for a third time with the Office of the Vice Provost for Undergraduate Education. When a student completes a course for the third time, grades and units for both the second and third completions count in the cumulative grade point average. The notation 'W' is not counted toward the three-retake maximum.

These policies reflect changes adopted by the Faculty Senate on June 2, 1994.

AMOUNT OF WORK

The usual amount of work for undergraduate students is 15 units per quarter; 180 units (225 for dual degree students) are required for graduation. Registration for fewer than 12 units is rarely permitted and may cause the undergraduate to be ineligible for certification as a full-time student. The maximum is 20 units (21 if the program includes a 1-unit activity course). The maximum may be exceeded by seniors only once for compelling reasons. A past superior academic performance is not considered to be sufficient justification for exceeding the maximum. Petitions for programs of fewer than 12 or more than 20 units must be submitted to the Office of the Vice Provost for Undergraduate Education, Sweet Hall, first floor. For additional information regarding satisfactory academic progress, refer to the "Academic Standing" section of this bulletin below.

Matriculated graduate students are expected to enroll for at least eight units; schools and departments may set a higher minimum. Petitions for programs of fewer than 8 must be signed by the student's department and submitted for consideration to the Office of the University Registrar. Graduate students are normally expected to enroll in no more than 24 units; registration for more than 24 units must be approved by the department. Under certain circumstances, graduate students may register on a part-time basis. See the "Tuition, Fees, and Housing" section of this bulletin.

UNIT OF CREDIT

Every unit for which credit is given is understood to represent approximately three hours of actual work per week for the average student. Thus, in lecture or discussion work, for 1 unit of credit, one hour per week may be allotted to the lecture or discussion and two hours for preparation or subsequent reading and study. Where the time is wholly occupied with studio, field, or laboratory work, or in the classroom work of conversation classes, three full hours per week through one quarter are expected of the student for each unit of credit; but, where such work is supplemented by systematic outside reading or experiment under the direction of the instructor, a reduction may be made in the actual studio, field, laboratory, or classroom time as seems just to the department.

AUDITING

No person shall attend any class unless he or she is a fully registered student enrolled in the course or meets the criteria for auditors. Auditors are not permitted in courses that involve direct participation such as language or laboratory science courses, fieldwork, art courses with studio work, or other types of individualized instruction. Auditors are expected to be observers rather than active participants in the courses they attend, unless the instructors request attendance on a different basis. Stanford does not confer credit for auditing, nor is a permanent record kept of courses audited. Students who have been suspended are not permitted to audit.

In all cases of auditing, the instructor's prior consent and the Office of the University Registrar's prior approval are required. Further information is available from the Office of the University Registrar.

RELIGIOUS HOLIDAYS

Students planning not to attend class or take an exam because of a religious observance are expected to convey this information to instructors in advance. The Office for Religious Life makes available to faculty, staff, and students a list of significant religious observances at the beginning of each academic year. For further information, contact the Deans for Religious Life at (650) 723-1762 or see http://religiouslife.stanford.edu.

LEAVES OF ABSENCE AND REINSTATEMENT (UNDERGRADUATE)

Undergraduates are admitted to Stanford University with the expectation that they will complete their degree programs in a reasonable amount of time, usually within four years. Students have the option of taking a leave of absence for up to one year upon filing a petition to do so with the Office of the University Registrar and receiving approval. The leave may be extended for up to one additional year provided the student files (before the end of the initial one-year leave) a petition for the leave extension with the Office of the University Registrar and receives approval. Leaves of absence for undergraduates may not exceed a cumulative total of two years (eight quarters including Summer Quarters). Undergraduates who take an approved leave of absence while in good standing may enroll in the University for the subsequent quarter with the privileges of a returning student.

Students who wish to withdraw from the current quarter, or from a quarter for which they have registered in advance and do not wish to attend, must file a leave of absence petition with the Office of the University Registrar. Information on tuition refunds is available in the "Refunds" section of this bulletin.

When a student is granted a leave of absence after the beginning of the term, courses in which the student was enrolled after the drop deadline appear on the student's transcript and show the symbol 'W' (withdrew).

Students who have exceeded their eight quarters of approved leave must apply for reinstatment. The University is not obliged to approve reinstatements of students. Applications for reinstatement are reviewed by the Vice Provost for Undergraduate Education and are subject to the approval of the Faculty Senate Committee on Undergraduate Standards and Policy or its designees. The Committee or its designees may determine whether the application for reinstatement will be approved or not, and/or the conditions a student must meet in order to be reinstated. Reinstatement decisions may be based on the applicant's status when last enrolled, activities while away from campus, the length of the absence, the perceived potential for successful completion of the program, as well as any other factors or considerations regarded as relevant to the University Registrar or the Committee.

Applications for reinstatement must be submitted to the Office of the Vice Provost for Undergraduate Education no later than four weeks prior to the start of the term in which the student seeks to enroll in classes. Petition information and instructions may be obtained by contacting the Office of the University Registrar.

Leaves of absence for and reinstatements of graduate students are addressed in the "Graduate Degrees" section of this bulletin.

RECORDS

TRANSCRIPTS

Transcripts of Stanford records are issued by the Office of the University Registrar upon the student's request when submitted in writing or via the online Axess system. There is no charge for official transcripts. The courses taken and grades given in one quarter do not appear on any student's transcript until all grades received by the grade deadline have been recorded; generally, this is two weeks after final exams. The University reserves the right to withhold transcripts or records of students with unmet obligations to the University.

CERTIFICATION OF ENROLLMENT OR DEGREES

The Office of the University Registrar can provide oral or written confirmation of registration, enrollment, or degree status. The printed certification can be used whenever enrollment or degree verification is required for car insurance, loan deferments, medical coverage, scholarship purposes, and so on. Using Axess, students are able to print an official certification at no charge. Certification of full- or part-time enrollment cannot be provided until after the study list is filed.

Degrees are conferred quarterly, but diplomas are issued at the Commencement exercises which are held only in June. After conferral, the degree awarded to a student can be verified by contacting the Office of the University Registrar for an official transcript, a certification form, or the National Student Clearinghouse. Requests for transcripts must be made by the student in writing or through Axess.

Full-time enrollment for undergraduates is considered to be enrollment in a minimum of 12 units of course work per quarter at Stanford. Work necessary to complete units from previous quarters does not count toward the 12 units necessary for full-time status in the current quarter. Enrollment in 8 to 11 units is considered half-time enrollment. Enrollment in 1 to 7 units is considered less-than-half-time, or part-time enrollment. During Summer Quarter, all graduate students who hold appointments as research or teaching assistants are considered to be enrolled on at least a half-time basis.

All undergraduates validly registered at Stanford are considered to be in good standing for the purposes of enrollment certification.

Stanford uses the following definitions (in units) to certify the enrollment status of graduate and professional students each quarter:

	Graduate	*Business (M.B.A., Sloan)*	*Law*	*Medicine (M.D.)*
Full time:	8 or more	11 or more	10 or more	9 or more
Half time:	6 or 7	6-10	6-9	6-8
Part time:	5 or fewer	5 or fewer	5 or fewer	5 or fewer

TGR students enrolled in a course numbered 801 or 802 are certified as full time.

Only information classified by the University as directory information (see below) can be confirmed to inquirers other than the student.

PRIVACY OF STUDENTS RECORDS

NOTIFICATION OF RIGHTS UNDER FERPA

The Family Educational Rights and Privacy Act of 1974 (FERPA) affords students certain rights with respect to their education records. They are:

1. The right to inspect and review the student's education records within 45 days of the date the University receives a request for access.

   The student should submit to the Registrar, Dean, chair of the department, or other appropriate University official, a written request that identifies the record(s) the student wishes to inspect. The University official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.
2. The right to request the amendment of the student's education records that the student believes are inaccurate, misleading, or otherwise in violation of the student's privacy rights under FERPA.

   A student may ask the University to amend the record that he or she believes is inaccurate or misleading. The student should write the University official responsible for the record, clearly identify the part of the records he or she wants changed, and specify why it should be changed.

   If the University decides not to amend the record as requested by the student, the University will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment.

   Additional information regarding the hearing procedures is provided to the student when notified of the right to a hearing.

3. The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent.

   One exception which permits disclosure without consent is disclosure to school officials with legitimate educational interests. A school official is a person employed by the University in an administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff); a person or company with whom the University has contracted (such as an attorney, auditor, or collection agent); a person serving on the Board of Trustees; or a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.

   Another exception is that the University discloses education records without consent to officials of another school, in which a student seeks or intends to enroll, upon request of officials at that other school.

4. The right to file a complaint with the U.S. Department of Education concerning alleged failures by the University to comply with the requirements of FERPA.

   The name and address of the office that administers FERPA is: Family Policy Compliance Office, U.S. Department of Education, 400 Maryland Avenue, SW, Washington, DC 20202-4605.

DIRECTORY INFORMATION

The University regards the following items of information as "directory information," that is, information that the University may make available to any person upon specific request (and without student consent):

Name
Date of birth
Birth location
Campus work address and phone number
Current mailing address
Stanford Directory (local) address and phone number
Stanford student residence address
Primary email address
ID card photographs (for classroom use only)
Academic information, including class, degree(s), major(s), minor(s), prior institution, and active terms

Students may prohibit the release of any of the items listed above (except name) by designating which items should not be released on the Privacy function of Axess. Students may prohibit the release of their name (and consequently all other information) after an appointment with a University Assistant Registrar to discuss the ramifications of this action.

Students, faculty, and others with questions regarding student records should contact the Office of the University Registrar.

CONSENT TO USE OF PHOTOGRAPHIC IMAGES

Registration as a student and attendance at or participation in classes and other campus and University activities constitutes an agreement by the student to the University's use and distribution (both now and in the future) of the student's image or voice in photographs, videotapes, electronic reproductions, or audiotapes of such classes and other campus and University activities.

If any student in a class where such photographing or recording is to take place does not wish to have his or her image or voice so used, the student should raise the matter in advance with the instructor.

STANFORD UNIVERSITY ID NUMBER

The Stanford University ID is a number assigned to each student's academic record for unique identification. It is printed on the Stanford University ID card and on documents distributed by the Office of the University Registrar and other administrative offices.

SUNET ID

The SUNet ID provides access to the Stanford University Network (SUNet) and its services, and identifies authorized users of these services. Each member of the Stanford electronic community creates a unique SUNet ID and password for him/herself.

SUNet IDs provide:

Axess services
Email service
Storage space within Stanford's distributed file system
Usenet newsgroups
World wide web services, including serving of personal web pages on the Leland system and access to Stanford Web Resources

IDENTIFICATION CARDS

ID cards are available to registered students, faculty, and regular staff through the Stanford ID Card Office, 632 Serra Street. The ID card serves as an identification card, an electronic key, and a debit card, allowing cardholders to use services for which they have privileges, to enter facilities, and to make purchases.

Married students or students with a domestic partner (same or opposite sex) may obtain a courtesy identification card for their spouse/ partner through the Stanford Card ID Office. The spouse/partner card enables use of some campus services during terms for which the student is registered.

Similar courtesy cards are also available to the spouses and same-sex partners of faculty and regular staff.

ID cards bear a photograph of the cardholder. This photograph is maintained in an online database and, as stated above in Directory Information, is available for classroom use upon specific request and without student consent unless the student has designated that the photograph not be released. Photographs can be designated as private using the Privacy function of Axess.

For more information, see http://campuscard.stanford.edu/.

PERSONAL IDENTIFICATION NUMBERS

Students eligible to use online services such as Axess, obtain a PIN through the Office of the University Registrar. The PIN, coupled with the assigned University identification number, uniquely identifies the student and serves in a place of a signature on electronic forms. The PIN and SUNet ID password must remain confidential. It is a violation of University policy to use another's PIN or identification number to misrepresent yourself in any way. Use of another student's PIN or SUNet ID password can result in loss of student privileges or other disciplinary action.

EXAMINATIONS

MIDTERMS

Classes that give midterm examinations outside of regular class hours must: (1) announce the date and time during the first week of the academic quarter, and (2) provide reasonable alternative times to those students for whom these announced times are not convenient. According to Honor Code interpretations and applications, different examinations may be given at these alternative times.

END-QUARTER POLICY STATEMENT

The End-Quarter Period is a time of reduced social and extracurricular activity preceding final examinations. Its purpose is to permit students to concentrate on academic work and to prepare for final examinations.

In Autumn, Winter, and Spring quarters, End-Quarter starts seven full days (to begin at 12:01 a.m.) prior to the first day of final exams. In Spring Quarter, final examinations begin on Friday; no classes are held on Thursday, the day before. In Summer Quarter, this consists of the weekend and the four class days preceding the final examinations, which take place on Friday and Saturday of the eighth week. (See the *Time Schedule* for dates.)

During the End-Quarter Period, classes are regularly scheduled and assignments made; this regular class time is used by instructors in whatever way seems best suited to the completion and summation of course material. Instructors should neither make extraordinary assignments nor announce additional course meetings in order to “catch up” in course presentations that have fallen behind. They are free, however, and even encouraged to conduct optional review sessions and to suggest other activities that might seem appropriate for students preparing for final examinations.

No graded homework assignments, mandatory quizzes, or examinations should be given during the End-Quarter Period except:

1. In classes where graded homework assignments or quizzes are routine parts of the instruction process.
2. In classes with laboratories where the final examination will not test the laboratory component. In such a case, the laboratory session(s) during the End-Quarter Period may be used to examine students on that aspect of the course.

Major papers or projects about which the student has had reasonable notice may be called due in the End-Quarter Period.

Take-home final examinations, given in place of the officially scheduled in-class examination, may be distributed in the End-Quarter Period. Although the instructor may ask students to return take-home examinations early in the final examination period, the instructor may not call them due until the end of the regularly scheduled examination time for that course. Such a policy respects the principle that students’ final examinations are to be scheduled over a period of several days.

End-quarter examinations may not be held during this period. This policy preserves the instruction time for courses and protects the students’ opportunities for extensive review and synthesis of their courses.

During the End-Quarter Period, no musical, dramatic, or athletic events involving compulsory student participation may be scheduled, unless approved as exceptions by the Committee on Undergraduate Standards and Policy (C-USP), nor may routine committee meetings be scheduled (such as those of the ASSU, the Senate of the Academic Council, or the committees of the President of the University) when such meetings normally would involve student participation.

Note—Students who believe that there are faculty who are violating End-Quarter policy should contact the Office of the University Registrar.

END-QUARTER EXAMINATIONS

Examinations are part of the process of education at the same time that they are a means to measure the student’s performance in course work. Their structure, content, frequency, and length are to be determined in accordance with the nature of the course and the material presented in it, subject only to the limitations contained herein.

Great flexibility is available regarding the types of examinations that an instructor may choose to employ. Examinations, including final examinations, may be, for example, in-class essay examinations, take-home essay examinations, objective examinations, oral examinations, or appropriate substitutes such as papers or projects. Instructors may use any type of examination, paper, or project, or any combination thereof, guided only by the appropriateness of the types of examinations, papers, or projects for the material upon which the student is being examined.

When the final examination is an in-class examination, the following regulations apply:

1. A three-hour period is reserved during examination week for the final examination in each course of more than 2 units. This examination period *must* be available for students, but not necessarily in its entirety, if an in-class examination is given. In courses with extraordinary meeting times, such that ambiguity might exist as regards the period reserved for the final examination, the schedule should be clarified and students informed no later than the end of the second week of the quarter.
2. Examinations in 1- or 2-unit courses must be completed by the end of the last class meeting before the End-Quarter Period, except in Summer Quarter when examinations must be completed during the last regularly scheduled class session.

When the final examination or its appropriate substitute is not an in-class examination (for example, when an instructor chooses to employ a take-home examination, paper, or project in lieu of an in-class examination), the following regulations apply:

1. The schedule and format of the final examination or its appropriate substitute shall be made known not later that the end of the second week of the quarter and, if changed subsequently, may be only an option of the plan originally announced by the instructor.
2. Although the instructor may ask students to return take-home examinations early in the final examination period, the instructor may not call them due until the end of the regularly scheduled examination time for that course.

In submitting official Study Lists, students commit to all course requirements, including the examination procedures chosen and announced by the course instructor. In selecting courses, students should take cognizance of the official schedule of final examinations announced in the quarterly *Time Schedule*. Students anticipating conflicts in final examination schedules should seek to resolve these with the instructors involved before submitting Study Lists at the end of the second week of the quarter. If accommodation cannot be made at that time, the student should revise his or her Study List in order to be able to meet the required final examination.

If unforeseen circumstances prevent the student from sitting for the regularly scheduled examination, instructors should make alternative arrangements on an individual basis. Such unforeseen circumstances include illness, personal emergency, or the student’s required participation in special events (for example, athletic championships) approved as exceptions by the Committee on Undergraduate Standards and Policy (C-USP).

STATEMENT CONCERNING EARLY EXAMINATIONS

Students are reminded that taking final examinations earlier than the scheduled time is a privilege, not a right. They should request this privilege only in the event of extraordinary circumstances.

Since the final examination schedule is published quarterly in the *Time Schedule* at the time of course selection and enrollment, students are expected to make their academic plans in light of known personal circumstances that may make certain examination times difficult for them.

In general, faculty members are discouraged from giving final examinations earlier than the published and announced times. If faculty nevertheless decide to administer early examinations, either the questions should be completely different from those on the regularly scheduled examination or the early examination should be administered in a highly controlled setting. An example of such a setting would be a campus seminar room where the examination questions would be collected along with students’ work and students would be reminded of their Honor Code obligations not to share information about the examination contents. Giving students easy opportunities to abuse the integrity of an examination is unfair to honest students and inconsistent with the spirit of the Honor Code.

Academic fields differ in the degree to which early examination requests present dilemmas for faculty. If, for example, an examination format consists of a small number of essay questions, where students would be greatly advantaged by knowing the question topics, faculty should be especially reluctant to allow early examinations unless they are willing to offer totally different examinations or a different kind of academic task, for example, a final paper in lieu of an examination.

GRADING SYSTEMS

GENERAL UNIVERSITY

The general University grading system is applicable to all schools of Stanford University except the Graduate School of Business, the School of Law, and M.D. students in the School of Medicine. Note that the GPA (grade point average) and rank in class are not computed under the general University grading system. Stanford does use an internal-only GPA which is based on units completed up to the time of conferral of the first bachelor's degree. This information is used for internal purposes only and is not displayed on the official transcript which is sent outside the University. Most courses are graded according to the general University grading system. However, courses offered through Law, Business, and Medicine are graded according to those schools' grading systems, even in cases where students in other programs are enrolled in their classes. Note also that, as to graduate students, there may be departmental requirements as to grades that must be maintained for purposes of minimum academic progress.

DEFINITION AND EXPLANATION

The following reflects changes adopted by the Faculty Senate on June 2, 1994 and effective Autumn Quarter 1995-96. All grades/notations for courses taken in 1995-96 or later are to be visible on student transcripts.

A	Excellent
B	Good
C	Satisfactory
D	Minimal pass
	(Plus (+) and minus (-) may be used as modifiers with the above letter grades)
NP	Not Passed
NC	No Credit (unsatisfactory performance, 'D+' or below equivalent, in a class taken on a satisfactory/no credit basis)
CR	Credit (student-elected satisfactory; A, B, or C equivalent)
S	No-option Satisfactory; A, B, or C equivalent
L	Pass, letter grade to be reported
W	Withdraw
N	Continuing course
I	Incomplete
RP	Repeated Course
*	No grade reported

EXPLANATION

NC The notation 'NC' represents unsatisfactory performance in courses taken on a satisfactory/no credit basis. Performance is equivalent to letter grade 'D+' or below.

NP The notation 'NP' is used by instructors in courses taken for a letter grade that are not passed.

CR In a course for which some students receive letter grades, the 'CR' represents performance that is satisfactory or better when the student has elected the 'CR' grading option.

S For an activity course or a course in which the instructor elects to grade students only on a satisfactory/no credit basis, the 'S' represents performance that is satisfactory or better. For such a course, no letter grades may be assigned for satisfactorily completed work.

It should be noted that the Registrar is unable to record course grades submitted when the instructor has not observed the required distinction between 'S' and 'CR.'

The 'satisfactory' options are intended to relieve the pressure on students for achievement in grades. The 'satisfactory' options in no way imply fewer or different course work requirements than those required of students who elect evaluation with a letter grade. A department may limit the number of 'satisfactory' courses to count for a major program. For those students admitted as freshmen for Autumn Quarter 1996-97 or later, no more than 36 units of Stanford course work (including activity courses) in which a 'CR' or 'S' was awarded can be applied toward the 180 (225 if dual degrees are being pursued) units required for a bachelor's degree. Students who enter Stanford as transfer students in 1996-97 or later are limited to 27 'CR' or 'S' units applied to the 180/225 minimum.

L The 'L' is a temporary notation that represents creditable completion of a course for which the student will receive a permanent letter grade before the start of the next quarter. The 'L' is given when the instructor needs additional time to determine the specific grade to be recorded, but it is not appropriate if additional work is expected to be submitted by the student. A student receives unit credit for work graded 'L.'

N The 'N' indicates satisfactory progress in a course that has not yet reached completion. Continuation courses need not continue at the same number of units, but the grade for all quarters of such a course must be the same.

N- The 'N-' grade indicates unsatisfactory progress in a continuing course. The first 'N-' grade constitutes a warning. The adviser, department chair, and students should discuss the deficiencies and agree on the steps necessary to correct them. A second consecutive 'N-' will normally cause the department to deny the student further registration until a written plan for the completion of the degree requirements has been submitted by the student and accepted by the department. Subsequent 'N-' grades are grounds for dismissal from the program.

I The 'I' is restricted to cases in which the student has satisfactorily completed a substantial part of the course work. No credit will be given until the course is completed and a passing grade received. When a final grade is received, all reference to the initial 'I' is removed.

In courses taken before 1994-95, satisfactory completion of the course work when an 'I' has been given is expected within a year from the date of the course's final examination, but an alternate time limit may be set by the instructor. Students may petition that these courses with an 'I' grade be removed from their records.

In a course taken in 1994-95 or later, 'I' grades must be changed to a permanent notation or grade within a maximum of one year. If an incomplete grade is not cleared at the end of one year, it is changed automatically by the Office of the University Registrar to an 'NP' (not passed) or 'NC' (no credit) as appropriate for the grading method of the course. Students must request an incomplete grade by the last class meeting. Faculty may determine whether to grant the request or not. Faculty are free to determine the conditions under which the incomplete is made up, including setting a deadline of less than one year.

RP The notation 'RP' (meaning Repeated Course) replaces the original grade recorded for a course when a student retakes a course. (See the "Repeated Courses" section of this bulletin, above.)

W The notation 'W' (meaning Withdrew) is recorded when a student withdraws from a course.

* The '*' symbol appears when no grade has been reported to the Registrar for courses taken prior to 2001-02. The '*' symbol remains on the transcript until a grade has been reported.

REPORTING OF GRADES

All grades must be reported within 96 hours after the time and day reserved for the final examination, and in no case later than noon of the fourth day (including weekends) after the last day of the final examination period.

In the case of degree candidates in Spring Quarter, final grades must be reported by noon of the day following the end of the final examination period.

REVISION OF END-QUARTER GRADES

When duly filed with the Office of the University Registrar, end-quarter grades are final and not subject to change by reason of a revision of judgment on the instructor's part; nor are passing grades to be revised on the basis of a second trial (for example, a new examination or additional work undertaken or completed after the end of the quarter). Changes may be made at any time to correct an actual error in computation or transcription, or where some part of the student's work has been unintentionally overlooked; that is, if the new grade is the one that would have been entered on the original report had there been no mistake in computing and had all the pertinent data been before the instructor, the change is a proper one.

If a student questions an end-quarter grade based on the grading of part of a specific piece of work (for example, part of a test) on the basis of one of the allowable factors mentioned in the preceding paragraph (for example, an error in computation or transcription, or work unintentionally overlooked, but not matters of judgment as mentioned below), the instructor may review the entire piece of work in question (for example, the entire test) for the purpose of determining whether the end-quarter grade was a proper one. In general, changing an end-quarter grade is permitted on the basis of the allowable factors already mentioned whether an error is discovered by the student or the instructor; however, changing a grade is not permitted by reason of revision of judgment on the part of the instructor.

In the event that a student disputes an end-quarter grade, the established grievance procedure should be followed (see the "Statement on Student Academic Grievance Procedures" section of this bulletin).

GRADUATE SCHOOL OF BUSINESS

Effective September 2000, all courses offered by the Graduate School of Business will be graded according to the following five-level scheme:

H	Honors. Work that is of truly superior quality.
HP	High Pass. A passing performance, and one that falls approximately in the upper quarter of passing grades.
P	Pass. A passing performance that falls in the center of the distribution of all passing grades.
LP	Low Pass. A passing performance that falls approximately in the lower quarter of passing grades.
U	Unsatisfactory. A failing performance. Work that does not satisfy the basic requirements of the course and is deficient in significant ways.

Students in some GSB courses may elect to take the course on a pass/fail basis, where any passing grade (H, HP, P, or LP) is converted to Pass, and U is converted to Fail. Students wishing to take a GSB course on a pass/fail basis should consult the GSB Registrar for rules and procedures. Prior to 2001-02, an asterisk (*) notation was placed when no grade was reported.

SCHOOL OF LAW

The two grading systems previously employed at the School of Law were revised effective September 2001. Under the numerical system (with letter equivalents), the range of satisfactory grades runs from 4.3 to 2.5 as outlined in the following distribution. Below the grade of 2.5 is one level of restricted credit (2.2) and one level of failure (2.1). The number grades with letter equivalents are as follows:

4.3, 4.2	A+	3.4, 3.3, 3.2	B+	2.2	Restricted Credit
4.1, 4.0, 3.9	A	3.1, 3.0, 2.9	B	2.1	Failure
3.8, 3.7, 3.6, 3.5	A-	2.8, 2.7, 2.6, 2.5	B-		

Students may elect to take a limited number of courses on a credit/restricted credit/no credit system (K/RK/NK). 'K' will be awarded for work that is comparable to numerical grades 4.3 to 2.5, 'RK' for Restricted Credit-level work (2.2), and 'NK' for Failure-level work (2.1). A limited number of courses are offered on a mandatory credit (KM)/no credit (NK) basis. 'N' is a temporary notation used in a continuing course; it is replaced with a final grade upon completion of the course series. Prior to 2001-02 an asterisk (*) notation was placed when no grade has been reported.

SCHOOL OF MEDICINE

In general, the following grades are used in reporting on the performance of students in the M.D. program:

Pass (+)	Indicates that the student has demonstrated to the satisfaction of the department or teaching group responsible for the course that the student has mastered the material taught in the course.
Fail (-)	Indicates that the student has not demonstrated to the satisfaction of the department or teaching group responsible for the course that the student has mastered the material taught in the course.
Incomplete (I)	Indicates that extenuating medical or personal circumstances have prevented the student from completing the course requirements. This grade is given when requested by the student with the prior approval of an Advising Dean in the School of Medicine.
Continuing (N)	Indicates that the course has not concluded and the student is continuing the course.
Exempt (Ex)	Indicates a course that is exempted by examination. No units are awarded.

In general, a 'Fail' grade can be cleared by repeating and passing the particular course or by other arrangement prescribed by the department or teaching group. An 'Incomplete' grade can be made up in a manner specified by the department or teaching group within a reasonable time; if the deficiency is not made up within the specified time, the 'Incomplete' grade becomes a 'Fail' grade. The opportunity to clear a 'Fail' grade or an 'Incomplete' grade cannot be extended to individuals who are not registered or eligible to register as students in the M.D. program. For more specific information, see http://med.stanford.edu/md/curriculum/assessment-grading.html.

ACADEMIC STANDING

Undergraduates matriculating in Autumn 1999 and thereafter are required to adhere to the academic standards described below. The standards include maintaining a minimum 2.0 cumulative GPA and a quantitative unit requirement for good academic standing. In addition, a minimum 2.0 cumulative GPA is required for conferral of a baccalaureate degree.

Undergraduates matriculating *prior to* Autumn 1999 are required to adhere to the academic standards described below but are *exempt* from the minimum 2.0 cumulative GPA requirement for academic standing purposes. However, departments can elect to require a minimum GPA for course work applicable to the major and the minor. Refer to departmental literature for specific requirements.

Undergraduate students normally are expected to plan their academic programs so that they can complete 180 units in four years (twelve quarters), including the requirements for a major and the General Education, Writing, and Language Requirements. Satisfactory academic progress is, on average, 45 units per academic year for four years leading to at least 180 units, a cumulative grade point average of at least 2.0, and a baccalaureate degree.

While undergraduates are expected to register for a minimum of 12 units, they are required to complete at least 9 units each quarter (by the end of the final exam period) and at least 36 units in their most recent three quarters of Stanford enrollment (by the end of the third final exam period). In addition, students are expected to maintain a cumulative grade point average of at least 2.0. Transfer work completed at other institutions is not considered in this calculation.

A student earning fewer than 9 units per quarter or fewer than 36 units in three quarters, or earning less than a 2.0 cumulative grade point average, is placed on probation. Students on probation or provisional registration status (see definitions below) are required to complete a minimum of 12 units per quarter (by the end of the final quarter examination period for each quarter) for each quarter for three consecutive quarters, and maintain a cumulative grade point average of at least 2.0 to attain good academic standing (a Stanford Summer Session Quarter counts toward the three consecutive quarter requirement if 11 or more units are completed). The C-USP Subcommittee on Academic Standing may stipulate otherwise by acting upon a petition for fewer units.

Full-time enrollment is considered to be enrollment in a minimum of 12 units of course work per quarter at Stanford. Under extenuating circumstances, students may petition to the C-USP Subcommittee on Academic Standing to take fewer units. Work necessary to complete units from previous quarters does not count toward the 12 units necessary for full-time enrollment in the current quarter. All students registering for fewer than 12 units should consider the effects of that registration on their degree progress, visas, deferments of student loans, residency requirements, and their eligibility for financial aid and awards.

All undergraduate students validly registered at Stanford are considered to be in good standing for the purposes of enrollment certification and athletic participation.

Units are granted for courses completed with grades 'A,' 'B,' 'C,' 'D,' 'Satisfactory' ('CR' or 'S'), and 'L.' Courses graded 'N' are counted provisionally as units completed, provided the student enrolls in the continuing segment of that course the following quarter. When the course is completed, the student receives the units for which he or she enrolled. No units are granted for a course in which the student receives an 'I' or an '*' until the course is completed satisfactorily and the final grade reported. (See "Grading Systems" above.)

PROBATION

A student who fails to complete at least 36 units of work in his or her most recent three quarters of enrollment at the University, or who fails to complete by the end of the final examination period at least 9 quarter units of work in his or her most recent quarter of enrollment at the University, or who has a cumulative grade point average of less than 2.0, shall be placed on probation (warning status).

A student shall be removed from probation after three consecutive subsequent quarters of enrollment at the University if, in each quarter, he or she completes a minimum of 12 units of new course work by the end of the final examination period and maintains a cumulative grade point average of at least 2.0. A student may also be removed from probation at the discretion of the C-USP Subcommittee on Academic Standing as a result of a review of individual records.

PROVISIONAL REGISTRATION

A student who, while on probation, fails in any quarter of registration to complete a minimum of 12 units of new course work by the end of the final examination period or fails to achieve a cumulative grade point average of at least 2.0, shall be placed on provisional registration status. Provisional registration may require that a student submit a properly endorsed petition to return to Stanford.

A student shall be removed from provisional registration after three consecutive subsequent quarters of enrollment at the University if, in each quarter, he or she completes a minimum of 12 units of new course work by the end of the final examination period and maintains a cumulative grade point average of at least 2.0. A student may also be removed from provisional registration at the discretion of the C-USP Subcommittee on Academic Standing as a result of a review of individual records.

SUSPENSION

A student who, while on provisional registration, fails to complete a minimum of 12 units of new course work by the end of the final examination period, or who fails to maintain a cumulative grade point average of at least 2.0, shall be suspended. In addition, and on occasion, a student may also be suspended directly from probation.

In general, students suspended for the first time are suspended for one year. Students suspended a subsequent time are suspended for three years.

Students suspended for one year are not eligible to enroll for four quarters (including Summer Quarter) following the quarter in which the suspension was issued. Students suspended for three years are not eligible to enroll for twelve quarters (including Summer Quarter) following the quarter in which the suspension was issued. Students are required to submit a properly endorsed petition for provisional registration to request reenrollment after the suspension period has been completed.

Return from Suspension—Students who have been suspended are required to petition for provisional registration to return after their suspension has been completed.

Appeal of Suspension—Students who have been suspended, and who believe they have a compelling reason to appeal their suspension, without a break in enrollment, are required to submit a petition for provisional registration.

Early Return from Suspension—Students who have been suspended and who believe they have a compelling reason to return early from their suspension are required to submit a petition for provisional registration.

PETITIONING

Instructions including deadlines for requesting provisional registration or an early return from suspension should be obtained from the Office of the Vice Provost for Undergraduate Education, Sweet Hall, first floor. The C-USP Subcommittee on Academic Standing, or those designated by the subcommittee, acts upon all requests concerning academic standing, including requests for provisional registration. Questions concerning academic standing or the petitioning process should be directed to the Office of the Vice Provost for Undergraduate Education.

Late petitions to return from suspension, appeal a suspension, or return early from suspension are not considered. Students are encouraged to submit petitions as early as possible.

Students applying for financial aid and/or on-campus housing should be aware of the deadlines and procedures for those offices.

NOTIFICATION

Written notification that a student is on probation, provisional registration, or suspension is sent to the student and to the student's academic adviser as soon as possible after the close of the quarter. Students also receive written notification of the outcome of their provisional registration petition.

STATEMENT ON STUDENT ACADEMIC GRIEVANCE PROCEDURES

The following policy was effective beginning in the 1999-2000 academic year and is subject to periodic review.

1. Coverage
   a) Any Stanford undergraduate or graduate student who believes that he or she has been subjected to an improper decision on an academic matter is entitled to file a grievance to obtain an independent review of the allegedly improper decision, followed by corrective action if appropriate. A grievance is a complaint in writing made to an administrative officer of the University concerning an academic decision, made by a person or group of persons acting in an official University capacity, that directly and adversely affects the student as an individual in his or her academic capacity.
   b) Grievance procedures apply only in those cases involving a perceived academic impropriety arising from a decision taken by: (1) an individual instructor or researcher; (2) a school, department, or program; (3) a committee charged to administer academic policies of a particular school, department, or program; (4) the University Registrar, the Vice Provost for Undergraduate Education, the C-USP Subcommittee on Academic Standing, or a Senate committee or subcommittee charged to administer academic policies of the Senate of the Academic Council. They do not pertain to complaints expressing dissatisfaction with a University policy of general application challenged on the grounds that the policy is unfair or inadvisable, nor do they pertain to individual school, department, or program academic policies, as long as those policies are not inconsistent with general University policy.
   c) Individuals should be aware that the University Ombudsperson's Office is available to all Stanford students, faculty, and staff to discuss and advise on any matter of University concern and frequently helps expedite resolution of such matters. Although it has no decision-making authority, the Ombudsperson's Office has wide powers of inquiry, including into student complaints against instructors.
2. Grievance and Appeal Procedures
   a) *Informal Attempts at Resolution:* the student first should discuss the matter, orally or in writing, with the individual(s) most directly responsible. If no resolution results, the student should then consult with the individual at the next administrative level, for example, the chair or director of the relevant department or program, or, for those cases in which there is none, with the school dean. At this stage, the department chair or program director, if any, may inform the dean that the consultation is taking place and may solicit his or her advice on how to ensure that adequate steps are taken to achieve a fair result. Efforts should be made to resolve the issues at an informal level without the complaint escalating to the status of a formal grievance.
   b) *The Filing of the Grievance:*
      1. If informal means of resolution prove unsatisfactory, the student should set forth in writing a statement of the decision that constitutes the subject matter of the dispute, the grounds on which it is being challenged, and the reasons why the grievant believes that the decision was improperly taken. The statement should also include a description of the remedy sought and the informal efforts taken to date to resolve the matter. It is at this point that the complaint becomes a formal grievance. The written grievance should specifically address the matters set forth in the Standards for Review, as stated in Section 4 below. The grievance should include an allegation of any adverse effects on the grievant, known to the grievant at the time of filing.
      2. The grievance document should be submitted to the dean of the school in which the grievance arose; for a grievance concerning a decision of the University Registrar, the Vice Provost for Undergraduate Education, or of a Senate committee or subcommittee, the procedures set forth herein for grievances and appeals shall be modified as stated in Section 3 below. A grievance must be filed in a timely fashion, that is, normally within 30 days of the end of the academic quarter in which the adverse decision occurred or should reasonably have been discovered. A delay in filing a grievance may, taking all circumstances into account, constitute grounds for rejection of the grievance.
   c) *The Response to the Grievance:*
      1. The relevant dean shall consider the grievance. The dean may attempt to resolve the matter informally or make whatever disposition of the grievance that he or she deems appropriate. The dean may, in appropriate cases, remand the grievance to a lower administrative level (including to the level at which the grievance arose) for further consideration.
      2. The dean may also refer the grievance, or any issue therein, to any person (the "grievance officer") who shall consider the matter and report to the dean as the latter directs. The dean shall inform the grievant (and the party against whose decision the grievance has been filed) in writing of any referral of the matter and shall specify the matters referred, the directions to the person or persons to whom the referral is made (including the time frame within which the person is to report back to the dean), and the name of that person.
      3. In undertaking the review, the dean or the grievance officer may request a response to the issues raised in the grievance from any individuals believed to have information considered relevant, including faculty, staff, and students.
      4. Should attempts to resolve the matter informally not be successful, the dean shall decide the grievance, and shall notify the grievant (and the party against whose decision the grievance has been filed) in writing of the disposition made of the grievance and the grounds for the disposition at the earliest practicable date after his or her receipt of the grievance.
      5. Normally, no more than 60 days should elapse between the filing of a grievance and the disposition by the dean. If, because of absence of key persons from the campus or other circumstances or exigencies (including those due to breaks in the academic calendar), the dean decides that disposition on that schedule is not possible, he or she shall inform the grievant (and the party against whose decision the grievance has been filed) of that in writing, giving the grounds therefore and an estimate of when a disposition can be expected.
   d) *The Filing of an Appeal:*
      1. If the grievant is dissatisfied with the disposition of the grievance at the decanal level, either on substantive or on procedural grounds, he or she may appeal in writing to the Provost.
      2. The appeal must specify the particular substantive or procedural bases of the appeal (that is, the appeal must be made on grounds other than general dissatisfaction with the disposition) and must be directed only to issues raised in the grievance as filed or to procedural errors in the grievance process itself, and not to new issues. The appeal shall contain the following:
         a. A copy of the original grievance and any other documents submitted by the grievant in connection therewith.
         b. A copy of the determination made by the dean on that grievance.
         c. A statement of why the reasons for the determination of the dean are not satisfactory to the grievant. This statement should specifically address the matters set forth in the Standards for Review in Section 4 below.
      3. The grievant shall file his or her appeal at the earliest practicable date after the grievant's receipt of the determination by the dean. Normally, no more than 30 days should elapse between the transmittal of the dean's decision on the grievance and the filing of the appeal. A delay in filing an appeal may, taking all circumstances into account, constitute grounds for rejection of the appeal.

e) *The Response to the Appeal:*
   1. The Provost may attempt to resolve the matter informally, or refer the appeal, or any issue thereof, to any person (the "grievance appeal officer") who shall consider the matter and report to the Provost as the latter directs. The Provost may also, in appropriate cases, remand the matter to a lower administrative level (including to the level at which the grievance arose) for further consideration.
   2. The Provost shall inform the grievant (and the party against whose decision the grievance has been filed) in writing of any referral of the matter and shall specify the matters referred, the directions to the person to whom the referral is made (including the time frame within which the person is to report back to the Provost), and the name of that person.
   3. Should attempts be made to resolve the matter informally not be successful, the Provost shall decide the appeal, and shall notify the grievant (and the party against whose decision the grievance has been filed) in writing of the disposition made of the grievance and the grounds for the disposition at the earliest practicable date after his or her receipt of the appeal. The decision of the Provost shall be final, unless the grievant requests a further appeal to the President pursuant to Section 2f below, and the President agrees to entertain this further appeal.
   4. Normally no more than 45 days should elapse between the filing of the appeal and the disposition by the Provost. If, because of absence of key persons from the campus or other circumstances or exigencies (including those due to breaks in the academic calendar), the Provost judges that disposition on that schedule is not possible, he or she shall inform the grievant (and the party against whose decision the grievance has been filed) of the fact in writing, giving the grounds therefore and an estimate of when a disposition can be expected.

f) *The Request to the President:* if the student is dissatisfied with the disposition of the appeal by the Provost, he or she may write to the President of the University giving reasons why he or she believes the grievance result to be wrong (following the general format set forth in Section 2d.2 above). No more than 30 days should elapse between the transmittal of the Provost's disposition and the written statement to the President urging further appeal. In any case, the President may agree or decline to entertain this further appeal. If the President declines to entertain the further appeal, the decision of the Provost shall be final. If the President decides to entertain the further appeal, he or she shall follow the general procedures set forth in Section 2e above, and the decision of the President shall be final.

3. Grievances Concerning Decisions of the University Registrar, the Vice Provost for Undergraduate Education, or of a Senate Committee or Subcommittee
   a) For a grievance concerning a decision of the University Registrar, the Vice Provost for Undergraduate Education, the C-USP Subcommittee on Academic Standing, or of a Senate committee or subcommittee, the grievant shall file his or her grievance with the Provost, rather than with the dean, and the Provost shall handle that grievance in accordance with the procedures set forth in Section 2c above.
   b) There shall be no appeal of the Provost's disposition of that grievance, except as may be available under Section 2f above.
4. Standards for Review and Procedural Matters
   a) The review of grievances or appeals shall usually be limited to the following considerations:
      1. Were the proper facts and criteria brought to bear on the decision? Were improper or extraneous facts or criteria brought to bear that substantially affected the decision to the detriment of the grievant?
      2. Were there any procedural irregularities that substantially affected the outcome of the matter to the detriment of the grievant?
      3. Given the proper facts, criteria, and procedures, was the decision one which a person in the position of the decision maker might reasonably have made?
   b) The time frames set forth herein are guidelines. They may be extended by the relevant administrative officer in his or her discretion for good cause.
   c) Questions concerning the filing and appeal of grievances should be directed to the Office of the Provost.

COURSES OF INSTRUCTION

2007-08

Unless otherwise specified, courses numbered from 1 through 99 are primarily for first- and second-year undergraduates; courses numbered from 100 through 199 are for third- and fourth-year undergraduates; and those from 200 through 699 are for graduate students.

Amendments to course offerings announced in the *Stanford Bulletin* are found in the *Time Schedule of Classes,* issued quarterly.

Beginning in Autumn Quarter 2005, a modified and redefined set of undergraduate General Education Requirements, designated in this bulletin as GERs, went into effect. Students who matriculated Autumn Quarter 2004-05 or later are subject to the revised General Education Requirements effective Autumn Quarter 2005-06. Students who matriculated Autumn Quarter 2003-04 or earlier remain on the old General Education Requirements, but may elect to change to the new system. Students interested in electing the revised GER system should contact the Office of the University Registrar. No further changes are allowed once a student has elected to move to the new system.

SUMMER SESSION

This bulletin includes, for the Summer Session, only those courses that can be tentatively scheduled at publication time by each department. For the complete list of courses and faculty, refer to http://summer.stanford.edu, updated in February.

SUBJECT CODES

Throughout the bulletin, Axess subject codes have been printed wherever relevant. A complete list of subject codes is printed in the Appendix on the last page of this bulletin.

COGNATE COURSES

Cognate course listings in a given department or program refer to course offerings in other departments and programs which may be used to fulfill some major, minor, or honors program requirement. Students must consult the degree requirements section of their department or program, or the department or program's student services office, to determine the applicability of a given cognate course to a major, minor, or honors program.

LANGUAGE COURSES

All courses in language instruction, except classes in Latin, classical Greek, classical Chinese, and classical Japanese, are listed in the "Language Center" section of this bulletin. Foreign language literature and general interest courses are listed in the sections of the relevant department.

TIME SCHEDULE OF CLASSES

Each quarter, the Office of the University Registrar produces a printed *Time Schedule of Classes.* Changes to course listings made subsequent to the printing of this bulletin are reflected in this publication. Students should consult Axess at http://axess.stanford.edu for the most up-to-date class scheduling information.

UNDERGRADUATE EDUCATION

Vice Provost for Undergraduate Education: John Bravman
Web Site: http://undergrad.stanford.edu/

The Vice Provost for Undergraduate Education (VPUE) is responsible for building partnerships with faculty, departments, programs, and schools to promote and sustain excellence in undergraduate education at Stanford. It has a special focus on the academic programs in the first and second year that engage students in critical thinking and scholarly inquiry and that lay the foundations for their subsequent fields of concentration and future achievements. The VPUE supports faculty and departments by providing resources for fostering excellence in teaching, advising and mentoring, and undergraduate research. The Bing Overseas Studies Program, Center for Teaching and Learning, Diversity Outreach, Freshman and Sophomore Programs, Freshman Dean's Office, Introduction to Humanities, New Student Orientation/Approaching Stanford, Program in Writing and Rhetoric, Hume Writing Center, Undergraduate Advising and Research, and Writing in the Major report to the VPUE. The Office of the VPUE works closely with the Office of the Vice Provost for Student Affairs and the Admissions Office. The Vice Provost for Undergraduate Education reports to the Provost.

Policies governing undergraduate education are formulated by Faculty Senate committees and voted into legislation by the Faculty Senate. The Committee on Undergraduate Standards and Policies (C-USP) addresses such topics as general education requirements, grading, awards, advising, and teaching evaluation. The Committee to Review Undergraduate Majors (C-RUM) oversees the initiation and review of undergraduate degree programs. Committee members include the Vice Provost for Undergraduate Education or his delegated staff (ex-officio) and representatives from the faculty at large, administration (such as the Office of the University Registrar), and students. The Associated Students of Stanford University (ASSU) nominations committee selects student members. The VPUE also maintains, by rule of the Faculty Senate, the Introduction to the Humanities Governance Board and the Writing and Rhetoric Governance Board to oversee these University degree requirements. Finally, the Undergraduate Advisory Council (UGAC) was established by the Provost in 1996 to serve as the main faculty advisory body for the Vice Provost for Undergraduate Education.

CENTER FOR TEACHING AND LEARNING

Associate Vice Provost for Undergraduate Education and Director: Michele Marincovich
Senior Associate Director (Science and Engineering): Robyn Wright Dunbar
Associate Director (Humanities): Mariatte Denman
Associate Director (Social Sciences and Technology): Marcelo Clerici-Arias
Academic Technology Specialist: Jeremy Sabol
Associate Director for Academic Support: Adina Glickman
Tutor Coordinator: Amy Chambers
Administrators: David Leech, Cristen Osborne, Linda Salser
Oral Communication Program Director and Senior Lecturer: Doree Allen
Oral Communication Specialists and Tutor Managers: Jennifer Hennings, Lindsay Schauer
Lecturers: Thomas Freeland, Joyce Moser, Marianne Neuwirth, Leslie Townsend, James Wagstaffe, Randall A. Williams

Department Offices: Sweet Hall, 4th floor
Oral Communication Program: Meyer Library 123
Mail Code: 94305-3087
Center Phone: (650) 723-1326
Email: TeachingCenter@stanford.edu
Web Site: http://ctl.stanford.edu

The Center for Teaching and Learning is a University-wide resource on effective teaching and public speaking for faculty, lecturers, and teaching assistants and on effective learning and public speaking for undergraduates and graduate students.

SERVICES TO UNDERGRADUATES AND GRADUATE STUDENTS

CTL provides resources for students who want to enhance their study approaches and clarify their learning strategies. Through courses, individual counseling, and workshops, CTL helps students build skills that are the foundation for continuous improvement and lifelong learning.

Free tutoring is available to undergraduates in several subjects; see http://tutoring.stanford.edu for details on where and when tutors can be found. Students qualified for tutoring may apply to be tutors and, if accepted, may take CTL's course on tutoring; the application process takes place in February.

SERVICES TO FACULTY, LECTURERS, AND TEACHING ASSISTANTS

CTL provides the Stanford community with services and resources on effective teaching. Our goals are: to identify and involve successful teachers who are willing to share their talents with others; to provide those who are seeking to improve their teaching with the means to do so; to acquaint the Stanford community with important innovations and new technologies for teaching; to prepare new teachers for their responsibilities; to contribute to the professional development of teaching assistants; to expand awareness of the role of teaching at research universities; and to increase the rewards for superior teaching.

CTL also has responsibility for helping teaching assistants (TAs) with their preparation for and effectiveness in teaching and for helping departments with designing effective TA training programs. Programs include: videotaping, microteaching, and consultation; small group and other forms of mid-quarter evaluation; workshops and lectures; a handbook on teaching and a library of teaching materials; quarterly teaching orientations; an informative quarterly newsletter; and work with individuals, groups, and departments on their specific needs. For further details, see CTL's teaching handbook or the CTL brochure, both available by calling (650) 723-1326, or see http://ctl.stanford.edu.

For questions or requests, email TeachingCenter@stanford.edu.

ORAL COMMUNICATION PROGRAM

The Oral Communication Program at CTL provides opportunities for undergraduates and graduate students to develop or improve their oral communication skills. Courses and workshops offer a comprehensive approach to speech communication, including training in the fundamental principles of public speaking and the effective delivery of oral presentations. The goal is to enhance students' general facility and confidence in oral expression. The program also provides innovative, discipline-based instruction to help students refine their personal speaking styles in small groups and classroom settings. Those interested in individualized instruction or independent study are invited to visit the program's central office in Meyer Library, room 123, where trained student tutors, multimedia, and instructional resource materials are available on an ongoing basis. To schedule an appointment, see http://speakinghelp.stanford.edu. For further details, call (650) 725-4149 or 723-1326 or see http://ctl.stanford.edu.

COURSES

All courses listed with CTL promote acquisition of public speaking skills and/or teaching excellence.

CTL 53. Working Smarter—College-level strategies and skills in time management, reading, speaking, writing, and test preparation. Students explore learning preferences to develop strategies in different academic settings.
2 units, Sum (Townsend, L; Glickman, A)

CTL 56. Building a Successful Academic Career—For freshmen in expanded advising programs. Techniques for honing academic skills for college, and applying those skills to better define intellectual identity in academic pursuits. May be repeated for credit.
1 unit, Aut, Win (Williams, R)

CTL 60/160. Investigating Stanford's Treasures—Private tours of some of Stanford's greatest resources led by Stanford experts; students interview the experts and introduce them to the class at the site. One hour of class discussion per week. Tours may include Jasper Ridge Biological Reserve, Memorial Church, Special Collections, and the Martin Luther King, Jr., Papers Project.
1-2 units, Aut (Moser, J)

CTL 112/212. Conquering Speech Fright—Techniques of effective oral presentation and strategies for reducing speech anxiety and enhancing self-confidence and enjoyment.
2 units, given next year

CTL 115/215. Voice Workshop—Focus is on breath, voice production, expansion of vocal range and stamina, and clarity of articulation. Geared toward public speaking including presentations, lectures, and job talks. May be taken in conjunction with CTL 117.
1-2 units, Aut, Win, Spr (Freeland, T)

CTL 116A. The Language of Film Noir: From Bogart to Pulp Fiction—The quintessential American film genre which combined femmes fatales, anti-heroes, lost dreams, violence, and a distinct style of expression. Film viewings, student oral presentations, and analyses of films.
1-2 units, Win (Moser, J)

CTL 116B. Screwballs and the Language of Laughter: American Comic Film from Chaplin to Present—A sampling of American comic masterpieces including silent movies, 30s screwball films, and works by Billy Wilder, Woody Allen, and contemporary film makers. Film viewings, student oral presentations, and analyses of films.
1-2 units, alternate years, not given this year

CTL 117/217. The Art of Effective Speaking—The principles and practice of effective oral communication. Through formal and informal speaking activities, students develop skills framing and articulating ideas through speech. Strategies for speaking extemporaneously, preparing and delivering multimedia presentations, formulating persuasive arguments, refining critical clarity of thought, and enhancing general facility and confidence in oral self-expression.
3 units, Aut (Neuwirth, M), Win (Allen, D)

CTL 118. Public Speaking: Romancing the Room—A practical approach to the art of public speaking. Emphasis is on developing skills in speech types including impromptu, personal experience, interviewing, demonstration, persuasive, and special occasion. Materials include videotape, texts of famous speeches, and a final dinner program of speeches. Students evaluate presentations by others. $55 materials fee.
3 units, Sum (Wagstaffe, J)

CTL 119. Oral Communication Tutor Teaching Practicum—Seminar. For students with a strong background in public speaking who wish to train as public speaking tutors for CTL's Oral Communication Program. Readings, exercises, and supervised teaching refine speaking skills. Preparation to serve as a peer tutor in a variety of academic disciplines. Prerequisite: application and consent of instructor.
1-3 units, Spr (Allen, D; Hennings, J)

CTL 120. Peer Tutor Training—Goal is to help students become effective peer tutors for course material already mastered by articulating aims; developing practical tutoring skills including strategies for drop-in sessions; observing experienced tutors; discussing reading assignments; role playing; and reflecting on experiences as a peer tutor intern. Prerequisite: consent of instructor.
1 unit, Aut, Win (Glickman, A)

CTL 130. Beyond Stereotype Threat: Claiming a Rightful Place in an Academic Community—(Same as PSYCH 125.) Stereotype threat as mitigating the quality of a student's test performance; its impact on academic success at Stanford. How to reduce the impact of stereotype threat on Stanford students.
3 units, Win (Glickman, A)

CTL 177. Performance of Power: Oratory and Authority from the Ancient World to the Postmodern—Speech as action has long been seen as essential to leadership. Theories and examples of oratory, from Aristotle to George W. Bush, assessing each as model of voice-activated authority. The impact of mass media technologies as they transform the public space of oratory. Write-2
4 units, Aut (Freeland, T)

CTL 180/280. Interpersonal and Small Group Communication—Contexts of work, family, and society. Topics include listening, conflict resolution, leadership, power and its implementation, group dynamics, emotions, and cultural influences on interactions. Sources include videos, role playing, interviews, individual and group presentations, and group exercises.
3 units, Win (Neuwirth, M)

CTL 199. Independent Study—Special study under lecturer direction, usually leading to a written report or an oral presentation. Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr, Sum (Staff)

CTL 201. Science Course Design—(Same as GES 201.) For students interested in an academic career and who anticipate designing science courses at the undergraduate or graduate level. Goal is to apply research on science learning to the design of effective course materials. Topics include syllabus design, course content and format decisions, assessment planning and grading, and strategies for teaching improvement.
2-3 units, Aut (Wright-Dunbar, R)

CTL 219. Oral Communication for Graduate Students—Graduate student speaking activities such as teaching (delivering lectures, guiding discussion, and facilitating small groups), professional presentations and conference papers, and preparing for oral exams and defenses. In-class projects, discussion, and individual evaluation assist students in developing effective techniques for improving oral communication skills.
1-3 units, Spr, Sum (Freeland, T; Staff)

CTL 225. Teaching Development Series—Teaching and academic career topics from CTL's workshops series. Documented participation in a minimum of 10 hours required for credit. Offerings vary quarterly. See http://ctl.stanford.edu for current information. May be repeated for credit. Prerequisite: consent of instructor.
1 unit, Aut, Win, Spr (Clerici-Arias, M)

CTL 226. College Teaching in the Humanities—For graduate students in the humanities interested in an academic career. Topics include latest research on teaching and learning, effective humanities teaching practices, designing courses and assignments, writing a teaching statement, disciplinary and interdisciplinary teaching, teaching with technology, and research on early career faculty.

2-3 units, Win (Denman, M)

CTL 299. Independent Study—Special study under lecturer direction, usually leading to a written report or an oral presentation. Prerequisite: consent of instructor.

1-3 units, Aut, Win, Spr, Sum (Staff)

FRESHMAN AND SOPHOMORE PROGRAMS

Assistant Vice Provost and Program Director: Sharon Palmer
Academic Technology Specialist: Edward O'Neill
Oral Communication Lecturer: Joyce Moser
College Programs Associate: LaCona Woltmon
Administrators: Gari Gene, Mona Kitasoe, Jasmine Lu

Department Offices: Sweet Hall, 4th floor
Phone: (650) 723-4338
Fax: (650) 736-2797
Email: froshsophprograms@stanford.edu
Web Site: http://fsp.stanford.edu/

Freshman and Sophomore Programs (FSP), a division of the office of the Vice Provost for Undergraduate Education, sponsors and supports Freshman-Sophomore College, as well as Stanford Introductory Seminars, including Freshman Seminars, Sophomore Seminars and Dialogues, and Sophomore College. FSP also coordinates initiatives that encourage faculty and students to build on relationships formed in introductory seminars by forming ongoing mentoring and research partnerships based on their shared intellectual interests. FSP is located on the fourth floor of Sweet Hall. For detailed information, see the web site or contact the office.

FRESHMAN-SOPHOMORE COLLEGE

The Freshman-Sophomore College (FroSoCo) at Sterling Quad is a residence for approximately 180 freshmen and sophomores interested in broad intellectual exploration of the liberal arts and sciences. The College integrates intellectual, academic, and social activities with residential life. Entering freshmen have the option of living for two years in FroSoCo.

STANFORD INTRODUCTORY SEMINARS

Participating Faculty: Over 200 faculty from more than 60 departments take part in Introductory Seminars programs. See faculty listings in each department's section of this bulletin for pertinent information.
SIS Offices: 4th Floor, Sweet Hall, 590 Escondido Mall
Mail Code: 94305-3091
Phone: (650) 723-4338
Email: froshsophprograms@stanford.edu
Web Site: http://introsems.stanford.edu/

Stanford Introductory Seminars (SIS) provide opportunities for first- and second-year students to work closely with faculty in an intimate and focused setting. These courses aim to intensify the intellectual experience of the freshman and sophomore years by allowing students to work with faculty members in a small group setting; introducing students to the variety and richness of academic topics, methods, and issues which lie at the core of particular disciplines; and fostering a spirit of mentorship between faculty and students. Over 200 faculty from more than 60 departments take part in the introductory seminars programs. The courses are given department credit and most count towards an eventual major in the field. Most also fulfill General Education Requirements (GERs).

Some faculty who have taught Freshman Seminars or Sophomore College volunteer to continue working with their students through a formal advising relationship during the students' sophomore year.

FRESHMAN SEMINARS AND SOPHOMORE SEMINARS AND DIALOGUES

Freshman Seminars and Sophomore Seminars and Dialogues are offered in many disciplines throughout the academic year. Freshman preference seminars are typically given for 3-4 units to a maximum of 16 students, and generally meet twice weekly. Although preference for enrollment is given to freshmen, sophomores and first-year transfer students may participate on a space-available basis and with the consent of the instructor. Sophomore preference seminars and dialogues give preference to sophomores and first-year transfer students, but freshmen may participate on a space-available basis and with the consent of the instructor. Sophomore preference seminars are given for 3-5 units to a maximum of 14 students, while sophomore preference dialogues take the form of a directed reading, and are given for 1-2 units to a maximum of 5 students. All seminars require a brief application. For a list of introductory seminars offered in 2007-08, see below. For an application or more information see the SIS annual course catalogue, published each September, or http://introsems.stanford.edu/.

SOPHOMORE COLLEGE

Sophomore College offers sophomores the opportunity to study intensively in small groups with Stanford faculty for several weeks before the beginning of Autumn Quarter. Students immerse themselves in a subject and collaborate with peers, upper-class sophomore assistants, and faculty in constructing a community of scholars. They are also encouraged to explore the full range of Stanford's academic resources in workshops and individually. At its best, Sophomore College is characterized by an atmosphere of intense academic exploration. Each Sophomore College course enrolls twelve to fourteen students, who live together in a Stanford residence and receive two units of academic credit. Eligible students will have been enrolled for no more than three academic quarters; be sophomores in the Autumn Quarter during which the college is offered; be in good academic standing; and have completed at least 36 units of academic work by the end of the Spring Quarter preceding the college. Students must also have an on-campus housing assignment for the ensuing academic year and intend to enroll in the Autumn Quarter. Admitted students who are found to have academic standing problems after the completion of Spring Quarter may have their admission revoked. The Sophomore College program fee covers tuition, room, board, books, and class-required travel arranged by the program. The total fee is $1300, but all students automatically receive an $800 scholarship. Each student pays the remaining $500, which is included in the University Bill. Financial aid is available. Students are also responsible for travel to campus (or to another site for some off-campus seminars), phone, network activation fees, and other personal expenses. Courses are announced in March, and applications are due in April. For a list of Sophomore College Seminars offered in 2007-08, see below. For more information or to apply, see http://soco.stanford.edu/.

COURSES

SOPHOMORE COLLEGE

ANTHROPOLOGY

ANTHSCI 11SC. Conservation and Development Dilemmas in the Amazon—The human dimensions of conservation efforts in the Amazon Basin. The human ecology of Amazonia through the peoples and cultures, and the ecosystems in which they live. The prospects for achieving the goals of biodiversity conservation and local community development. Amazonia as a microcosm of the challenges facing conservation and development efforts in the Third World.

2 units, Aut (Durham, W)

BIOLOGICAL SCIENCES

BIOSCI 10SC. Natural History, Marine Biology, and Research—The biology of Monterey Bay and the coastal mountains and redwood forests of Big Sur. Literary, artistic, and political history. Topics: conservation, sanctuary, and stewardship of the oceans and coastal lands. Meetings with conservationists, authors, environmentalists, politicians, land-use planners, lawyers, scientists, and educators.

2 units, Aut (Thompson, S)

BIOSCI 11SC. The Ecology of Invasions—Introduction to invasion ecology including the animal and plant species which are transforming ecosystems around the world. Ongoing research project in the Jasper Ridge Biological Preserve to investigate why the Argentine ant, once established, eliminates most native ant species, and why a few native species are able to resist.

2 units, Aut (Gordon, D)

CHEMICAL ENGINEERING

CHEMENG 10SC. How Computer Chips Are Made—Fabrication sequence for integrated circuits. Properties of solids. Semiconductors; transistors and their function in an integrated circuit. Transistor fabrication including doping, deposition, etching, and lithography. Future trends such as smaller transistors.

2 units, Aut (Bent, S)

CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 10SC. Green Buildings—What makes a building green? The efficient use of energy, water, and construction materials to provide healthful and enjoyable spaces in which to live and work. Focus is on energy efficiency and architectural features that enable a building to provide a significant fraction of its own heating, cooling, and electrical needs.

2 units, Aut (Masters, G)

COMPARATIVE LITERATURE

COMPLIT 12SC. Ghost Stories: Why the Dead Return and What They Want From Us—Anxiety about mortality and wisdom about the cultural place of the past in the enduring genre of the ghost story from classical literature to popular film. Memory and regret, mourning and forgetting. Classic authors such as Hoffmann, Poe, James, Joyce, and Ibsen, and more recent authors such Paul Auster, Marie Darrieussecq, Catherine Lim, and Toni Morrison.

2 units, Aut (Berman, R)

DRAMA

DRAMA 11SC. Learning Theater: From Audience to Critic at the Oregon Shakespeare Festival—Twelve days and eight plays at the Oregon Shakespeare Festival in Ashland. Details of the plays, interpretation, production, acting, and their value as entertainment and challenge.

2 units, Aut (Rehm, M; Paulson, L)

ECONOMICS

ECON 14SC. A Random Walk Down Wall Street—Modern finance theory. Financial instruments including stocks, bonds, options, mutual funds, and exchange-traded funds. Historical returns on asset classes. Equity analysis. Capital pricing model. Efficient market hypotheses. Index funds. Meetings with financial managers and venture capitalists.

2 units, Aut (Shoven, J)

ENGLISH

ENGLISH 15SC. Mixed Race in the New Millennium—Current controversies over mixed race identification. Political and aesthetic implications. Literary and pop cultural images in literature, performance, the Internet, and visual media. Legal leverage and national recognition gained in the last decade. Organizations, web sites, and affinity and advocacy groups, and their rhetoric and graphics.

2 units, Aut (Elam, M)

ETHICS IN SOCIETY

ETHICSOC 10SC. The Meaning of Life: Moral and Spiritual Inquiry through Literature—Short novels and plays as the basis for reflection on ethical values and the purpose of life. Why are people here? How do they find meaningful work? What can death teach about life? What is the meaning of success? What is the nature of true love? How can one find balance between work and personal life? How free are people to seek their own destinies? What obligations does one have to others?

2 units, Aut (McLennan, W)

GEOLOGICAL AND ENVIRONMENTAL SCIENCES

GES 12SC. Environmental and Geological Field Studies in the Rocky Mountains—Geologic origin from three billion years ago, paleoclimatology and glacial history, long- and short-term carbon cycle and global climate change, and environmental issues related to changing land-use patterns and increased demand for natural resources. Small groups analyze data to prepare reports and maps.

2 units, Aut (Chamberlain, P)

HISTORY

HISTORY 17SC. The Invasion of Britain in the Second World War—Two invasions: a potential hostile invasion intended by Hitler for September, 1940; and a benign invasion by nearly two million American troops. Effect of Americans on Britain, Britain on Americans, and the invasions on the course of the war.

2 units, Aut (Stansky, P)

HISTORY 18SC. The Federal Government and the West—(Same as POLISCI 18SC.) Historical development and current status of the relationship between the U.S. federal government and the American West. Land ownership, natural resource management, agriculture, water, energy, and environmental quality.

2 units, Aut (Kennedy, D; Brady, D; Frisby, T; Noll, R)

LINGUISTICS

LINGUIST 10SC. Ebonics, Creoles, and Standard English in Education—A dispassionate look at the 1996 Oakland School Board's proposal to take the everyday vernacular of African American students (Ebonics) into account in teaching them mainstream or standard English and the substantial linguistic and pedagogical research associated with it.

2 units, Aut (Rickford, J)

MECHANICAL ENGINEERING

ME 12SC. Hands-on Jet Engines—The jet engine has arguably done more than any other 20th century invention to transform the world. Prior to the advent of commercial jet airliners, cross-country travel was a rarity, world travel was the province of the idle rich, and Stanford was a regional university. Now intercontinental travel is common, and internationalization has affected nearly everything we do. From an engineering perspective, jet engines continue to embody some of the most sophisticated technology ever designed, and competition drives continual improvements in fuel economy, engine lifetime, noise, and emissions.

2 units, Aut (Eaton, J)

MEDICINE

MED 10SC. AIDS in Africa—Hypotheses about the origins of HIV, different types of virus and their virulence, and the diversity in HIV prevalence in Africa. Social, political, and economic consequences of the epidemic.

2 units, Aut (Katzenstein, D)

MUSIC

MUSIC 11SC. Men, Women, and Opera—Six operas through the lenses of gender and sexuality. Italian romantic opera. Contemporary queer/feminist appropriations. Mozart's comic operas. Romantic obsessions with beauty, music, and love. Thinking and writing critically about music. Opera viewing. Team projects staging an operatic scene.

2 units, Aut (Hadlock, H)

PHYSICS

PHYSICS 11SC. A 21st-Century View of the Universe: The Elementary Particles, Dark Matter, and Dark Energy—The development of cosmology as a truly experimental science that has led to the observations that about a quarter of the energy content in the universe is in the form of dark matter which gravitationally attracts but is otherwise invisible, and about two-thirds is in the form of dark energy which causes space itself to expand at an ever-increasing rate. The evidence for dark matter and dark energy, and the experiments being developed to investigate their nature.

2 units, Aut (Burchat, P)

POLITICAL SCIENCE

POLISCI 18SC. The Federal Government and the West—(Same as HISTORY 18SC.) Historical development and current status of the relationship between the U.S. federal government and the American West. Land ownership, natural resource management, agriculture, water, energy, and environmental quality.

2 units, Aut (Kennedy, D; Brady, D; Frisby, T; Noll, R)

SOCIOLOGY

SOC 10SC. Bargaining, Power, and Social Influence— How simple and complex negotiations unfold under varying circumstances, and how conflict can be avoided. Effective negotiating strategies. Sample negotiations to understand to be more effective. Presentation of case study.

2 units, Aut (Cook, K)

FRESHMAN SEMINARS AND SOPHOMORE SEMINARS AND DIALOGUES

Freshman and Sophomore Seminars and Dialogues are offered in many disciplines throughout the academic year. Freshman preference seminars are given for 3-4 units to a maximum of 16 students, and generally meet twice weekly. Although preference for enrollment is given to freshmen, sophomores and first-year transfer students may participate on a space-available basis and with the consent of the instructor. Sophomore preference seminars and dialogues, similarly, give preference to sophomores and first-year transfer students, but freshmen may participate on a space-available basis and with the consent of the instructor. Sophomore preference seminars are given for 3-5 units to a maximum of 14 students, while sophomore preference dialogues take the form of a directed reading, and are given for 1-2 units to a maximum of 5 students.

All seminars require a brief application. See the *Time Schedule*, the *Stanford Introductory Seminars Course Catalogue* published each September, or http://introsems.stanford.edu/. Due dates for 2007-08 applications for both freshman and sophomore preference courses are: Autumn Quarter, 5 p.m., September 21; Winter Quarter, noon, December 7; Spring Quarter, noon, March 14.

For course descriptions, see course listings in the teaching department section of this bulletin.

F = preference to freshmen; S = preference to sophomores; Dial = dialogue; Sem = Seminar.

AERONAUTICS AND ASTRONAUTICS

AA 113N. Structures: Why Things Don't (and Sometimes Do) Fall Down—(F,Sem) GER:DB-EngrAppSci

3 units, Win (Springer, G)

AMERICAN STUDIES

AMSTUD 114N. Visions of the 1960s—(S,Sem) GER:DB-Hum, EC-AmerCul

5 units, Aut (Gillam, R)

ANESTHESIOLOGY

ANES 113Q. Disease-Oriented Approach to Human Physiology—(S,Sem) The role of the physiology of major organ systems in a healthy person, how it is altered in disease, and therapeutic approaches to normalizing the pathophysiologic state. Current therapies and those under investigation. Organ systems and diseases including the cardiovascular (myocardial infarction, trauma and infection leading to shock), central nervous (stroke, concussion, cerebral hemorrhage, spinal-cord trauma, meningitis), pulmonary (pneumonia, asthma, emphysema), renal (kidney failure), and hepatic (cirrhosis, hepatitis). Field trips to operating rooms or intensive-care units at Stanford Medical Center.

3 units, Spr (Rosenthal, M)

ANTHROPOLOGY

CASA 7N. Science, Technology, and Medicine: Disease as Culture—(F,Sem)

3-5 units, Spr (Jain, S)

CASA 100N. Ethnographies of North America: An Introduction to Cultural and Social Anthropology—(F,Sem) GER:DB-SocSci

3-4 units, Aut (Wilcox, M)

APPLIED PHYSICS

APPPHYS 68N. Lasers and Photons—(F,Sem) GER:DB-EngrAppSci

3 units, Aut (Bucksbaum, P)

APPPHYS 69N. Advanced Electronic Materials: Principles and Applications—(F,Sem) GER:DB-EngrAppSci

3 units, Spr (Fisher, I)

APPPHYS 78Q. Tools of Nanotechnology—(S,Sem) GER:DB-EngrAppSci

3 units, Aut (Cole, K)

APPPHYS 79Q. Energy Choices for the 21st Century—(S,Sem) GER:DB-EngrAppSci

3 units, Aut (Fox, J; Geballe, T)

BIOCHEMISTRY

BIOC 118Q. Genomics and Medicine—(S,Sem) GER:DB-EngrAppSci

3 units, Spr (Brutlag, D)

BIOENGINEERING

BIOE 70Q. Medical Device Innovation—(S,Sem)

3 units, Spr (Doshi, R; Mandato, J)

BIOLOGICAL SCIENCES

BIOSCI 6N. Climate Change: Drivers, Impacts, and Solutions—(F,Sem) GER:DB-NatSci

3 units, Win (Field, C)

BIOSCI 14N. Plants and Civilization—(F,Sem) GER:DB-NatSci

3 units, Win (Mooney, H)

BIOSCI 16N. Island Ecology—(F,Sem) GER:DB-NatSci

3 units, Spr (Vitousek, P)

BIOSCI 21N. Evolutionary Basis of Animal Sexual Behaviors—(F,Sem) GER:DB-NatSci

3 units, Spr (Baker, B)

BIOSCI 24N. From Bread to Genomics: Using Yeast to Study Biology—(F,Sem) GER:DB-NatSci

3 units, Aut (Cyert, M)

BIOSCI 25Q. The Molecular Basis of Genetic Disease—(S,Sem) GER:DB-NatSci

3 units, Spr (Kopito, R)

BIOSCI 26N. Maintenance of the Genome—(F,Sem) GER:DB-NatSci

3 units, Spr (Hanawalt, P)

BIOSCI 28N. Molecular Basis of Cancer—(F,Sem) GER:DB-NatSci

3 units, Spr (Fang, G)

BIOSCI 31Q. Ants: Behavior, Ecology, and Evolution—(S,Sem)

3 units, Spr (Gordon, D)

BIOSCI 33N. Conservation Science and Practice—(F,Sem) GER:DB-NatSci

3 units, Spr (Daily, G)

BIOSCI 34N. Hunger—(F,Sem) GER:DB-NatSci
3 units, Aut (Barton, K)

BIOSCI 36N. Physiology of Human Performance—(F,Sem) GER:DB-NatSci
3 units, Aut (Heller, C; Grahn, D; Sims, S)

BIOSCI 106Q. The Heart of the Matter—(S,Sem) (Same as GENE 106Q.) GER:DB-NatSci
3 units, Win (Myers, R; Simoni, R)

BIOMEDICAL INFORMATICS

BIOMEDIN 109Q. Genomics: A Technical and Cultural Revolution—(S,Sem) (Same as GENE 109Q.) Write-2
3 units, Win (Altman, R)

CHEMICAL ENGINEERING

CHEMENG 60Q. Environmental Regulation and Policy—(S,Sem) GER:DB-EngrAppSci
3 units, Aut (Robertson, C; Libicki, S)

CHEMENG 70Q. Masters of Disaster—(S,Sem) GER:DB-EngrAppSci
3 units, Aut (Robertson, C; Moalli, J)

CHEMENG 80Q. Art, Chemistry, and Madness: The Science of Art Materials—(S,Sem) GER:DB-EngrAppSci
3 units, Spr (Frank, C; Loesch-Frank, S)

CHEMISTRY

CHEM 22N. Naturally Dangerous—(F,Sem)
2 units, Aut (Collman, J)

CHEM 24N. Nutrition and History—(F,Sem)
2 units, Spr (Huestis, W)

CHEM 25N. Science in the News—(F,Sem)
3 units, Aut (Andersen, H)

CHEM 27N. Lasers: The Light Fantastic—(F,Sem) GER:DB-NatSci
3 units, Win (Moerner, W)

CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 31Q. Accessing Architecture through Drawing—(S,Sem) GER:DB-EngrAppSci
4 units, Aut (Walters, P)

CEE 46Q. Fail Your Way to Success—(S,Sem) GER:DB-EngrAppSci
3 units, Spr (Clough, R)

CEE 48N. Designing Organizations to Execute Global Projects—(F,Sem)
4 units, Win (Levitt, R)

CLASSICS GENERAL

CLASSGEN 22N. Technologies of Civilization: Writing, Number, and Money—(F,Sem) GER:DB-Hum
4-5 units, Spr (Netz, R)

CLASSGEN 24N. Sappho: Erotic Poetess of Lesbos—(F,Sem) GER:DB-Hum, EC-Gender
4-5 units, Spr (Peponi, A)

COMMUNICATION

COMM 118Q. Theories of Film Practice—(S,Sem) Write-2
4 units, Win (Breitrose, H)

COMPARATIVE LITERATURE

COMPLIT 10N. Shakespeare and Performance in a Global Context—(F,Sem) GER:DB-Hum, EC-Gender
3 units, Spr (Parker, P)

COMPLIT 11Q. Shakespeare, Playing, Gender—(S,Sem) GER:DB-Hum, EC-Gender
3 units, Win (Parker, P)

COMPLIT 30N. Fascism and Culture—(F,Sem) (Same as ITALGEN 30N.) GER:DB-Hum
4 units, Aut (Schnapp, J)

COMPARATIVE MEDICINE

COMPMED 81N. Comparative Anatomy and Physiology of Mammals—(F,Sem) GER:DB-NatSci
3 units, Win (Bouley, D)

COMPMED 83Q. Horse Medicine—(S,Dial)
1-2 units, Aut (Green, S)

COMPUTER SCIENCE

CS 20N. The Role of Information Technology in Global Conflict Resolution—(F,Sem) GER:DB-EngrAppSci
3 units, Spr (Shoham, Y)

CS 26N. Motion Planning for Robots, Digital Actors, and Other Moving Objects—(F,Sem) GER:DB-EngrAppSci
3 units, Aut (Latombe, J)

CS 73N. Business on the Information Highways—(F,Sem) Write-2
3 units, Spr (Wiederhold, G; Barr, A; Tessler, S)

CS 74N. Digital Dilemmas—(F,Sem) GER:DB-EngrAppSci
3 units, Aut (Dill, D)

CS 99N. The Coming Revolution in Computer Architecture: What to Do with a Billion Transistors—(F,Sem)
3 units, Spr (Dally,W)

DEVELOPMENTAL BIOLOGY

DBIO 12Q. The Evolution and Development of the Human Hand—(S,Sem)
3-4 units, Win (Porzig, E)

DRAMA

DRAMA 11N. Dramatic Tensions: Theater and the Marketplace—(F,Sem) GER:DB-Hum
4 units, Aut (Freed, A)

DRAMA 14N. Shakespeare from Stage to Screen—(F,Sem) GER:DB-Hum
4 units, Aut (Rayner, A)

DRAMA 16N. Beauty or the Beast? Kitsch and Contemporary Culture—(F,Sem) GER:DB-Hum
4 units, Win (Jakovljevic, B)

DRAMA 17N. *Del Otro Lado:* Latina/o Performance Art in the U.S.—(F,Sem) (Same as SPANLIT 178N.) GER:DB-Hum, EC-AmerCul
3 units, Win (Moraga, C)

DRAMA 180Q. Noam Chomsky: The Drama of Resistance—(S,Sem) GER:DB-Hum
3 units, Spr (Rehm, R)

DRAMA 185Q. Law and Drama—(S,Dial)
1-2 units, Spr (Jakovljevic, B)

DRAMA 186Q. The Emergence of the Director—(S,Sem) GER:DB-Hum
4 units, Win (Jakovljevic, B)

DRAMA 187Q. The Stage in Dialogue with History—(S,Sem) GER:DB-Hum
3 units, Aut (Weber, C)

DRAMA 189Q. Mapping and Wrapping the Body—(S,Sem) GER:DB-Hum, EC-Gender
3 units, Aut (Eddelman, W)

ECONOMICS

ECON 11N. Understanding the Welfare System—(F,Sem)
2 units, Aut (MaCurdy, T)

ECON 17N. Energy, the Environment, and the Economy—(F,Sem)
2 units, Spr (Wolak, F)

ECON 93Q. Global Capital Markets—(S,Dial)
3 units, Win (Marotta, G)

EDUCATION

EDUC 93Q. Young Children's Mathematical Thinking and Learning—(S,Sem) GER:DB-SocSci
3 units, Win (Murata, A)

EDUC 115Q. Identities, Race, and Culture in Urban Schools—(S,Sem)
3 units, Spr (Nasir, N)

ELECTRICAL ENGINEERING

EE 15N. The Life of an Engineering Project—(F,Sem) GER:DB-EngrAppSci
3 units, Win (Goldsmith, A; Le, M)

EE 17N. Engineering the Micro and Nano Worlds: From Chips to Genes—(F,Sem) GER:DB-EngrAppSci
3 units, Spr (Pease, R; Maluf, N)

EE 20N. Hacking Things—(F,Sem)
3 units, Win (Peumans, P)

EE 21N. What is Nanotechnology?—(F,Sem) GER:DB-EngrAppSci
3 units, Aut (Wong, P)

EE 22N. Medical Imaging Systems—(F,Sem)
3 units, Win (Nishimura, D)

ENGINEERING

ENGR 159Q. Japanese Companies and Japanese Society—(S,Sem) (Same as MATSCI 159Q.) GER:DB-SocSci
3 units, Spr (Sinclair, R)

ENGLISH

ENGLISH 14Q. John Donne: His Poetry, Prose, and the Early Modern World—(S,Sem) GER:DB-Hum
4-5 units, Aut (Brooks, H)

ENGLISH 51N. Drama Queens: Powerful Women on Stage—(F,Sem) GER:DB-Hum
3 units, Aut (Friedlander, L)

ENGLISH 55N. American Sports, American Lives—(F,Sem)
3 units, Win (Rampersad, A)

ENGLISH 62N. Eros in Modern American Poetry—(F,Sem) GER:DB-Hum
3 units, Win (Fields, K)

ENGLISH 66N. Homage: The Art of Influence—(F,Sem) GER:DB-Hum
3 units, Aut (Tallent, E)

ENGLISH 69Q. Sources of Global Challenges Today, Possibilities for Global Solutions: A Literary Exploration—(S,Sem) GER:DB-Hum
3-5 units, Spr (Drake, S)

ENGLISH 70N. Shakespeare on Film—(F,Sem) GER:DB-Hum
3 units, Spr (Riggs, D)

ENGLISH 77N. Living in the Past: Italy in the Anglo-American Imagination—(F,Sem) GER:DB-Hum
3 units, Aut (Evans, M)

ENGLISH 82Q. Shakespeare's Plays—(S,Sem) GER:DB-Hum
5 units, Aut (Rebholz, R)

ENGLISH 83Q. Playwriting: A Workshop in Craft—(S,Sem)
4 units, Aut (DiPirro, K)

ENGLISH 87N. The Graphic Novel: Literature Lite?—(S,Sem) GER:DB-Hum, Write-2
5 units, Win (Lunsford, A)

ENGLISH 88Q. Imagining Others: Cosmopolitanism in the 21st Century—(S,Sem)
4 units, Win (Savelson, K)

FEMINIST STUDIES

FEMST 188N. Imagining Women: Writers in Print and in Person—(S,Sem) Write-2
4-5 units, Spr (Miner, V)

FEMST 191Q. Writing Women's Lives—(S,Dial)
2 units, Aut (Miner, V)

FRENCH GENERAL

FRENGEN 45N. American Writers in 20th-Century Paris—(F,Sem) GER:DB-Hum
3-4 units, Win (Alduy, C)

FRENGEN 180Q. Aspects of Contemporary French Society through Film—(S,Sem) GER:DB-Hum
4 units, Spr (Bertrand, M)

GENETICS

GENE 106Q. The Heart of the Matter—(S,Sem) (Same as BIOSCI 106Q.) GER:DB-NatSci
3 units, Win (Myers, R; Simoni, R)

GENE 109Q. Genomics: A Technical and Cultural Revolution—(S,Sem) (Same as BIOMEDIN 109Q.) Write-2
3 units, Win (Altman, R)

GEOLOGICAL AND ENVIRONMENTAL SCIENCES

GES 37N. Energy and the Environment on the Back of an Envelope—(F,Sem) GER:DB-NatSci
3 units, Aut (Caldeira, K)

GES 38N. The Worst Journey in the World: The Science, Literature, and History of Polar Exploration—(F,Sem) GER:DB-NatSci
3 units, Win (Dunbar, R)

GES 42N. Landscapes and Tectonics of the San Francisco Bay Area—(F,Sem)
5 units, Aut (Hilley, G)

GES 43N. Environmental Problems—(F,Sem) GER:DB-NatSci
3 units, Win (Loague, K)

GES 46N. Exploring the Critical Interface between the Land and Monterey Bay: Elkhorn Slough—(F,Sem)
3-5 units, Spr (Francis, C)

GES 55Q. The California Gold Rush: Geologic Background and Environmental Impact—(S,Sem) GER:DB-NatSci, Write-2
3 units, Win (Bird, D)

GES 56Q. Changes in the Coastal Ocean: The View From Monterey and San Francisco Bays—(S,Sem) GER:DB-NatSci
3 units, Spr (Dunbar, R)

GERMAN GENERAL

GERGEN 50N. Charlemagne's Germany—(F,Sem) GER:DB-Hum
3-4 units, Aut (Andersson, T)

GERGEN 104N. Resistance Writings in Nazi Germany—(S,Sem) GER:DB-Hum
3 units, Aut (Bernhardt, E)

GERMAN LITERATURE

GERLIT 123N. The Brothers Grimm and Their Fairy Tales—(F,Sem) GER:DB-Hum
4 units, Spr (Robinson, O)

GERLIT 133Q. Modernism and Fiction—(S,Sem) GER:DB-Hum
4 units, Spr (Berman, R)

HEALTH RESEARCH AND POLICY

HRP 89Q. Introduction to Crosscultural Issues in Medicine—(S,Sem) GER:EC-AmerCul
3 units, Win (Corso, I)

HISTORY

HISTORY 30N. Fiction and English Society—(F,Sem) GER:DB-Hum
4 units, Aut (Stansky, P)

HISTORY 34N. The European Witch Hunts—(F,Sem) GER:DB-Hum
4 units, Win (Stokes, L)

HISTORY 36N. Gay Autobiography—(F,Sem) GER:DB-Hum, EC-Gender
4 units, Spr (Robinson, P)

HISTORY 48Q. South Africa: Contested Transitions—(S,Sem) GER:DB-Hum
3 units, Win (Samoff, J)

HISTORY 51N. The American Enlightenment—(F,Sem) GER:DB-Hum
4-5 units, Win (Winterer, C)

HISTORY 62N. The Atomic Bomb in Policy and History—(F,Sem) GER:DB-SocSci
5 units, Spr (Bernstein, B)

HISTORY 90Q. Buddhist Political and Social Theory—(S,Sem) GER:DB-SocSci, EC-GlobalCom
4-5 units, Aut (Mancall, M)

HISTORY 91Q. Mao Zedong: The Man Who Would Become China—(S,Sem)
5 units, Spr (Mullaney, T)

HISTORY 94N. Colonialism and Collaboration—(F,Sem) GER:DB-SocSci, EC-GlobalCom
4-5 units, Win (Moon, Y)

HISTORY 97N. Modernizing Women in Japan—(F,Sem) GER:DB-Hum, EC-Gender
5 units, Aut (Wigen, K)

HUMAN BIOLOGY

HUMBIO 84Q. Social Justice, Responsibility, Health—(S,Sem)
4 units, Aut (Heaney, C)

HUMBIO 86Q. Love: An Exploration—(S,Sem)
3 units, Spr (Murray, A)

HUMBIO 87Q. Women and Aging—(S,Sem) (Same as MED 87Q.)
5 units, Win (Winograd, C)

HUMBIO 91Q. Neuroethology: The Neural Control of Behavior—(S,Sem) GER:DB-NatSci
3 units, Aut (Fernald, R)

HUMBIO 97Q. Sport, Exercise, and Health: Exploring Sports Medicine—(S,Sem) (Same as ORTHO 97Q.) Write-2
3 units, Aut, Spr (Matheson, G)

HUMBIO 99Q. Becoming a Doctor: Readings from Medical School, Medical Training, Medical Practice—(S,Sem)
4 units, Aut (Zaroff, L)

ITALIAN GENERAL

ITALGEN 30N. Fascism and Culture—(F,Sem) (Same as COMPLIT 30N.) GER:DB-Hum
4 units, Aut (Schnapp, J)

JAPANESE GENERAL

JAPANGEN 71N. Language and Gender in Japan: Myths and Reality—(F,Sem) GER:DB-SocSci, EC-Gender
4 units, Spr (Matsumoto, Y)

JAPANGEN 75N. Around the World in Seventeen Syllables: Haiku in Japan, the U.S., and the Digital World—(F,Sem) GER:DB-Hum
3-4 units, Aut (Carter, S)

LAW

LAWGEN 107Q. Legal Craft and Moral Intuitions—(S,Sem) (Same as POLISCI 33Q.) GER:DB-SocSci, EC-EthicReas
4 units, Win (Kelman, M)

LAWGEN 109Q. The History of Punishment and Sentencing in California—(S,Sem)
3 units, Aut (Weisberg, R; Dansky, K)

LINGUISTICS

LINGUIST 37Q. Forensic Linguistics—(S,Dial)
2 units, Spr (Traugott, E)

LINGUIST 44N. Living with Two Languages—(F,Sem) GER:DB-SocSci
3 units, Spr (Clark, E)

LINGUIST 46Q. Slips of the Tongue—(S,Sem)
3 units, Spr (Zwicky, A)

LINGUIST 62N. The Language of Food—(F,Sem)
3 units, Win (Jurafsky, D)

LINGUIST 63N. Translation—(F,Sem) GER:DB-SocSci
3 units, Aut (Kay, M)

MANAGEMENT SCIENCE AND ENGINEERING

MS&E 92Q. International Environmental Policy—(S,Sem)
4 units, Win (Weyant, J)

MS&E 93Q. Nuclear Weapons, Terrorism, and Energy—(S,Sem) GER:DB-EngrAppSci
3 units, Spr (Hecker, S)

MS&E 94Q. The Public Use and Misuse of Mathematics: How to Interpret Numbers as Used by Media and Politicians—(S,Sem)
3 units, Spr (May, M)

MATERIALS SCIENCE AND ENGINEERING

MATSCI 70N. Building the Future: Invention and Innovation with Engineering Materials—(F,Sem) GER:DB-EngrAppSci, Write-2
5 units, Spr (Bravman, J)

MATSCI 159Q. Japanese Companies and Japanese Society—(S,Sem) (Same as ENGR 159Q.) GER:DB-SocSci
3 units, Spr (Sinclair, R)

MATHEMATICS

MATH 80Q. Capillary Surfaces: Explored and Unexplored Territory—(S,Sem)
3 units, Win (Finn, R)

MATH 87Q. Mathematics of Knots, Braids, Links, and Tangles—(S,Sem)
3 units, Spr (Wieczorek, W)

MECHANICAL ENGINEERING

ME 10N. Form and Function of Animal Skeletons—(F,Sem) GER:DB-EngrAppSci
3 units, Win (Carter, D)

ME 13N. Redesigning the Human Experience—(F,Sem) GER:DB-EngrAppSci
3 units, Win (Leifer, L)

ME 16N. The Science of Flames—(F,Sem) GER:DB-EngrAppSci
3 units, Spr (Mitchell, R)

ME 18Q. Creative Teams and Individual Development—(S,Sem) GER:DB-EngrAppSci
3 units, Aut (Wilde, D)

ME 19N. Robotics—(F,Sem) GER:DB-EngrAppSci
3 units, Win (Niemeyer, G)

ME 24N. Designing the Car of the Future—(F,Sem) GER:DB-EngrAppSci
3 units, Aut (Gerdes, C)

MEDICINE

MED 70Q. Cancer and the Immune System—(S,Sem) Write-2
3 units, Spr (Negrin, R)

MED 86Q. Seeing the Heart—(S,Dial)
1-2 units, Win (McConnell, M)

MED 87Q. Women and Aging—(S,Sem) (Same as HUMBIO 87Q.)
5 units, Win (Winograd, C)

MED 88Q. Dilemmas in Current Medical Practice—(S,Sem)
3 units, Aut (Croke, J; Jones, H)

MED 108Q. Human Rights and Health—(S,Sem)
3 units, Win (Laws, A)

MED 120Q. Pathophysiology of Diseases of the Heart and Blood Vessels—(S,Sem)
3 units, Spr (Stertzer, S)

MICROBIOLOGY AND IMMUNOLOGY

MI 25N. Modern Plagues—(F,Sem) Write-2
3 units, Spr (Boothroyd, J)

MOLECULAR AND CELLULAR PHYSIOLOGY

MCP 100Q. The Hippocampus as a Window to the Mind—(S,Sem)
3 units, Spr (Madison, V)

MUSIC

MUSIC 11N. A View from the Podium: The Art of Conducting—(F,Sem) GER:DB-Hum
3 units, Aut (Cai, J)

MUSIC 11Q. The Allure of Chamber Music—(S,Sem) GER:DB-Hum
3 units, Win (Cohen, A)

MUSIC 13Q. Classical Music and Politics: Western Music in Modern China—(S,Sem) GER:DB-Hum, EC-GlobalCom
3 units, Spr (Cai, J)

MUSIC 14N. Women Making Music—(F,Sem) GER:DB-Hum, EC-Gender
3 units, Spr (Hadlock, H)

MUSIC 15N. The Role of Technology in the Arts—(F,Sem) GER:DB-Hum
3 units, Spr (Berger, J)

MUSIC 16N. Music, Myth, and Modernity: Wagner's Ring Cycle and Tolkien's *Lord of the Rings*—(F,Sem) GER:DB-Hum, EC-GlobalCom
3 units, Spr (Grey, T)

MUSIC 17N. The Operas of Mozart—(F,Sem) GER:DB-Hum
3 units, Win (Berger, K)

MUSIC 17Q. Perspectives in North American Taiko—(S,Sem) GER:DB-Hum, EC-AmerCul
4 units, Spr (Sano, S; Uyechi, L)

MUSIC 34N. The Work of Art as Noun and Verb—(F,Sem) GER:DB-Hum
4 units, Spr (Applebaum, M)

NEUROLOGY AND NEUROLOGICAL SCIENCES

NENS 66Q. The Diseased Brain: Multiple Sclerosis as a Model of Neurological Illness—(S,Sem) Introduction to medical neuroscience through multiple sclerosis. Examination of gross and microscopic specimens of normal and diseased human brains; diagnostic test procedures; diagnostic reasoning processes leading to identification of illnesses; and the medical, social, and psychological dimensions of living with chronic illness and disability. Patient interviews and demonstrations of neurodiagnostic procedures such as electroencephalography (EEG), electromyography (EMG), cerebrospinal fluid analysis, and magnetic resonance imaging (MRI). Recommended: background in biological sciences.
3 units, Win (Dorfman, L)

NENS 67N. Intracellular Trafficking and Neurodegeneration—(S,Sem) Cell structures and functions, the intracellular trafficking system that maintains exchanges of materials and information inside cells, and clinical features and pathologies of neurodegenerative diseases. Techniques for examining cellular and subcellular structures, especially cytoskeletons; functional insights generated from structural explorations. Prerequisite: high school biology.
3-5 units, Spr (Yang, Y)

OBSTETRICS AND GYNECOLOGY

OBGYN 78Q. Darwin's Evolution and Genomic Revolution—(S,Sem)
3 units, Win (Hsueh, A)

ORTHOPEDIC SURGERY

ORTHO 97Q. Sport, Exercise, and Health: Exploring Sports Medicine—(S,Sem) (Same as HUMBIO 97Q.) Write-2
3 units, Aut, Spr (Matheson, G)

PATHOLOGY

PATH 103Q. Lymphocyte Migration—(S,Dial)
1 unit, Aut (Michie, S)

PATH 105Q. Final Analysis: The Autopsy as a Tool of Medical Inquiry—(S,Sem)
3 units, Spr (Regula, D)

PEDIATRICS

PEDS 111Q. Issues of Race and Ethnicity in the Health of Children—(S,Sem) Medicine and pediatrics from a public-health, evidence-based perspective. How research methods unmask health issues for at-risk racial and ethnic groups of children. Determinants of health with regard to race and ethnicity and ideas for changes in public policy. Students identify an area of interest and proposed intervention.
3-4 units, Spr (Burgos, A)

PHILOSOPHY

PHIL 12N. Mortal Questions—(F,Sem) GER:DB-Hum
3 units, Aut (Burgess, A)

PHIL 14N. Belief—(F,Sem) GER:DB-Hum
3 units, Win (Lawlor, K)

PHIL 16N. Values and Objectivity—(F,Sem) GER:DB-Hum
3 units, Aut (Ryckman, T)

PHIL 17N. The Logic of Social Justice—(F,Sem) GER:DB-SocSci
3 units, Win (Pauly, M)

PHYSICS

PHYSICS 41N. Mechanics: Insights, Applications, and Advances—(F,Sem)
1 unit, Win (Abel, T)

PHYSICS 43N. Understanding Electromagnetic Phenomena—(F,Sem)
1 unit, Spr (Drell, P)

PHYSICS 83N. Physics in the 21st Century—(F,Sem) GER:DB-NatSci
3 units, Win (Dimopoulos, S)

PHYSICS 84Q. The Rise of Machines—(S,Sem)
3 units, Spr (Schindler, R)

PHYSICS 87N. The Physics of One: Nanoscale Science and Technology—(F,Sem) GER:DB-NatSci
3 units, Win (Manoharan, H)

POLITICAL SCIENCE

POLISCI 16N. Politics of Economic Development—(F,Sem) GER:DB-SocSci, Write-2
5 units, Spr (Tomz, M)

POLISCI 33Q. Legal Craft and Moral Intuitions—(S,Sem) (Same as LAW 107Q.) GER:DB-SocSci, EC-EthicReas
4 units, Win (Kelman, M)

POLISCI 35Q. Food and Politics—(S,Dial)
2 units, Win (Reich, R)

POLISCI 43N. Oil, Regime Change, and Conflict—(S,Sem)
5 units, Aut (Karl, T)

POLISCI 44N. Everyday Political Life in the Authoritarian Middle East—(F,Sem)
5 units, Aut (Blaydes, L)

POLISCI 45N. Civil War Narratives—(F,Sem) GER:DB-SocSci
5 units, Win (Laitin, D)

PORTUGUESE LITERATURE

PORTLIT 193Q. Spaces and Voices of Brazil through Films—(S,Sem)
3-4 units, Aut (Wiedemann, L)

PSYCHIATRY

PSYC 72Q. Traumatic Stress—(S,Sem) Effects of traumatic events; interventions to alleviate their psychosocial impact. Events include natural disasters, illness, interpersonal violence, war, the Holocaust, and terrorism. Resilience factors that protect individuals from adverse effects. Oral and multimedia presentation. Write-2
3 units, Spr (Koopman, C)

PSYC 76Q. Temperament and Creativity in Mood Disorders—(S,Sem) Western cultural notions of mad geniuses and artistic temperaments. How many individuals who suffer from depression, bipolar disorder, and related problems are nonetheless productively creative. Current psychological and neurobiological research, and assessment of mood, temperament, and creativity. Emphasis is on written and oral communications and multimedia presentations. Write-2
4 units, Win (Ketter, T)

PSYC 78Q. Mental Health in Collegiate Athletes—(S,Sem) Developmental, social, and performance issues in collegiate sports. Topics include transition to Stanford, time management, coping with injuries.
3 units, Win (Steiner, H; Denny, K)

PSYC 111Q. Madness and the Womb: Mental Illness in Women through the Centuries—(S,Sem) Historical and current concepts of mental illness in women. Premenstrual dysphoric disorder (PMS), postpartum depression, menopausal mood disorders, and eating disorders. Historical biopsychosocial approach. Readings include women's diaries and advice books, physicians' casebooks, and 19th- and 20th-century medical texts. Guest speakers from art and literature departments. Literary and artistic images, and the social and cultural contexts of these disorders during the last 300 years.
3 units, Win (Rasgon, N; Williams, K)

PSYCHOLOGY

PSYCH 8N. Life Span Development—(F,Sem) GER:DB-SocSci
3 units, Spr (Carstensen, L)

PSYCH 12N. Self Theories—(F,Sem) GER:DB-SocSci
3 units, Aut (Dweck, C)

PSYCH 16N. Amines and Affect—(F,Sem) GER:DB-SocSci
3 units, Win (Knutson, B)

PSYCH 17N. Language and Society: How Languages Shape Lives—(F,Sem) GER:DB-SocSci
3 units, Aut (Boroditsky, L)

PSYCH 18N. Early Social Cognitive Development—(F,Sem) GER:DB-SocSci
3 units, Spr (Johnson, S)

RELIGIOUS STUDIES

RELIGST 5N. Three Sacred Stories of Judaism, Christianity, and Islam—(F,Sem) GER:DB-Hum, EC-GlobalCom
3-4 units, Aut (Gregg, R)

RELIGST 7N. The Divine Good: Secular Ethics and Its Discontents—(F,Sem) GER:DB-Hum, EC-EthicReas
4 units, Win (Sockness, B)

RELIGST 8N. Francis of Assisi: An Exemplary Saint—(F,Sem) GER:DB-Hum
3 units, Aut (Gelber, H)

SCIENCE, TECHNOLOGY, AND SOCIETY

STS 101Q. Technology in Contemporary Society—(S,Sem) GER:DB-SocSci
4 units, Aut (McGinn, R)

SLAVIC GENERAL

SLAVGEN 13N. Russia and the Russian Experience—(F,Sem) GER:DB-Hum
3-4 units, Win (Schupbach, R)

SLAVGEN 77Q. Russia's Weird Classic: Nikolai Gogol—(S,Sem) GER:DB-Hum
3-4 units, Aut (Fleishman, L)

SOCIOLOGY

SOC 15N. The Transformation of Socialist Societies—(F,Sem) GER:DB-SocSci, EC-GlobalCom
3 units, Win (Tuma, N)

SOC 22N. The Roots of Social Protest—(F,Sem) GER:DB-SocSci
3 units, Aut (Olzak, S)

SOC 45Q. Understanding Race and Ethnicity in American Society—(S,Sem) GER:DB-SocSci
5 units, Aut (Snipp, C)

SOC 46N. Race, Ethnic, and National Identities: Imagined Communities—(F,Sem) GER:DB-SocSci
3 units, Spr (Rosenfeld, M)

SPANISH LITERATURE

SPANLIT 101N. Visual Studies and Chicana/o Art—(F,Sem) GER:DB-Hum, EC-AmerCul
3-5 units, Spr (Yarbro-Bejarano, Y)

SPANLIT 104N. Race and Slavery in Literature of the 19th-Century Spanish Empire—(F,Sem) GER:EC-GlobalCom
3-4 units, Aut (Surwillo, L)

SPANLIT 108Q. Latin American Cinema: Politics and Aesthetics—(S,Sem) GER:DB-Hum
3-4 units, Win (Ruffinelli, J)

SPANLIT 114N. Lyric Poetry—(F,Sem)
3-5 units, Spr (Predmore, M)

SPANLIT 119N. Buenos Aires, Havana, Mexico City: Modernism and the Latin American City—(F,Sem)
3 units, Win (Gallo, R)

SPANLIT 178N. *Del Otro Lado:* Latina/o Performance Art in the U.S.—(F,Sem) (Same as DRAMA 17N.) GER:DB-Hum, EC-AmerCul
3 units, Win (Moraga, C)

SPECIAL LANGUAGE PROGRAM

SPECLANG 198Q. Modern Greece in Film and Literature—(S,Sem) GER:DB-Hum, EC-GlobalCom
3-5 units, Aut (Prionas, E)

STATS 43N. Displaying Data: Principles, Computer Graphics, and the Internet—(F,Sem) GER:DB-Math
3 units, Spr (Walther, G)

STATISTICS

STATS 47N. Breaking the Code?—(F,Sem) GER:DB-Math
3 units, Spr (Holmes, S)

SURGERY

SURG 67Q. Medical Experience in Foreign Lands—(S,Sem)
3 units, Win (Wang, N; Laub, D)

SURG 68Q. Current Concepts in Transplantation—(S,Sem) Write-2
3 units, Spr (Martinez, O; Krams, S)

SURG 69Q. It's All in the Head: Understanding Diversity, Development, and Deformities of the Face—(S,Sem) Write-2
3-4 units, Win (Helms, J; Brugmann, S)

FRESHMAN DEAN'S OFFICE

Assistant Vice Provost and Dean of Freshmen and Transfer Students: Julie Lythcott-Haims
Offices: Sweet Hall, 1st floor and basement
Phone for freshmen and transfer students: (650) 723-7674
Phone for parents: (650) 725-0649
Email: frosh@stanford.edu
Web Site: http://frosh.stanford.edu/

The Freshman Dean's Office welcomes and integrates freshmen into Stanford from acceptance of admission through the end of the first undergraduate year. It addresses students' individual transitional needs, connects students to resources and opportunities, and cultivates an understanding of Stanford's history and traditions. The office is also a resource for transfer students and parents.

INTRODUCTION TO THE HUMANITIES PROGRAM

Director: Russell A. Berman
Associate Director: Ellen Woods
Affiliated Faculty: Shahzad Bashir (Religious Studies), Carl Bielefeldt (Religious Studies), Chris Bobonich (Philosophy), Philippe Buc (History), Scott Bukatman (Art History), Eamonn Callan (Education), Charitini Douvaldzi (German Studies), Dan Edelstein (French and Italian), Shelley Fisher Fishkin (English), Charlotte Fonrobert (Religious Studies), Hans Ulrich Gumbrecht (Comparative Literature), Robert Harrison (French and Italian), Linda Hess (Religious Studies), Ian Hodder (Archaeology and Anthropology), Nadeem Hussain (Philosophy), Rachel Jacoff (French and Italian), Joshua Landy (French and Italian), Helen Longino (Philosophy), Henry Lowood (University Libraries, German Studies), Richard Martin (Classics), Marsh H. McCall, Jr. (Classics), Robert Proctor (History), Alice Rayner (Drama), Jessica Riskin (History), Eric Roberts (Computer Science), Rob Robinson (German Studies), Janice Ross (Drama), Gabriela Safran (Slavic Languages and Literatures), Debra Satz (Philosophy and Ethics in Society), Thomas Sheehan (Religious Studies), Jennifer Summit (English), Kenneth Taylor (Philosophy), Blakey Vermeule (English), Barbara Voss (Archaeology and Anthropology), Amir Weiner (History), Bryan Wolf (Art and Art History), Tobias Wolff (English), Lee Yearley (Religious Studies)
Lecturers: Ahmed Alwishah, Jennifer Barker, Magdalena Barrera, Rashida Braggs, Mia Bruch, Sarah Cervenak, Kathleen Coll, Kirsti Copeland, Tomas Crowder, Jon Daenke, Gary Devore, Bo Earle, Michael Feola, Sabrina Ferri, Marisa Galvez, Melissa Ganz, Gillian Goslinga, Philip Horky, Martha Kelly, Joann Kleinner, Laura Maguire, Kathryn Mathers, Christine McBride, Molly McCarthy, Michael McFall, Zena Meadowsong, Daniel Medin, Martina Meyer, Suzanne Miller, Alice Petty, Stephen Puryear, Jennifer Rapp, Laurel Scotland-Stewart, Dana Sherry, Maya Soifer, Melissa Stephenson, Kathleen Tierny, David Walter, Gabriel Wolfenstein, Huseyin Yilmaz
Department Offices: Building 250, Room 251E
Mail Code: 94305-2020
Department Phone: (650) 723-0944
Email: ihumprogram@stanford.edu
Web Site: http://ihum.stanford.edu

Courses given in Introduction to the Humanities Program have the subject code IHUM. For a complete list of subject codes, see Appendix.

Introduction to the Humanities offers courses which satisfy a three quarter General Education Requirement (GER) for first-year students. The purpose of the Introduction to the Humanities (IHUM) requirement is to build an intellectual foundation in the study of human thought, values, beliefs, creativity, and culture. Introduction to the Humanities courses enhance skills in analysis, reasoning, argumentation, and oral and written expression, thus helping to prepare students for more advanced work in the humanities, and for work in other areas.

The IHUM requirement may be satisfied in two ways:

Introduction to the Humanities courses—a one quarter, interdisciplinary course followed by a two quarter, course sequence.

The Program in Structured Liberal Education—a three quarter, residence-based program; see below or see the "Structured Liberal Education" section of this bulletin.

COURSES

Students enrolled in Introduction to the Humanities courses satisfy the first-year requirement by pairing a one quarter interdisciplinary course in Autumn Quarter with a two quarter sequence in Winter and Spring quarters. The Autumn Quarter courses develop skills in humanistic disciplines through close reading and critical investigation of a limited number of works as preparation for further work in the humanities and, specifically, for any one of the Winter-Spring sequences.

AUTUMN

IHUM 46. Visions of Mortality—Anyone reading this is alive, and so must someday die. Issues arising from these facts of life and death beginning with the most fundamental questions arising from first-person confrontation with thoughts of one's own mortality. Is death bad for a person, and if so, why? What can the badness or the indifference of death tell us about what makes life good? If death is the permanent end of existence, does this make human choices arbitrary, and life meaningless? GER:IHUM-1

4 units, Aut (Bobonich, C; Safran, G)

IHUM 48. The Art of Living—The fundamental choice of deciding what is valuable to a person and how to live one's life: a life of reason and knowledge, of faith and discipline, of nature and freedom, of community and altruism, or of originality and style. How it is possible to live well and beautifully, what it takes to implement these ways of living, and what happens when they come under pressure from inside and out. GER:IHUM-1

4 units, Aut (Landy, J; Taylor, K; Douvaldzi, C)

IHUM 57. Humans and Machines—Shifting boundaries between mechanical and human: how humans interact with machines, and how they may be conceived, designed, and manipulated as machines; how machines in turn reflect upon their human creators. What it means to think of the human body as a machine or as not a machine: what is a machine; what forms can machinery take; what is a living body; what have concepts such as machine, human, alive, and intelligent meant in different times and places; and how have their meanings changed? GER:IHUM-1

4 units, Aut (Lowood, H; Bukatman, S; Riskin, J)

IHUM 58. Technological Visions of Utopia—How changes since Thomas More's *Utopia* was written, including advances in science and technology, have opened new possibilities for the good society. Focus is on works that consider how literary visions of society have evolved with the progress of science and technology. Readings include More and technologically determined visions of the late 20th century. GER:IHUM-1

4 units, Aut (Roberts, E; Robinson, O)

IHUM 60. Sex: Its Pleasures and Cultures—How the pleasures of sex have been shaped. Focus is on enjoyment more than dangers and hygiene. Historical relativity in forms of sexual pleasure; theories contrasting stable biological dispositions with changing contexts of sexual forms; legitimate and illegitimate forms of sexuality, past and present; and whether there is a need for restraints to sexual behavior that cross historical boundaries. Multiple forms of sexual pleasure. Concepts and images from different cultural traditions. GER:IHUM-1

4 units, Aut (Gumbrecht, H; Fonrobert, C)

IHUM 63. Freedom, Equality, Difference—Which freedoms should a just society promote and which should be curtailed for the sake of justice? What equalities properly concern government and how can the achievement of equality be reconciled with respect for freedom? What roles should social and political institutions take in guaranteeing freedom and equality? Focus is on interdisciplinary inquiry including political philosophy, education, literature, history, and law. Abstract ideas and case histories, using one to shed light on the other. GER:IHUM-1

4 units, Aut (Callan, E; Satz, D)

IHUM 64. Journeys—Works spanning 2,300 years, diverse cultural and historical situations, and different forms and genres, which present essential aspects of the journey from birth to death. These texts trace moral, spiritual, and emotional passages within that one great journey, passages that challenge and transform people as they advance toward what poet Thomas Gray called the inevitable hour. GER:IHUM-1

4 units, Aut (Wolff, T; Yearley, L)

IHUM 65. American Memory and the Civil War—The place of the war in American cultural memory; its representation in literature, visual arts, music, high art and popular culture, stage, and film. How the battle shifted from real to imagined locations. Themes include competing ideas of race and nation, freedom and citizenship, personal and collective identity, and the purpose of literature and the arts. The idea that the stories told by writers and artists are shaped by the role of the past in the times in which they live. GER: IHUM-1

4 units, Aut (Wolf, B; Fishkin, S)

WINTER-SPRING SEQUENCES

IHUM 2,3. Epic Journeys, Modern Quests—Two quarter sequence. Great religious, philosophical, and literary texts that have addressed timeless questions about human identity and the meaning of human life. Focus is on the epic tradition in the ancient and classical worlds and its transformations or abandonment in modernity. Compares conceptions of the afterlife. How traditions about the afterlife are created and appropriated. The diminished importance of the dead and increased emphasis on the power of the living in literary genres. GER:IHUM-2,3

IHUM 2: *4 units, Win (Harrison, R; Jacoff, R)*
IHUM 3: *4 units, Spr (Landy, J; Edelstein, D)*

IHUM 4A,B. Mass Violence from Crusades to Genocides—Two quarter sequence. The evolution, varieties, causes, and logic of mass violence in premodern and modern history; how mass violence shaped historical trends. What accounts for the persistence of mass violence in history? Do religions, ethnicity, and modernity foment or restrain mass violence? Is there a common pattern of mass violence thoughout the centuries? Geographic focus is Europe; comparisons with societies which the Europeans encountered such as the Aztec empire, the Islamic world, and the African colonies. GER:IHUM-2,3

IHUM 4A: *4 units, Win (Buc, P)*
IHUM 4B: *4 units, Spr (Weiner, A)*

IHUM 6A,B. World History of Science—Two quarter sequence. The broad sweep of global science, from the prehistoric roots of the oldest known technologies, the events of the Scientific Revolution, through recent triumphs in the physical and life sciences. History as unavoidably selective. How science transforms and is transformed by human engagements with technology, religion, art, politics, and moral values. GER:IHUM-2,3

IHUM 6A: *4 units, Win (Proctor, R)*
IHUM 6B: *4 units, Spr (Proctor, R)*

IHUM 23A,B. The Fate of Reason—Two quarter sequence. The historical fate of Socrates' proposal that only reason can provide answers to questions of what to believe and how to act. The fate of reason in cultural contexts including medieval Christian, Islamic, and Jewish. Themes include free will, personal identity, the authority of morality, and the tension between reason as power for improving life and as insufficient means for reaching important truths. GER:IHUM-2,3

IHUM 23A: *4 units, Win (Hussain, N)*
IHUM 23B: *4 units, Spr (Longino, H)*

IHUM 25A,B. Art and Ideas—Two quarter sequence. Issues in aesthetics and performance through examples from the classical age to the present. Concepts of art and practice intersecting with topics such as imitation, instruction through pleasure, the creative process, perception, social analysis, and embodiment as a form of knowledge. Texts and performances from drama, dance, music, visual arts, and performance art practices that reflect aesthetic ideas. GER:IHUM-2,3

IHUM 25A: *4 units, Win (Ross, J)*
IHUM 25B: *4 units, Spr (Rayner, A)*

IHUM 34A,B. A Life of Contemplation or Action? Debates in Western Literature and Philosophy—Two quarter sequence. Literary treatments of the debate over the active versus the contemplative life from the classical to the modern era. Changing literary, historical and philosophical contexts. GER:IHUM-2,3

IHUM 34A: *4 units, Win (Summit, J)*
IHUM 34B: *4 units, Spr (Vermeule, B)*

IHUM 39A,B. Inventing Classics: Greek and Roman Literature in Its Mediterranean Context—Two quarter sequence. The ancient Mediterranean world was as consumed with questions about the nature of human society and human existence as is present-day society. Sources include influential literary texts from Greece and Rome, and from other cultures in the Mediterranean and the Near East, organized by literary genre. The origins of such genres. GER:IHUM-2,3

IHUM 39A: *4 units, Win (McCall, M)*
IHUM 39B: *4 units, Spr (Martin, R)*

IHUM 40A,B. World Archaeology and Global Heritage—Two quarter sequence. The impact of the past on the present, and of the present on the past: the role of the past in contemporary society, and of present-day archaeological research, management, and conservation in approaching the past. Topics include debates about the peopling of the New World, religious conflicts over heritage sites, and archaeology's roles in heritage and conflicts. Sources include archaeological sites, landscapes, architecture, objects, literary works, religious texts, films, political essays, and scientific articles. GER:IHUM-2,3

IHUM 40A: *4 units, Win (Hodder, I)*
IHUM 40B: *4 units, Spr (Voss, B)*

IHUM 68A,B. Approaching Religion—Two quarter sequence. Challenges facing the world's religions in responding to issues such as globalization, feminism, science, pluralism, and individualism. How Christianity, Islam, Hinduism, and Buddhism underwent transformations, grappling with the tension between making necessary changes and preserving tradition. Encounters between these religious traditions and the forces of contemporary social change. GER:IHUM-2,3

IHUM 68A: *4 units, Win (Sheehan, T; Bashir, S)*
IHUM 68B: *4 units, Spr (Hess, L; Bielefeldt, C)*

PROGRAM IN STRUCTURED LIBERAL EDUCATION

The Program in Structured Liberal Education (SLE) offers students an intensive, three quarter, residence-based learning experience, which satisfies the IHUM requirement, both of the University Writing and Rhetoric requirements, and the General Education Requirement in the Humanities.

For information on the program, see the "Structured Liberal Education" section below.

OVERSEAS STUDIES PROGRAM

Program Director: Norman Naimark

Stanford Program in Australia
Director, Centre for Marine Studies, University of Queensland: Ove Hoegh-Guldberg
Faculty: Kevin Arrigo, Kenneth Anthony, Bill Casey, Tony Chiffings, Martin Crotty, Sophie Dove, Norman Duke, John Hall, Ron Johnstone, Davey Kline, Selina Ward

Stanford Program in Beijing
Director: Xiaohong Shen
Faculty: Pamela Hinds, Michael Klausner, Chongfeng Li, Dashu Wang, Shizhou Wang, Dongmei Zhao, Li'an Zhou, Yun Zhou

Stanford Program in Berlin
Director: Karen Kramer
Faculty: Maria Biege, Ulrich Brückner, Knut Ebeling, Dubravka Friesel-Kopecki, Martin Jander, Wolf-D. Junghanns, Ingo Klein, Christa Maerker, Matthias Pabsch, William Petig, Maurice Rehm, Janice Ross, Jari Splettstoesser, Sylke Tempel, Jochen Wohlfeil

Stanford Program in Florence
Director: Ermelinda Campani
Faculty: Khaled Fouad Allam, Laurence Baker, Paolo Galluzzi, Terry Karl, Charles Loverme, Giuseppe Mammarella, Alberto de Minin, Laurence Morel, Leonardo Morlino, Lapo Pistelli, Fiorenza Quercioli, Roger Romani, Filippo Rossi, Emanuela Scarpellini, Timothy Verdon, Luisa Vierucci

Stanford Center for Technology and Innovation (SCTI)—Kyoto
Director: Terry MacDougall
Faculty: Toshihiko Hayashi, Bettina Langner-Teramoto, Kären Wigen

Stanford Program in Madrid
Director: Santiago Tejerina-Canal
Faculty: Herbert Klein, Michael Predmore

Stanford Program in Moscow

Program Director: Alexander Abashkin

Faculty: Tatyana Boldyreva, Galina Filatova, David Holloway, Valeriya Kilpyakova, Liza Kurganova, Vladimir Mau, Dmitri Trenin, Olga Zinovieva

Stanford Program in Oxford

Director: Geoffrey Tyack

Faculty: Stephen Barley, Paddy Bullard, Giovanni Cappocia, Helena Chance, James Forder, Sara Hobolt, Ashley Jackson, Barbaro Martinez-Ruiz, Robert McMahon, Amanda Palmer, Emma Plaskitt, Richard Rowley, Bart van Es, Steven Zipperstein

Stanford Program in Paris

Director: Estelle Halevi

Faculty: Colette Deremble, Jean Paul Deremble, John Ferejohn, Jean-Marie Fessler, Sonia Gourevitch, Patrick Guedon, Laurent Habert, Sylvain Kahn, Jan Keppler, Eloi Laurent, Jacques Le Cacheux, Benoit Leguet, Carolyn Lougee-Chappell, Nonna Mayer, Florence Mercier, Marie-Madeleine Mervant-Roux, Elizabeth Molkou, Anne Muxel, Julie Parsonnet, Christian de Perthuis, Pauline Reychman, Françoise Rullier, Sylvie Strudel, Fabrice Virgili

Stanford Program in Santiago

Director: Iván Jaksic

Faculty: Mabel Abad, César Albornoz, Andrés Bobbert, Ignacio Briones, Sergio Castro, Germán Correa, Celia Cussen, Claudio Fuentes, Elizabeth Hadly, Maria-Paz Haro, Tamar Herzog, Sergio Micco, Sergio Missana, Oscar Muñoz, Alvaro Palma, Hernan Pons, Jennie Popp, Bernardo Subercaseaux, Teresa Valdés

Program Offices: First Floor, Sweet Hall, 590 Escondido Mall
Mail Code: 94305-3089
Phone: (650) 723-3558
Email: study@osp.stanford.edu
Web Site: http://osp.stanford.edu

Courses given in the Overseas Studies Program have subject codes beginning with OSP. For a complete list of subject codes, see Appendix.

The Bing Overseas Studies Program (BOSP) provides opportunities for Stanford students to broaden their undergraduate education through study in another country and immersion in its culture. Regular programs in Australia, Beijing, Berlin, Florence, Kyoto, Madrid, Moscow, Oxford, Paris, and Santiago offer courses in engineering, humanities, sciences, and social sciences with full Stanford credit. Many courses also count toward major requirements and/or fulfill General Education Requirements. Students may enroll for one or more quarters at most locations. Academic or paid internships are available at the Berlin, Florence, Kyoto-SCTI, Moscow, and Paris programs. Research opportunities are available in various formats at different centers. Minimum academic and language prerequisites are specific to each program. See http://osp.stanford.edu for information on these requirements.

While studying overseas through BOSP, students remain registered at Stanford and pay regular tuition, along with the overseas fee, which is based on Stanford room and board rates. Regular financial aid applies, and may be increased to cover additional costs. At most centers, students live in a homestay or with local students.

Overseas Studies also offers a limited number of special programs including, in 2007-08, eight three-week faculty-led seminars at overseas locations and a quarter-long program in Cape Town, South Africa.

Overseas Studies, located on the first floor of Sweet Hall, has full-time staff members and student advisers to assist in planning for overseas study. The following information, while accurate at the time of printing, is subject to change. See http://osp.stanford.edu/ for updated information.

COURSES

AUSTRALIA

OSPAUSTL 10. Coral Reef Ecosystems—Key organisms and processes, and the complexity of coral reef ecosystems. Students explore the Great Barrier Reef from the southern end which demonstrates the physical factors that limit coral reefs, to the northern reef systems which demonstrate key aspects of these high biodiversity ecosystems. Human-related changes. Emphasis is on research experiences and development of analytical skills. Two units only counted for Biological Sciences major. GER:DB-EngrAppSci

3 units, Aut (Hoegh-Guldberg, O; Ward, S; Arrigo, K; Anthony, K)

OSPAUSTL 20. Coastal Resource Management—Problem solving, research, communication, teamwork, and social assessment skills in sustainable coastal zone management. Issues include: ecosystem functions and values at risk under the proposed development in case study; environmental outcomes most desirable for the local stakeholders and how those are defined; features of the human communities and their function as they relate to the management options; tools or mechanisms for a sustainable management outcome. Taught by multidisciplinary team that includes Australian and developing country experts. Two units only counted for Biological Sciences major. GER:DB-EngrAppSci

3 units, Aut (Johnstone, R; Chiffings, T)

OSPAUSTL 30. Coastal Forest Ecosystems—Prehistory of Australian rainforest and how rainforest structure and biodiversity change with altitude, latitude, and geology. Tropical coastal marine wetlands, mangrove forests, and the relationship between land- and sea-based biota. Biology and ecology of marine plants, mangroves, and tropical salt marsh. Introduction to specialized fields of marine plant biology and ecology including biogeography and evolution, aquatic plant ecophysiology, water quality and bioindicator techniques, pollution and eutrophication, and environmental control of marine plant distribution and productivity. Two units only counted for Biological Sciences major. GER:DB-EngrAppSci

3 units, Aut (Hall, J; Duke, N)

OSPAUSTL 40. Australian Studies—Introduction to Australian society, history, culture, politics, and identity. Social and cultural framework and working understanding of Australia in relationship to the focus on coastal environment in other program courses. Field trips. GER:DB-SocSci, EC-GlobalCom

3 units, Aut (Crotty, M)

OSPAUSTL 50. Targeted Research Project—Prior to arriving in Australia, students establish a link with University of Queensland faculty to develop project ideas that combine personal interests and career goals with opportunities presented by the Australian Coastal Studies program, such as how mangrove roots find sediment rich zones of the shore, or the dynamics of ecotourism in southern and northern coastal Queensland. Project report and presentation in Australia.

4 units, Aut (Hoegh-Guldberg, O)

BEIJING

OSPBEIJ 13. China's Economy—Reform and opening policy; sources of economic growth; macroeconomic policy; WTO entry and growth in international trade; state and non-state sectors; growth and disparities of China's regions. Development of China's economy; insights into Chinese business customs and investment environment; analytical models for China's economy; effective strategies for doing business in China. GER:DB-SocSci, EC-GlobalCom

5 units, Aut (Wang, D)

OSPBEIJ 19. Population and Society in East Asia—Current demographic situation, and country differences. Emphasis is on China; attention to Japan and S. Korea. Relationship between social change and demographic change in the past. Factors influencing and influenced by fertility, mortality, and migration. Fertility control, the aging process, old age care, and migration. GER:DB-SocSci, EC-GlobalCom

4 units, Spr (Zhou, Y)

OSPBEIJ 26. Corporate Governance and the Privatization of Chinese Enterprises—Transition of state-owned enterprises to partial private ownership and the development of Chinese private-sector businesses. Governance of these enterprises and how investors are or are not protected. Corporate governance in other countries with similar challenges. Legal reform. Developments in the Chinese capital market that are driving the privatization process. Measures taken to mitigate the dislocation created by privatization. GER:DB-SocSci, EC-GlobalCom

5 units, Spr (Klausner, M)

OSPBEIJ 29. Economic Analysis of Property Rights and Contracts—U.S. legal and economic institutions as a conceptual foundation for studying China's transition to a market economy and the privatization of Chinese state-owned enterprises. Role of property rights in an economy; problems in economies with poorly defined property rights; protection of property rights. Economic forces leading to formation of a firm as opposed to market exchanges among individuals. Legal institutions facilitating the formation of firms. Protecting interests of investors. GER:DB-SocSci

5 units, Spr (Klausner, M)

OSPBEIJ 31. Buddhist Cave Temples of China—Cultural and artistic treasures. Topics: historiography and bibliography; early Buddhist remains, distribution, and periodization of the cave temples at Yunkang, Datong; types and dating of the cave temples at Kizil, Xinjiang; comparison with Buddhist cave temples of India. GER:DB-Hum

4 units, Aut (Li, C)

OSPBEIJ 33. Designing Products for the Chinese Context—Project course. Student teams examine contexts in which a product is or might be used in China. Methods for observing and interviewing users of a product in their local context; methods for representing collected data; prototyping and crosscultural considerations in design. Class designs a study, gathers data, and identifies principles to guide design. Interaction with local community.

4 units, Aut (Hinds, P)

OSPBEIJ 36. Globally Distributed Work—History of and strategic reasons for distributed work; challenges associated with geographic distance; time zone, language, and cultural differences; and implications of using collaboration technologies to work across national boundaries. Group dynamics, interpersonal relationships, structuring distributed work, working and leading effectively as a global team member. Field trips to international firms in China, and to meet with government officials about growth of global work in China and its policy implications. GER:EC-GlobalCom

4 units, Aut (Hinds, P)

OSPBEIJ 44. Discovering Modern Chinese History in Beijing—From 1840 to the present. Focus is on Beijing as China's political, economic, and cultural center. Latter part of the Qing dynasty as the root of China's backwardness and Chinese elites' initial efforts at self-strengthening; struggles of Chinese politicians and intellectuals to find a path to modernism; China's peaceful rise during the reform eras. Field trips to historical sites in Beijing. GER:DB-SocSci, EC-GlobalCom

4 units, Spr (Zhao, D)

OSPBEIJ 55. Chinese Economy in Transition—From planned regime to market economy: political economy and institutional aspects of China's economic transition and open-door policy. How can China achieve economic success given disadvantages in natural resources, human capital stock, and institutional arrangements? Theoretical economic analysis, empirical data, and case studies. Emergence of China as an economic superpower; major challenges ahead. GER:DB-SocSci, EC-GlobalCom

5 units, Spr (Zhou, L)

OSPBEIJ 66. Essentials of China's Criminal Justice System—Criminal laws and cases. Topics include criminal legal thinking, liability, prosecution and defense in criminal litigation, death penalty debates, evidence and compulsory measures, and the Chinese prison system. Comparisons with other systems. Human rights protection. GER:DB-SocSci, EC-GlobalCom

5 units, Aut, Spr (Wang, S)

CHINESE LANGUAGE PROGRAM

OSPBEIJ 3C. First-Year Modern Chinese

5 units, Spr (Staff)

OSPBEIJ 9. Chinese Language Tutorial

2 units, Spr (Staff)

OSPBEIJ 21C. Second-Year Modern Chinese

5 units, Aut (Staff)

OSPBEIJ 23C. Second-Year Modern Chinese

5 units, Spr (Staff)

OSPBEIJ 101C. Third-Year Modern Chinese

5 units, Aut (Staff)

OSPBEIJ 103C. Third-Year Modern Chinese

5 units, Spr (Staff)

OSPBEIJ 211C. Fourth-Year Modern Chinese

5 units, Aut (Staff)

BERLIN

OSPBER 11. The Vanishing City: Lost Architecture and the Art of Commemoration in Berlin—Berlin as archaeology of modernity and its lost utopias. The projection of new models simultaneous with destruction such as new Prussian, new fascist, new socialist, and new democratic Berlins. Field trips to sites including destroyed Prussian castles, Nazi buildings, and socialist architecture. Methods of visualizing what disappeared, deciphering what is left, and understanding what is new. GER:DB-Hum

4-5 units, Spr (Ebeling, K)

OSPBER 15. Shifting Alliances? The European Union and the U.S.—The development of European integration, a model for global security and peace, and a possible replacement for the U.S. position as unilateral superpower. Competing arguments about the state of transatlantic relations. GER:DB-SocSci, EC-GlobalCom

4-5 units, Win (Brückner, U)

OSPBER 17. Split Images: A Century of Cinema—20th-century German culture through film. The silent era, Weimar, and the instrumentalization of film in the Third Reich. The postwar era: ideological and aesthetic codes of DEFA, new German cinema, and post-Wende filmmaking including *Run Lola Run* and *Goodbye Lenin*. Aesthetic aspects of the films including image composition, camera and editing techniques, and relation between sound and image. GER:DB-Hum, EC-GlobalCom

4-5 units, Aut (Kramer, K)

OSPBER 23. Opera in Berlin—Students attend opera performances. Pre-attendance focus is on musical, historical, and cultural contexts; post-performance focus is on specifics of the production, performance, and interpretation. No knowledge of opera required. GER:DB-Hum

3-5 units, Aut (Rehm, R)

OSPBER 24. Greek Tragedy and German Culture: An Artistic Symbiosis—Relationship between ancient Greece and modern Germany, focusing on Greek tragedies and authors including Goethe, Schlegel, Hölderlin, Wagner, Nietzsche, Brecht, and Müller. Field trips to Berlin museums, including the Pergamon, the architectural work of Schinkel, and plays and operas. GER:DB-Hum

3-5 units, Aut (Rehm, R)

OSPBER 28. Art and Body Culture: Dance in Germany from Modernism to Fascism and Beyond—Interdisciplinary. History of the body and the sexual and national politics of artistic modernism between the wars. German body culture; its manifestation in dance and athletics. Link between the constructions of modern identity and the cultural and social uses of nudism, nude dancing, and gymnastics and dance photography. Field trips to German contemporary dance companies for performances. GER:DB-Hum, EC-Gender

4 units, Spr (Ross, J)

OSPBER 29. The Performance of Memory: Tourism of the Third Reich and Holocaust—How WW II has been memorialized in Germany emphasizing Berlin through historical walking, biking, and cultural tours in the city and its surroundings that have arisen since the fall of the Berlin Wall and the reunification of Germany. What happens when trauma becomes memorialized and turns the city into a participatory public theatre of memory? GER:DB-Hum, EC-GlobalCom
4 units, Spr (Ross, J)

OSPBER 30. *Berlin vor Ort*: A Field Trip Module—The cultures of Berlin as preserved in museums, monuments, and architecture. Berlin's cityscape as a narrative of its history from baroque palaces to vestiges of E. German communism, from 19th-century industrialism to grim edifices of the Sachsenhausen concentration camp.
1 unit, Aut (Jander, M), Win, Spr (Pabsch, M)

OSPBER 38. Research Module—For continuing students. Research under the guidance of a local specialist in libraries, archives, research institutes, and/or in the field. Prerequisite: GERGEN 177A.
3-4 units, Win, Spr (Kramer, K)

OSPBER 55. Filmed Experience: Berlin at Eye-Level—Students produce short documentary or experimental videos arising from experiences and course work in Berlin. Screenings of films made in Berlin to develop awareness of the practical side of filmmaking: narration; camera angles; editing; equipment; and shooting schedules. GER:DB-Hum
5 units, Spr (Maerker, C)

OSPBER 60. Cityscape as History: Architecture and Urban Design in Berlin—Diversity of Berlin's architecture and urban design resulting from its historical background. Architect Ludwig Mies van der Rohe and his artistic ancestors. Role of the cultural exchange between Germany and the U.S. Changing nature of the city from the 19th century to the present. GER:DB-Hum
4-5 units, Aut (Pabsch, M)

OSPBER 66. Theory from the Bleachers: Reading German Sports and Culture—German culture past and present through the lens of sports. Intellectual, societal, and historical-political contexts. Comparisons to Britain, France, and the U.S. The concepts of *Körperkultur, Leistung, Show, Verein,* and *Haltung*. Fair play, the relation of team and individual, production and deconstruction of sports heroes and heroines, and sports nationalism. Sources include sports narrations and images, attendance at sports events, and English and German texts.
3 units, Win (Junghanns, W)

OSPBER 67. Sissy Sits, Lola Runs: Gender Moves in German Movies—Gender representations in German cinema from the silent era to the present, East and West, in changing sociopolitical contexts. Gender roles and assumptions as part of the social fabric in all cultures. GER:DB-Hum, EC-Gender
5 units, Win (Kramer, K)

OSPBER 70. The Long Way to the West: German History from the 18th Century to the Present—Battles still current within Germany's collective memory. Sources include the narrative resources of museums, and experts on the German history in Berlin and Potsdam. Field trips. GER:DB-Hum
5 units, Spr (Jander, M)

OSPBER 83. World War II: Germany's Ever Present Past—The polarized political and discursive context of the post-WW I Weimar Republic, and how the National Socialists consolidated power, defined and attempted to eradicate inner and foreign enemies, and stabilized a system through terror and reward. The production for and of war, and the preparations for and implementation of the Holocaust. The politics of memory: how does Germany recall, explain, commemorate, mourn? GER:DB-SocSci, EC-GlobalCom
4-5 units, Win (Tempel, S)

OSPBER 101A. Contemporary Theater—Texts of plays are supplemented by the theoretical writings of the respective playwrights and background reading in theater history and theory. Weekly theater trips, a tour of backstage facilities, attendance at a rehearsal, and discussions with actors, directors, or other theater professionals. In German. GER:DB-Hum
5 units, Spr (Kramer, K)

OSPBER 115X. The German Economy: Past and Present—The history of the German economy in: the Wilhelmine Empire, the Weimar Republic, the Third Reich, the postwar real socialism of the GDR, and the free market economy of the FRG. The processes of economic transition since unification and the current challenges faced by united Germany as Europe's first economic power and the world's second largest export nation. GER:DB-SocSci, EC-GlobalCom
4-5 units, Aut (Klein, I)

OSPBER 126X. A People's Union? Money, Markets, and Identity in the EU—The institutional architecture of the EU and its current agenda. Weaknesses, strengths, and relations with partners and neighbors. Discussions with European students. Field trips; guest speakers. GER:DB-SocSci, EC-GlobalCom
4-5 units, Aut (Brückner, U)

OSPBER 161X. The German Economy in the Age of Globalization—Germany's role in the world economy: trade, international financial markets, position within the European Union; economic relations with Eastern Europe, Russia, the Third World, and the U.S. International aspects of the economic and environmental policies of the Red-Green Coalition Government. The globalization of the world's economy and Germany's competitiveness as a location for production, services, and R&D, focusing on the German car industry. GER:DB-SocSci, EC-GlobalCom
4-5 units, Win (Klein, I)

OSPBER 174. Sports, Culture, and Gender in Comparative Perspective—Theory and history of mass spectator sports and their role in modern societies. Comparisons with U.S., Britain, and France; the peculiarities of sports in German culture. Body and competition cultures, with emphasis on the entry of women into sports, the modification of body ideals, and the formation and negotiation of gender identities in and through sports. The relationship between sports and politics, including the 1936 Berlin Olympic Games. GER:DB-SocSci, EC-Gender
5 units, Spr (Junghanns, W)

GERMAN LANGUAGE PROGRAM

OSPBER 1Z. Accelerated German: First and Second Quarters—A jump start to the German language, enabling students with no prior German to study at the Berlin Center. Covers GERLANG 1 and 2 in one quarter.
8 units, Aut (Wohlfeil, J; Splettstoesser, J), Win (Wohlfeil, J)

OSPBER 2Z. Accelerated German, Second and Third Quarters—Qualifies students for participation in an internship following the study quarter. Emphasis is on communicative patterns in everyday life and in the German work environment, including preparation for interviews.
8 units, Spr (Wohlfeil, J)

OSPBER 21B. Intermediate German—Grammar review, vocabulary building, writing, and discussion of German culture, literature, and film. Corequisite: OSPBER 100B.
5 units, Aut, Win (Friesel, D), Spr (Petig, W)

OSPBER 100B. *Aktives Deutsch*—Required for students enrolled in 21B; open to students in 101B. Active use of German, including vocabulary from a variety of fields and disciplines, and discussion of current issues.
2 units, Aut (Friesel, D), Win, Spr (Splettstoesser, J)

OSPBER 101B. *Sprache und Stadt*: Advanced German—German language skills for intermediate and advanced students. Focus on Berlin through film, literature, music, live performance, new media, and on-site visits. Essay writing, vocabulary building and in-class presentations.
5 units, Aut, Win, Spr (Biege, M)

ON VIDEOTAPE

OSPBER 40B. Introductory Electronics—See ENGR 40 for course description. GER:DB-EngrAppSci
5 units, Aut, Win (Howe, R), Spr (Wong, S)

OSPBER 50B. Introductory Science of Materials—See ENGR 50 for course description. GER:DB-EngrAppSci
4 units, Aut, Win, Spr (Staff)

FLORENCE

OSPFLOR 19. Political Institutions and the Language of Politics: A Comparative Study of Italy and the U.S.—Changes in the structure of polity, decision making, and communication in Italy as a result of political transition beginning with Tangentopoli in early 90s; corresponding similarities in American politics. Comparative analysis of the Italian political system. Political communication: how the media has been historically used within the political context; footage from political campaigns; the effects of the media on the respective political systems. GER:DB-SocSci
4 units, Spr (Pistelli, L)

OSPFLOR 20. Health Care Policy and Reforms in the Italian Health Care System—Principles of health care system design; examples from Italy, other European systems, and the U.S. Central goals of health care systems and the demographic, economic, and related challenges facing these systems in modern industrialized countries. Tradeoffs between public sector and private sector approaches; financing issues; and design of methods for health care delivery. Economic concepts with themes from sociology, political science, demography, and related disciplines. GER:DB-SocSci, EC-GlobalCom
4 units, Aut (Baker, L)

OSPFLOR 33. The Americanization of Italy—How cultural and social patterns from the U.S. shape everyday life in contemporary Italy. Popular culture and consumer culture as vehicles of penetration; role of supermarkets, malls, and new patterns of consumption. Are American models accepted or changed according to Italian culture? How global and local interact in this cultural encounter. GER:DB-SocSci
4 units, Win (Scarpellini, E)

OSPFLOR 34. The Woman in Florentine Art—Influence and position of women in the history of Florence as revealed in its art. Sculptural, pictorial, and architectural sources from a social, historical, and art historical point of view. Themes: the virgin mother (middle ages); the goddess of beauty (Botticelli to mannerism); the grand duchess (late Renaissance, Baroque); the lady, the woman (19th-20th centuries). GER:DB-Hum, EC-Gender
4 units, Aut (Verdon, T)

OSPFLOR 36. Introduction to the International Economy: The State, the Firm and the Region—Institutions, mechanisms, and development of the modern global economy. Contradictions and challenges of international markets; opportunities and threats for companies, regions, and nations. Macro perspective on international markets and nations; micro view on small and large multinational corporations; meso dimension on the role of regions and territories in the global economy. GER:DB-SocSci, EC-GlobalCom
5 units, Spr (Di Minin, A)

OSPFLOR 39. Envisioning Rights: Europe and America—Notions of human rights, emphasizing Europe's role, since WW II period. Comparison of European and American approaches; institutions unique to Europe; transitional justice; and Italian issues, including theft and restitution of art, discrimination against immigrants and women, and freedom of expression. Conflict between U.S. and Europe over renditions, torture, and U.S. policies towards unlawful combatants. GER:DB-SocSci
5 units, Win (Karl, T)

OSPFLOR 40. In the Footsteps of Galileo—Primarily for non-technical students. Impact of the telescope on the cosmic worldview from its first astronomical application by Galileo to modern cosmology. Cosmos of antiquity and the Copernican revolution. Galileo's astronomical discoveries. Development of the telescope and the attendant push-back of the cosmic horizon. Modern telescopes and current questions such as the fate of the cosmos, the origin of black holes, and the possibility of extrasolar life; how telescopes may help in obtaining answers. GER:DB-NatSci
4 units, Spr (Romani, R)

OSPFLOR 41. The Contemporary Art Scene in Tuscany: Theory and Practice—The ever-changing and multifaceted scene of contemporary art through visual and sensorial stimulation. How art is thought of and produced in Italy today. Hands-on experience. Sketching and exercises on-site at museums and exhibits, plus workshops on techniques.
3-5 units, Aut (Rossi, F)

OSPFLOR 42. Academic Internship—Mentored internships in banking, education, the fine arts, health, media, not-for-profit organizations, publishing, and retail. May be repeated for credit.
1-5 units, Win, Spr (Campani, E)

OSPFLOR 44. The Revolution in Science: Galileo and the Birth of Modern Scientific Thought—Galileo's life and scientific progress starting from his student years at the University of Pisa. Departure from traditional natural philosophy leading to radical reformation of cosmology and physics, emphasizing the science of motion. His innovative use of observation and measurement instruments, emphasizing the telescope. Cultural and social context. GER:DB-Hum
5 units, Win (Galluzzi, P)

OSPFLOR 48. Sharing Beauty: Florence and the Western Museum Tradition—The city's art and theories of how art should be presented. The history and typology of world-class collections. Social, economic, political, and aesthetic issues in museum planning and management. Collections include the Medici, English and American collectors of the Victorian era, and modern corporate and public patrons. GER:DB-Hum
4 units, Win (Rossi, F; Verdon, T)

OSPFLOR 49. The Cinema Goes to War: Fascism and World War II as Represented in Italian and European Cinema—Structural and ideological attributes of narrative cinema, and theories of visual and cinematic representation. How film directors have translated history into stories, and war journals into visual images. Topics: the role of fascism in the development of Italian cinema and its phenomenology in film texts; cinema as a way of producing and reproducing constructions of history; film narratives as fictive metaphors of Italian cultural identity; film image, ideology, and politics of style. GER:DB-Hum
5 units, Win (Campani, E)

OSPFLOR 54. High Renaissance and *Maniera*—The development of 15th- and early 16th-century art in Florence and Rome. Epochal changes in the art of Michelangelo and Raphael in the service of Pope Julius II. The impact of Roman High Renaissance art on masters such as Fra' Bartolomeo and Andrea del Sarto. The tragic circumstances surrounding the early *maniera:* Pontormo and Rosso Fiorentino and the transformation of early mannerism into the elegant style of the Medicean court. Contemporary developments in Venice. GER:DB-Hum
5 units, Spr (Verdon, T)

OSPFLOR 55. Academy of Fine Arts: Studio Art—Courses through the Academia delle Belle Arti. Details upon arrival. Minimum Autumn and Winter Quarter enrollment required; 1-3 units in Autumn. May be repeated for credit.
1-5 units, Aut, Win, Spr (Campani, E)

OSPFLOR 56. University of Florence Courses
1-5 units, Aut, Win, Spr (Campani, E)

OSPFLOR 67. Women in Italian Cinema: Maternity, Sexuality, and the Image—Film in the social construction of gender through the representation of the feminine, the female, and women. Female subjects, gaze, and identity through a historical, technical, and narrative frame. Emphasis is on gender, identity, and sexuality with references to feminist film theory from the early 70s to current methodologies based on semiotics, psychoanalysis, and cultural studies. Advantages and limitations of methods for textual analysis and the theories which inform them. Primarily in Italian. GER:DB-Hum, EC-Gender
4 units, Spr (Campani, E)

OSPFLOR 71. Becoming an Artist in Florence: Contemporary Art in Tuscany and New Tendencies in the Visual Future—Recent trends in art, current Italian artistic production, differences and the dialogue among visual arts. Events, schools, and movements of the 20th century. Theoretical background and practical training in various media. Work at the Stanford Center and on site at museums, exhibits, and out in the city armed with a sketchbook and camera. Emphasis is on drawing as the key to the visual arts. Workshops to master the techniques introduced.

3-5 units, Spr (Rossi, F)

OSPFLOR 77. Italian Politics Between Europe and the Mediterranean—How and why a country's internal and external geopolitical aspects are related to each other. How Italy's European membership and its Mediterranean position complement each other in reshaping fundamental aspects of Italian domestic and foreign policy. GER:DB-SocSci, EC-GlobalCom

5 units, Win (Morel, L)

OSPFLOR 78. An Extraordinary Experiment: Politics and Policies of the New European Union—Institutional design of EU, forthcoming changes, and comparison of the old and new designs. Interactions between the EU, member states, organized interests, and public opinion. Major policies of the EU that affect economics such as competition or cohesion policies, market deregulation, and single currency. Consequences of the expansion eastwards. The role of institutions as a set of constraints and opportunities for the economic actors; relationships between political developments and economic change in the context of regional integration; lessons for other parts of the world. GER:DB-SocSci, EC-GlobalCom

5 units, Aut (Morlino, L)

OSPFLOR 79. Migrations and Migrants: The Sociology of a New Phenomenon—Interdisciplinary approach to the study of immigration. Typology of forms of migration through politics put into action by the EU and within single nations. Related cultural and religious questions which elicit symbolic borders, territorialization of cultural identities, and the often spatial differentiation of immigrants and locals. The politics of integration and the instruments necessary to manage it. GER:DB-SocSci, EC-GlobalCom

5 units, Aut (Allam, K)

OSPFLOR 86. Comparative Democratization—Comparison of transition and consolidation of democracy in late 20th and early 21st centuries across regions, emphasizing S. and E. Europe and Latin America. Definitions of democracy; diifferent settings and patterns of democratization, including hybrid regimes; the international context for democratization and foreign efforts to promote democracy. GER:DB-SocSci

5 units, Win (Karl, T; Schmitter, P)

OSPFLOR 94. Photography in Florence—Introduction to the functioning of the camera, exposure, and b/w film processing and printing. Emphasis is on perceptive imagery and the development of technical proficiency. 35mm camera required. Limited enrollment.

4 units, Win (Loverme, C)

OSPFLOR 97. Current Issues in Human Rights and International Justice—Roosevelt's four freedoms, problematic notions of human rights, concept of fair trial, the U.S. Supreme Court decision on Guantanamo detainees, current international protection against torture and rape. Is current international protection satisfactory? Did victors' justice at Nuremberg serve any purpose? Is a jury necessary to establish guilt or innocence? What is genocide? How should post-conflict situations be handled? Why is the U.S. opposing the International Criminal Court? GER:DB-SocSci, EC-EthicReas

4 units, Spr (Vierucci, L)

OSPFLOR 106V. Italy: From Agrarian to Postindustrial Society—Italian history from the Risorgimento to the present. Society, crises, evolution, values, and the relation to the political institution in different periods. The ideologies, political doctrines, and historical events which contributed to the formation of modern Italy's predominant subcultures: Catholic and Socialist. In Italian. GER:DB-SocSci, EC-GlobalCom

4 units, Aut (Mammarella, G)

OSPFLOR 111Y. From Giotto to Michelangelo: Introduction to the Renaissance in Florence—Lectures, site visits, and readings reconstruct the circumstances that favored the flowering of architecture, sculpture, and painting in Florence and Italy, late 13th to early 16th century. Emphasis is on the classical roots; the particular relationship with nature; the commitment to human expressiveness; and rootedness in the real-world experience, translated in sculpture and painting as powerful plasticity, perspective space, and interest in movement and emotion. GER:DB-Hum

4 units, Win (Verdon, T)

OSPFLOR 115Y. The Duomo and Palazzo della Signoria: Symbols of a Civilization—The history, history of art, and symbolism of the two principal monuments of Florence: the cathedral and the town hall. Common meaning and ideological differences between the religious and civic symbols of Florence's history from the time of Giotto and the first Guelf republic to Bronzino and Giovanni da Bologna and the Grand Duchy. GER:DB-Hum

4 units, Aut (Verdon, T)

OSPFLOR 134F. Modernist Italian Cinema—As the embodiment of modernity, cinema develops in the wake of modernism proper, but can be understood as one of its technological and aesthetic expressions. Topics: cinema's archaeology in futurist texts and theories with their nationalistic political flavor and their iconoclastic, radical, and interdisciplinary rethinking of the language and form of all the arts (Marinetti, Pirandello, D'Annuzio). GER:DB-Hum

5 units, Aut (Campani, E)

ITALIAN LANGUAGE PROGRAM

OSPFLOR 21F. Second-Year Italian, First Quarter—Review of grammatical structures; grammar in its communicative context. Listening, speaking, reading, and writing skills practiced and developed through authentic material such as songs, newspaper articles, video clips, and literature. Insight into the Italian culture and crosscultural understanding.

4 units, Aut, Win, Spr (Quercioli, F)

OSPFLOR 22F. Second-Year Italian, Second Quarter—Grammatical structures, listening, reading, writing, speaking skills, and insight into the Italian culture through authentic materials. Intermediate to advanced grammar. Content-based course, using songs, video, and literature, to provide cultural background for academic courses.

4 units, Win (Quercioli, F)

OSPFLOR 31F. Advanced Italian Conversation—Refine language skills and develop insight into Italian culture using authentic materials. Group work and individual meetings with instructor.

4 units, Aut, Win, Spr (Quercioli, F)

ON VIDEOTAPE

OSPFLOR 50F. Introductory Science of Materials—See ENGR 50 for course description. GER:DB-EngrAppSci

4 units, Aut, Win, Spr (Staff)

KYOTO-SCTI (STANFORD CENTER FOR TECHNOLOGY AND INNOVATION)

OSPKYOTO 21. Research Project—Independent research projects on aspects of Japanese culture, society, or public policy. Students interested in developing the project as a web page should take a home campus class on creating web pages or have equivalent experience.

2-3 units, Spr (MacDougall, T)

OSPKYOTO 24. Japan in Contemporary International Affairs—Japanese foreign affairs since the end of the cold war. Evolution of the U.S.-Japan alliance, the rise of China, transformation of the security environment, and historical, strategic, geopolitical, economic, and cultural factors in Japan's new assertiveness in foreign relations. GER:DB-SocSci, EC-GlobalCom

5 units, Spr (MacDougall, T)

OSPKYOTO 28. Kyoto: History of Urban and Architectural Space—Introduction to the culture of Kyoto and the Kansai area through the built environment and its historical and cultural background. Representative building styles of major periods of Japanese history, and the development of spatial expression of social status and culture, relation of inside and outside, ambiguity of space, and living with the seasons. GER:DB-Hum

4-5 units, Spr (Langner-Teramoto, B)

OSPKYOTO 42. Scenes In and Around Kyoto—Introduction to Japanese history emphasizing events in the capital region. Buddhism and conquest; court and countryside; warriors and women; prayer and play; monarchy and modernity; Japan in the world. Field trips to prominent sites of power and production in Kyoto. Sources include maps, monographs, movies, and museums. GER:DB-Hum, EC-GlobalCom

5 units, Spr (Wigen, K)

OSPKYOTO 44. Modernizing Women in Japan—Late 19th- to the 20th-centuries. Women as objects and agents of experiments in social change in the modern world. Sources include film, fiction, journalism, essays, diaries, and secondary works. Recommended: course work on Japan or gender. GER:DB-Hum, EC-Gender

4-5 units, Spr (Wigen, K)

OSPKYOTO 215X. The Political Economy of Japan—Institutions and processes in the political organization of economic activity in modern Japan. The interaction of public and private sector institutions in the growth of Japan's postwar economy. The organization and workings of key economic ministries and agencies of the government, private sector business groupings, government interaction, and public policy making. The transformation of Japanese industrial policy from the rapid growth of heavy and chemical industries to the promotion of high technology and communications industries. The international, political, and economic ramifications of the structure and importance of Japanese capitalism. GER:DB-SocSci

4-5 units, Spr (Hayashi, T)

JAPANESE LANGUAGE PROGRAM

OSPKYOTO 9K. First-Year Japanese Language, Culture, and Communication B

5 units, Spr (Staff)

OSPKYOTO 17K. Second-Year Japanese Language, Culture, and Communication B

5 units, Spr (Staff)

OSPKYOTO 19K. Second-Year Japanese Language, Culture, and Communication B

5 units, Spr (Staff)

OSPKYOTO 129K. Third-Year Japanese Language, Culture, and Communication B

5 units, Spr (Staff)

OSPKYOTO 211K. Advanced Japanese

5 units, Spr (Staff)

ON VIDEOTAPE

OSPKYOTO 33. Digital Systems II—See EE 108B for course description. GER:DB-EngrAppSci

3-4 units, Spr (Staff)

OSPKYOTO 40K. Introductory Electronics—See ENGR 40 for course description. GER:DB-EngrAppSci

5 units, Spr (Wong, S)

MADRID

The Stanford Program in Madrid opens in Winter Quarter, 2007-08. Curriculum is in development; see http://osp.stanford.edu for course information.

MOSCOW

OSPMOSC 15. Academic Internship—Placements in areas such as banking, finances, consulting, journalism, language teaching, and technology. Introduction to Russian society and work experience. Evaluation and analysis of experience in final academic paper.

2-3 units, Aut (Abashkin, A)

OSPMOSC 20. The Soviet Union in World War II—WW II on the eastern front, one of the bloodiest and most brutal wars in history. Focus is on the military and political conduct of the war, and the impact of the war on the Soviet society. GER:DB-SocSci

5 units, Aut (Holloway, D)

OSPMOSC 22. Russia and the World—Foreign policy of the Russian Federation as it tries to establish its place in the post-communist world. Internal debates about where Russia belongs in the world; impact of military decline on Russian policy; rise of energy resources as a basis for Russian power. GER:EC-GlobalCom

3 units, Aut (Holloway, D)

OSPMOSC 25. Russian Short Stories of the 19th and 20th Centuries—The short story as a hybrid and flexible form; its use to express philosophical, ethical, aesthetic, satiric, and social ideas. Its open structure; metaphors and poetic similes; depiction of conditions of reality. Authors may include Pushkin, Gogol, Tolstoy, Dostoevsky, Chekhov, Bunin, Gorky, Platonov. GER:DB-Hum

3 units, Aut (Kurganova, L)

OSPMOSC 26. Moscow Landscape: Architecture, Music, and Museums—Introduction to Moscow culture. City planning from the 15th century to the present: palaces, monasteries, churches, cultural institutions, and housing construction. Political, economic, and social context. Concept of a metropolis applicable to other world cities. GER:DB-Hum

3 units, Aut (Zinovieva, O)

OSPMOSC 61. Problems and Prospects of Post-Soviet Eurasia—Processes shaping the former Soviet Union or the Commonwealth of Independent States, including Russia and the newly independent states of Eastern Europe, the South Caucasus, and Central Asia. Economic and political models since the break-up of the USSR. Changing geopolitics of post-Soviet Eurasia: political regimes, economic development, security, energy relationships, post-Soviet societies, religion, and globalization. GER:DB-SocSci, EC-GlobalCom

5 units, Aut (Trenin, D)

OSPMOSC 62. Economic Reform and Economic Policy in Modern Russia—Russian economic history in the 20th century. Reasons and logic for economic transformation, major components of postcommunist economic transformation doctrine, and results of practical implementation. Mechanisms of economic policy decision making in modern Russia, and patterns of and alternatives in economic development. GER:DB-SocSci, EC-GlobalCom

5 units, Aut (Mau, V)

RUSSIAN LANGUAGE PROGRAM

OSPMOSC 10M. Intensive First-Year Russian
9 units, Aut (Kurganova, L; Boldyreva, T)

OSPMOSC 51M. Second-Year Russian
5 units, Aut (Boldyreva, T)

OSPMOSC 111M. Third-Year Russian
5 units, Aut (Filatova, G)

OSPMOSC 177M. Fourth-Year Russian
5 units, Aut (Kilpyakova, V)

OXFORD

All students in the Oxford Program enroll in a 6-unit tutorial. See http://osp.stanford.edu/oxford for additional information on Oxford tutorials and topics.

OSPOXFRD 17. Novels of Sensation: Gothic, Detective Story, Prohibition, and Transgression in Victorian Fiction—Literary and moral value of transgressive sub-genres of the novel; what they reveal about Victorian society's anxiety over prohibited elements in the domestic and public spheres. Sources include gothic and detective novels. GER:DB-Hum
5 units, Spr (Plaskitt, E)

OSPOXFRD 18. Making Public Policy: An Introduction to Political Philosophy, Politics, and Economics—UK and U.S. What should society look like? How should incomes be distributed? How should it be taxed? How much inequality is acceptable? The overlap of economics with practical politics through political philosophy behind the government decisions; how public policy ought to be formulated. Issues include poverty, environmental policy, trade and globalization, and transport. GER:DB-SocSci
5 units, Win (McMahon, R)

OSPOXFRD 20. Biography and History: Literary Biography and the Study of the Past—Major conceptual issues, how these have changed over time, and what the insights and tools of literary biography mean for the writing of history. Problems in literary biography including reliability, relationship to fiction, preoccupation with individual achievement, and emphasis on genius. Readings include fiction illuminating the interplay between biographical and historical knowledge, and how a biographical quest can inspire reflection upon the reader and the world. GER:DB-Hum
5 units, Spr (Zipperstein, S)

OSPOXFRD 24. British and American Constitutional Systems in Comparative Perspective—Introduction to the study of constitutions and constitutional systems of government. The workings of the British and American systems of government. Comparative study of the most important constitutional issues facing Britain and the U.S. such as how suspected terrorists should be treated in a time of war. How to think about fundamental constitutional questions. GER:DB-SocSci
4-5 units, Aut (McMahon, R)

OSPOXFRD 28. Technology and Work—Theory and research on the social implications of technology and technological change for workers at all levels. Topics include: alternative conceptions of technology as social phenomenon; workplace technology; individual and group reactions to technological change; the construction of a technology's social meaning; and management of technological change. Emphasis is on automation, electronic data processing, and microelectronic technologies including CAD-CAM systems, telecommunication networks, medical imaging, artificial intelligence, and personal computers. GER:DB-EngrAppSci
3 units, Win (Barley, S)

OSPOXFRD 29. Issues in Technology and Work for a Post-Industrial Economy—How changes in technology and organization are altering work and lives. Topics include distributed and virtual organizations, the blurring of boundaries between work and family life, computer supported cooperative work, trends in skill requirements and occupational structures, monitoring and surveillance in the workplace, downsizing and its effects on work systems, project work and project-based lifestyles, the growth of contingent employment, telecommuting, and the changing nature of labor relations. GER:DB-EngrAppSci
3 units, Aut (Barley, S)

OSPOXFRD 30. Topics in Management Science and Engineering—Independent study in one of these topics: changing nature of work in industrial societies; cultural and social structure of science and engineering; social construction of technology; ethnography of work and organizations; comparative analysis of British and U.S. labor unions. Weekly meetings to review progress and set goals. May be repeated for credit.
3 units, Aut, Win (Barley, S)

OSPOXFRD 31. The European Union: Politics and Policy Making—The EU's development and political system; problems and challenges facing it. Theories of the integration process; institution; and policy making processes. Policy areas including economics, justice and home affairs, and foreign relations. Representation of citizens in the EU. GER:DB-SocSci
5 units, Aut (Hobolt, S)

OSPOXFRD 35. Modern UK and European Government and Politics—Background of main political systems in Europe and recent developments in European politics. Topics: Blair's constitutional reforms; the consequences of the German reunification; Berlusconi's rise to power in Italy; the extreme right in France and elsewhere; the single currency; the enlargement of the EU; and proposals for a constitution and their recent rejection by the French and Dutch electorates. GER:DB-SocSci
4-5 units, Spr (Cappocia, G)

OSPOXFRD 45. British Postwar Economic Policy—Development of British economic policy making from 1945, focusing on political economy including: ideological motives of governments; political business cycle; and the influence of changing intellectual fashions. Policy areas: attitude to the pound; control of the business cycle; and the role of the state in the economy. Prerequisite: ECON 50. GER:DB-SocSci
4-5 units, Win (Forder, J)

OSPOXFRD 51. Britain in the Era of the Two World Wars—Causes of Britain's involvement, her role in the final outcome, and their impact on Britain's role as a world power. The effects of the wars on British politics, culture, and the everyday lives of combatants and non-combatants. Films, literature, reminiscences, and historical sources. GER:DB-Hum
5 units, Win (Tyack, G)

OSPOXFRD 65. Oxford: The City as a Work of Art—Oxford's role as patron of British art, architecture, and design from the 13th century to the present. Themes in the history of art, architecture, and design: medieval and gothic, renaissance, classical, modern and postmodern. Resources such as university and college buildings, museums, galleries, and private collections. The roles of patronage and collecting; the functioning of the arts.
2 units, Win, Spr (Chance, H)

OSPOXFRD 82. Jane Austen and the Rise of the Woman Novelist—Austen's technique and development, and her place among women writers in the 18th and 19th centuries. Juvenalia. Literary and historical contexts. 18th-century cult of sensibility; contemporary vogue for gothic novels; and Austen's treatment of class, economics, female friendship, courtship, and politics. GER:DB-Hum
4-5 units, Aut (Plaskitt, E)

OSPOXFRD 84. African Art and Writing Traditions—Historical and social contexts. How African graphic writing systems are used as visual art and markers of identity, religion, and moral philosophy. Arts and graphic writing traditions of the sub-Sahara including Bamum, Asante, Yoruba, Ejagham, and Kongo. Parallel graphic traditions in visual systems used in the African diaspora, including Haiti, Cuba, Brazil, Jamaica, Trinidad, Suriname, and southeastern U.S. GER:DB-Hum
5 units, Spr (Martinez-Ruiz, B)

OSPOXFRD 85. African Art and Museum Display—Formation of a market for African art through museum and gallery display. Historical development of African art collecting in relation to parallel processes for modernism and contemporary art; effects of African cultural practices and globalization. Proliferation of African art collections in British institutions including the Pitt-Rivers, Horniman, and British museums.
5 units, Spr (Martinez-Ruiz, B)

OSPOXFRD 114Z. Close Readings in English Literature, 1509-1642—Restricted to students majoring in English and related subjects. Taught jointly for Stanford students and second-year St. Catherine's undergraduates. From the beginning of Henry VIII's reign to the onset of the Civil War, excluding Shakespeare. The poetry, prose, and drama of the period in their literary, cultural, and historical contexts. GER:DB-Hum
5 units, Aut (van Es, B)

OSPOXFRD 116Z. Close Readings in English Literature, 1642-1740—From the Civil War to the mid-18th century: poetry, prose, and drama in literary, cultural, and historical contexts, and key texts. Open only to students majoring in English and related subjects. Taught jointly for Stanford students and second-year St. Catherine's undergraduates. GER:DB-Hum
5 units, Win (Bullard, P)

OSPOXFRD 117W. Social Change in Modern Britain—Changes in the social institutions, attitudes, and values in Britain over the past 20 years. Social changes occurring as a consequence of the Thatcher years of government. Changes to the British economy, the welfare state, National Health Service, the education system, the criminal justice system, gender relations, marriage, divorce, reproduction, and the family. The consequences in terms of British competitiveness, income distribution, wealth and poverty, social class, health and illness, educational attainment and skills development, crime, and family life. GER:DB-SocSci
4 units, Spr (Palmer, A)

OSPOXFRD 141V. European Imperialism and the Third World, 1870-1970—European imperialism from its zenith in the late 19th century to the era of decolonization after WW II. The effects of Western imperialism in the Third World. The legacy of imperialism and decolonization to the modern world. GER:DB-SocSci, EC-GlobalCom
5 units, Spr (Jackson, A)

OSPOXFRD 154Z. Close Readings in English Literature, 1740-1832—Restricted to students majoring in English and related subjects. Taught jointly for Stanford and second-year St. Catherine's undergraduates. Texts beginning with William Collins and Thomas Gray and concluding with John Keats. GER:DB-Hum
5 units, Spr (Plaskitt, E)

OSPOXFRD 163X. Shakespeare: Critical Commentary—For English majors or minors only. Topics include the use of soliloquy, epilogues, alternation of prose and verse, rhetoric, meta-theatricality. Close reading technique. Taught jointly with students from St. Catherine's College.
5 units, Aut, Win (Rowley, R)

OSPOXFRD 221Y. Art and Society in Britain—Themes in 18th-, 19th-, and 20th-century British art. Painting, sculpture, and design. Comparisons between the British experience and that of continental Europe and the U.S. Readings address questions related to the role of art in modern society. GER:DB-Hum
4-5 units, Aut (Tyack, G)

PARIS

OSPPARIS 12. Plagues of Europe: from the Black Death to HIV—How disease spreads and how it can be controlled. Human interactions with the microbial world. Topics: epidemiology of infectious diseases; infectious agents such as viruses, bacteria, parasites, and fungi; roles of national and international health programs in disease control; human migration and disease; HIV epidemiology in Europe; ecologic change and disease; food borne illness and vector borne disease; vaccination; how tuberculosis changed Europe; and emerging threats. GER:EC-GlobalCom
4 units, Spr (Parsonnet, J)

OSPPARIS 13. Naturalism versus Spiritualism in 19th-Century France—Comparison of the climate for scientific discovery in mid-19th-century France and in present-day U.S. Recurring conflict in scientific and religious beliefs regarding life. How did Pasteur's rejection of spontaneous generation challenge or support views of creationism? How philosophers conceptualized these scientific discoveries. Impact of Darwin's work on society; conflicting philosophies of vitalism, mechanism, and organicism; and growth of experimentalism.
2 units, Spr (Parsonnet, J)

OSPPARIS 20. Reforming Europe: The Challenges Ahead—The European project since 1950; measures the EU must consider in shaping its future and reforming its institutions. Where does it go from here; how can it meet the challenges such as demography, education, and energy? GER:DB-SocSci
4-5 units, Win (Kahn, S)

OSPPARIS 22. Immigration in France—Emphasis is on West African immigration. Historical, statistical, legal, and political perspectives. Living conditions of immigrants and their children. Ethnographic observations or interviews on a group-defined topic. GER:DB-SocSci, EC-GlobalCom
4-5 units, Aut (Strudel, S)

OSPPARIS 25. Literature and the City—Subtle and hidden aspects of Paris through the eyes of France's greatest writers, poets, and philosophers including Balzac, Baudelaire, Zola, and Aragon. Essays, poems, and novels that portray the historical, social, and political realty of the city better than textbooks or guides. GER:DB-Hum
4 units, Win (Rullier, F)

OSPPARIS 26. France: Present and Future—Students read and discuss lead articles and associated issues in a daily French newspaper, usually *Le Monde*. Additional articles from past newspapers and scholarly essays to provide context.
2 units, Aut (Lougee Chappell, C)

OSPPARIS 27. Paris and Politics—Development of Paris as a capital city over the past four centuries, emphasizing how political entities and ideals and sociopolitical challenges have shaped its physical setting and urban culture. Field trips. GER:DB-SocSci
5 units, Aut (Lougee Chappell, C)

OSPPARIS 33. The Economics of Climate Change: Policies in Theory and Practice in the EU and the U.S.—Economic tools for tackling climate change. Analytical bases of existing cap-and-trade schemes. The European greenhouse gas Emission Trading Scheme within the frame of the Kyoto Protocol, and emerging regulatory or voluntary markets in the U.S. Carbon-pricing mechanisms with focus on power and gas markets. Possibilities of linking carbon pricing mechanisms on both sides of the Atlantic and conditions for integrating these markets into an international post-Kyoto agreement. GER:DB-SocSci, EC-GlobalCom
5 units, Spr (de Perthuis, C; Keppler, J; Leguet, B)

OSPPARIS 34. Emerging European Constitutionalism: The Role of Constitutional Courts in Europe since WW II—Traditional European constitutional thought in the 19th and 20th centuries. New model of constitutionalism in post-WW I Austria. Post-WW II developments in Germany and Italy. French *Conseil constitutionnel* under the 5th Republic. Emergence of Spanish and Portuguese courts after the fall of Franco. New E. European constitutional courts. Development of the European courts: Court of Justice and European Court for Human Rights. GER:DB-SocSci, EC-GlobalCom
3 units, Win (Ferejohn, J)

OSPPARIS 35. Political Thought of the French and American Revolutions—Ideas of citizenship as they emerged from the French and American revolutionary traditions. Ideological origins of the revolutions and emergence of post-revolutionary constitutional traditions. France: post-Reformation developments of absolute monarchy of the Ancien Régime; ideological developments during the revolutionary period and reflections on those developments to the present. U.S.: republican thought in 17th- and 18th-century England and the U.S.; ideological developments during the Revolution; the Constitutional period; and ideological reflections to the present. GER:DB-Hum

5 units, Win (Ferejohn, J)

OSPPARIS 41. EAP: Perspective, Interior Decorating, Volume, and Design—May be repeated for credit.

2 units, Aut, Win, Spr (Halevi, E)

OSPPARIS 42. EAP: Drawing with Live Models—May be repeated for credit.

2 units, Aut, Win, Spr (Halevi, E)

OSPPARIS 43. EAP: Painting and Use of Color—May be repeated for credit.

2 units, Aut, Win, Spr (Halevi, E)

OSPPARIS 44. EAP: Graphic Art—May be repeated for credit.

2 units, Aut, Win, Spr (Halevi, E)

OSPPARIS 56. Theater in Transition: Stage and Audience in France Today—The static and silent spectator as first partner of the stage and sometimes co-creator of the theatrical event. Audience; new forms of performance; how space is reinvented; new light and sound effects; how texts are re-interpreted; and the changing role of the actor on the stage. GER:DB-Hum

4 units, Spr (Mervant-Roux)

OSPPARIS 81. France During the Second World War: Between History and Memory—French politics and society from the causes of the collapse of the French Third Republic and the emergence of the French State at Vichy. The political and cultural measures of this regime in the shadow of Nazi Germany. Anti-Jewish laws and action; deportations by Vichy, the Germans, the French Fascists, and reactions to the fate of the Jews. Visions of the Resistance, the combat for liberation, and WW II in the collective memory of France. GER:DB-SocSci

5 units, Win (Virgili, F)

OSPPARIS 91. Globalization and Its Effect on France and the European Union—Economic and political impact of globalization on France and the EU and influence of France and the EU on the process of globalization. Issues of sovereignty and national identity for France; protection from versus integration into the network of globalization. GER:DB-SocSci, EC-GlobalCom

5 units, Spr (Le Cacheux, J; Laurent, E)

OSPPARIS 92. Building Paris: Its History, Architecture, and Urban Design—The development of Parisian building and architecture from the 17th century to the present. Interaction of tradition and innovation in its transformation and its historical, political, and cultural underpinnings. Visits and case studies throughout Paris illustrate the formation of the city landscape and its culture. GER:DB-Hum

4 units, Spr (Halevi, E)

OSPPARIS 107Y. The Age of Cathedrals: Religious Art and Architecture in Medieval France—The major artistic and cultural movements that changed the face of France from the period of Suger in the 12th century through the reign of St. Louis in the 13th century. Monastic spirituality progressively gave way to an urban culture focused on man and secular knowledge, which developed daring and sophisticated building techniques. The years 1150-1250 represented a period of architectural renaissance and l'Ile-de-France was its birthplace. GER:DB-Hum

4 units, Aut (Deremble, C; Deremble, J)

OSPPARIS 120X. French Painting—Changes in artistic aims and the interaction between artist and society throughout the period. Weekly field trips to Paris museums holding paintings of David, Ingres, Delacroix, Courbet, Daumier, Manet, Renoir, Monet, Degas, and others. GER:DB-Hum

4 units, Win (Halevi, E)

OSPPARIS 124X. Building the European Economy: Economic Policies and Challenges Ahead—Issues and challenges of European economic construction. The European Economic Union at the end of the 50s; European industrial, agricultural, social, and monetary economic policies. Topics: wider definitions of Europe, its relations with industrial and developing countries, and its challenges in confronting global economic crises. GER:DB-SocSci

5 units, Aut (Le Cacheux, J; Laurent, E)

OSPPARIS 153X. Health Systems and Health Insurance: France and the U.S., a Comparison across Space and Time—Should health systems be organized or left to the free market? What is the role of the state in the delivery of health care? The evolution of the health profession, health policy, and reform in France and the U.S.; measures restraining professional autonomy such as prescription guidelines in the French Medical Convention. Is the solution to the increase of health expenditures and reduced access to health care the end of autonomy for the medical profession? GER:DB-SocSci, EC-GlobalCom

4-5 units, Win (Fessler, J)

OSPPARIS 186F. Contemporary African Literature in French—Focus is on African writers and those of the diaspora, bound together by a common history of slave trade, bondage, colonization, and racism. Their works belong to the past, seeking to save an oral heritage of proverbs, story tales, and epics, but they are also contemporary. GER:DB-Hum, EC-GlobalCom

4 units, Aut (Rullier, F)

OSPPARIS 211X. Political Attitudes and Behavior in Contemporary France—The institutions of the Fifth Republic, the main political forces, and their evolution. Electoral behavior, taking into account other forms of political action such as the demonstrations for the defense of schools (1984) and the *lycée* students (1990), or the protest that followed the desecration of the Jewish cemetery in Carpentras. Attitudes and values are linked to voting choice. GER:DB-SocSci, EC-GlobalCom

4-5 units, Aut (Mayer, N; Muxel, A)

FRENCH LANGUAGE PROGRAM

OSPPARIS 22P. Intermediate French I

4 units, Aut, Win (Mercier, F), Spr (Molkou, E)

OSPPARIS 23P. Intermediate French II

4 units, Aut (Gourevitch, S), Win (Molkou, E), Spr (Reychman, P)

OSPPARIS 124P. Advanced French I

4 units, Aut (Molkou, E)

OSPPARIS 125P. Advanced French II

4 units, Win (Guedon, P), Spr (Habert, L)

ON VIDEOTAPE

OSPPARIS 40P. Introductory Electronics—See ENGR 40 for course description. GER:DB-EngrAppSci

5 units, Aut (Howe, R), Spr (Wong, S)

OSPPARIS 50P. Introductory Science of Materials—See ENGR 50 for course description. GER:DB-EngrAppSci

4 units, Aut, Win, Spr (Staff)

SANTIAGO

OSPSANTG 17. Chilean Fiction of the 20th Century—Novels and short stories. Chilean and Latin American political and economic history contexts. GER:DB-Hum

4-5 units, Win (Missana, S)

OSPSANTG 18. Africans and Afro-Latinos in the Southern Andes—Impact of African slavery on Chile, Peru, Bolivia, and Argentina from the introduction of black slaves in the 16th century to the abolition of slavery in the 19th century. Sources include documents produced by slaves that trace lives and strategies of resistance and survival. Topics include marriage, material culture, property, religious expression, and social networks. Afro-Latino presence in local communities today emphasizing oral history and the recovery of local traditions. GER:DB-SocSci

4-5 units, Spr (Cussen, C)

OSPSANTG 23. Colonial Latin America—16th to early 19th century; issues, developments, and institutions in Spanish and Portuguese America. Topics: pre-Columbian America; Europe in the 15th century and the European expansion; consequences and effects of the encounter between the old and new worlds; religion; slavery; women; and the coming of independence. GER:DB-SocSci, EC-GlobalCom

5 units, Win (Herzog, T)

OSPSANTG 25. The Evolution and Ecology of the South American Biota—Ecology, evolution, paleontology, geology, geography, and philosophy of science illustrate evolution of the S. American biota. Field trips; case studies. Plate tectonics, mountain uplift, and ocean circulation; how those physical events influence macroevolution, speciation, coevolution, migration events, the Cambrian explosion, and mass extinctions. Challenges facing global conservation efforts. GER:DB-NatSci

3 units, Aut (Hadly, E)

OSPSANTG 42. Women's Representation in the Cinema of the Southern Cone—Cultural and cinematic constructions of femininity in Argentina, Chile, and Uruguay. Representation of women; social roles and cinematic positions assigned by patriarchal societies. Sources include films by female and male directors. Prerequisite: ability to understand Spanish language films without English subtitles. GER:DB-Hum

3 units, Win (Haro, M)

OSPSANTG 56. Contemporary Chilean Women Writers—Poems by Nobel Prize Winner Gabriela Mistral. Novels by María Luisa Bombal (*La última niebla*), Carolina Geel (*Cárcel de mujeres*), Marta Brunet (*María Nadie*), Isabel Allende (*La casa de los espíritus*), Pía Barros (*A horcajadas*), and Marcela Serrano (*Para que no me olvides*). How these authors have articulated women's consciousness and experiences and questioned their own world's values from a feminist perspective. GER:DB-Hum, EC-Gender

3-5 units, Spr (Haro, P)

OSPSANTG 57. Cinema of the Southern Cone—Films of Argentina, Chile, and Uruguay including María Luisa Bemberg's *Camila*, Tatiana Gaviola's *Mi último hombre*, Gonzalo Justiniano's *Amnesia*, Miguel Littín's *El chacal de Nahualtoro*, Orlando Lubbert's *Taxi para tres*, Hector Olivera's *No habrá más penas ni olvido*, Marcelo Pineyro's *Caballos salvajes*, Luis Puenzo's *La historia oficial*, and Eusebio Subiela's *Hombre mirando al sudeste*. Themes, genres, and styles; history and culture. GER:DB-Hum

3 units, Spr (Haro, M)

OSPSANTG 58. Living Chile: A Land of Extremes—Physical, ecological, and human geography of Chile. Perceptions of the Chilean territory and technologies of study. Flora, fauna, and human adaptations to regional environments. Guest lectures; field trips; workshops. GER:DB-EngrAppSci

5 units, Aut, Spr (Castro, S)

OSPSANTG 62. Topics in Chilean History—Main themes of Chilean history: Spanish colonial background; independence in comparative perspective; construction of the republic in the 19th century; actors in the political process; the clash between authoritarian and democratic traditions in the 20th century. How Chileans have viewed their own history through conventional historical accounts, novels, and memoirs. GER:DB-SocSci

4-5 units, Win (Jaksic, I)

OSPSANTG 68. The Emergence of Nations in Latin America—Major themes of 19th-century Latin American history, including independence from Spain, the emergence of nation states, and the development of a new social, political, and economic order. GER:DB- SocSci

4-5 units, Aut, Spr (Jaksic, I)

OSPSANTG 85. Marine Ecology of Chile and the South Pacific—Relationships among physical processes in the ocean, biological productivity, and the exploitation of resources by high-thropic-level predators including human beings. Characterization of ecological patterns; identification of processes operating on marine systems. Open ocean ecosystems, intertidal and benthic regions of the world's oceans, and ecological research developed along coastal regions, focusing on Chile's 4,000 km coastline. GER:DB-NatSci

5 units, Win (Palma, A)

OSPSANTG 104X. Modernization and Culture in Latin America—Intellectual and cultural expressions of Latin America against the background of modernization viewed as a constant tension between rationalization and subjectification, change and identity preservation, and the logic of development or economic expansion and the logic of the culture. Readings include Morande, *Cultura y modernización en América Latina* and Sarlo, *Una modernidad periférica*. GER:DB-SocSci, EC-GlobalCom

5 units, Aut (Subercaseaux, B)

OSPSANTG 111. Social Heterogeneity in Latin America—Latin America is characterized by social heterogeneity and inequality. An interpretation of these phenomena, focusing on the social, ethnic, gender, political, and economic dimensions. Their historical roots and unfolding during the periods of industrialization, the 60s, 70s, and 80s, and the contemporary situation. GER:DB-SocSci, EC-Gender

5 units, Aut (Valdés, T)

OSPSANTG 116X. Modernization and its Discontents: Chilean Politics at the Turn of the Century—Chile's strides towards becoming a developed country have engendered high levels of alienation and disaffection among significant sectors of the population. The roots of this apparent paradox of modernization, focusing on newly emerging actors in the Chilean political scene: Mapuche organizations, women's groups, the environmental movement, and new features of the established ones like trade unions and human rights activists. GER:DB-SocSci

5 units, Spr (Correa, G)

OSPSANTG 118X. Artistic Expression in Latin America—Elite, mass-media, and popular cultural changes in Chile under conditions of economic and political liberalization. The reception of cultural meanings from the center of the world social system (U.S., EU, and Japan), reformulation to respond to local conditions, and export in the shape of cultural artifacts. Innovative elements rooted in the regional and local culture. GER:DB-SocSci, EC-GlobalCom

5 units, Win (Albornoz, C)

OSPSANTG 119X. The Chilean Economy: History, International Relations, and Development Strategies—The Chilean economy in five stages, taking into account: the international economic position of Chile; internal economic structures closely related to the inherited historical conditions and to the changing international economic position of the country; and the economic strategies prevalent during the period and the concrete development policies conducted by government authorities. GER:DB-SocSci

5 units, Spr (Muñoz, O)

OSPSANTG 129X. Latin America in the International System—Latin America's role in world politics, with emphasis on the history of and models for explaining U.S.-Latin American relations. Latin America's evolving relationship in the international system. GER:DB-SocSci

4-5 units, Win (Fuentes, C)

OSPSANTG 130X. Latin American Economies in Transition—Introduction to the main debates and approaches developed to understand and analyze the economies of Latin America. Recent processes of transition to market economies. Common characteristics among countries of the region; the differences and special traits of individual countries. Historical, analytical, and empirical perspectives on topics at the center of controversies and specific policy problems over several decades. Recommended: ECON 1, 51, and 52. GER:DB-SocSci

5 units, Aut (Briones, I)

OSPSANTG 141X. Politics and Culture in Chile—The relationship between politics and culture in Chile during the 20th century, reflecting on the effects of such relationships on esthetics and identity. The possibility that, in Chile, culture has been pulled by politics and social praxis, a condition that has created a deficit in cultural thickness. The oligarchic regime around 1920, the welfare state around 1940, projects of social transformation around 1970, dictatorship around 1980, women writers and Mapuche poetry in contemporary Chile. GER:DB-Hum, EC-GlobalCom

5 units, Spr (Subercaseaux, B)

OSPSANTG 160X. Latin America in the International Economy—The external economic relations of Latin American countries. Similarities and differences among countries, focusing on the last 15 years. Analytical and empirical elements for interpretation of policies, and the outcome. Trade, external debt, capital flows, and the inter-relationships between domestic economy and overall growth. Recommended: ECON 1, 51, and 52. GER:DB-SocSci

5 units, Win (Staff)

OSPSANTG 221X. Political Transition and Democratic Consolidation: Chile in Comparative Perspective—The dynamics of the Chilean transition. Topics: challenges faced by democratic governments in the 90s framed by the legacy of military rule, 1973-90; political culture; institutional traditions of democracy; and the Chilean process within the broader context of Latin American political development. GER:DB-SocSci

5 units, Aut (Micco, S)

SPANISH LANGUAGE PROGRAM

OSPSANTG 12S,13S. Accelerated Second-Year Spanish: Chilean Emphasis—Intensive sequence integrating language, culture, and sociopolitics of Chile. Emphasis is on achieving advanced proficiency in oral and written discourse including formal and informal situations, presentational language, and appropriate forms in academic and professional contexts. Prerequisites for 12S: one year of college Spanish, or 11 or 21B if taken more than two quarters prior to arriving in Santiago. Prerequisites for 13S: 11 or 21B within two quarters of arriving in Santiago, or 12 or 22B.

12S: *5 units, Aut, Win, Spr (Popp, J)*
13S: *5 units, Aut, Win, Spr (Abad, M)*

OSPSANTG 33. Spanish Language Tutorial—Prerequisite: two years of college Spanish or equivalent placement.

2 units, Aut, Win, Spr (Abad, M; Pons, H; Popp, J)

OSPSANTG 102S. Composition and Writing Workshop for Students in Santiago—Advanced. Writing as craft and process: brainstorming, planning, outlining, drafting, revising, style, diction, and editing. Non-Spanish majors or minors may choose topics related to their studies. Prerequisite: SPANLANG 13C, 13R, 13S, 23B, or equivalent.

3-5 units, Aut, Win, Spr (Bobbert, A)

SPECIAL PROGRAMS

In addition to courses at its established centers, the Overseas Studies Program offers courses in other locations around the world. The first four courses are offered as part of a full Spring Quarter program in Cape Town, South Africa. The remaining courses are Overseas Seminars, offered in the weeks prior to the beginning of Autumn Quarter. Additional details can be found at http://osp.stanford.edu.

CAPE TOWN

OSPGEN 21. Public Health and Primary Health Care in a Changing Community Context—Strategies and controversies in community health policy and practice as expressed in the Western Cape region of S. Africa. Topics: an upstream population approach to health and disease; economic and social determinants of health; social analysis of patterns of disease and death; role of physicians in community health; epidemiological approaches to health needs of underserved populations; healthcare priorities in the new S. Africa. Students conduct community-based public health assessments. Location: Cape Town, South Africa. GER:DB-SocSci

4 units, Spr (Stanton, T)

OSPGEN 22. Community Reconstruction and Development in Post-Apartheid South Africa—Emphasis is on theory and practice of community reconstruction and development using the Western Cape region as a case study. How S. African communities redress economic injustice and stagnation in partnership with nongovernmental organizations, metropolitan government agencies, and higher education institutions. Innovative processes of community development and local policies and contexts that support or inhibit these approaches. Service-learning component. Location: Cape Town, South Africa. GER:DB-SocSci, EC-GlobalCom

4 units, Spr (Stanton, T)

OSPGEN 23. History and Politics of South Africa in Transition—S. Africa's unfolding democratic era: its achievements in development and reconciliation; and challenges related to continuing poverty, a stagnant economy and high unemployment, and HIV and other health challenges. Topics: modern South African politics; affirmative action and employment equity; the Truth and Reconciliation Commission; violence and ethnicity; racial identity and racism; S. Africa and the African Renaissance; and land distribution and restoration. Location: Cape Town, South Africa. GER:DB-SocSci

4 units, Spr (Simons, M)

OSPGEN 24. Targeted Research Project—Research that responds to needs of Western Cape communities or health service providers, and ties in to disciplinary course work. Location: Cape Town, South Africa.

4 units, Spr (Stanton, T)

OVERSEAS SEMINARS

OSPGEN 52. The Political Economy of the European Union—EU and NATO institutions, their challenges and impact on relations with the U.S. The Euro and monetary policy, economic aspects of European integration, the EU judicial system, and foreign and security policy. Students meet with politicians, diplomats, and business leaders. Field trips to the European Parliament, the European Commission and NATO headquarters in Brussels, and the European Court of Justice in Luxembourg. Location: Leuven, Belgium.

2 units, Aut (Crombez, C)

OSPGEN 64. A Decade of Majority Rule: Transformation Struggles in South Africa—Efforts to transform S. Africa focusing on the space between the broken and the built. Comparative social history and public policy analysis. Three transition arenas: community reconstruction, HIV/AIDS and public health, and education. Location: Cape Town, S. Africa.

2 units, Aut (Samoff, J)

OSPGEN 67. Workshop in Shakespearean Production—Relationships among criticism, production, and performance of Shakespeare. Students attend Shakespeare productions in London and Stratford. Readings of the texts and hands-on experimentation with all phases of theatrical production, including scene work and performance. Location: Oxford, United Kingdom.

2 units, Aut (Friedlander, L)

OSPGEN 70. Indigenous Australia—Culture and ecology of desert Aboriginal people living in a remote region of W. Australia. Students interact with their Martu hosts. Issues in greater Australian human prehistory; social, ecological, and political factors that shape contemporary relationships between rural Aborigines, their urban counterparts, and the broader Australian society. Location: Newman, Western Australia.

2 units, Aut (Bird, D; Bird, R)

OSPGEN 71. Music and Acoustics of Ancient and Contemporary Greece—Listening as a path into other cultures and places. Human and environmental sounds of Greece. Musical archaeology. Environmental soundscapes of the countryside, urban environment, and undersea world. Psychoacoustics, the science of hearing. Contemporary Greek composition and performance. Location: Thessaloniki, Greece.

2 units, Aut (Chafe, C)

OSPGEN 72. Jews and Christians in Italy: A Historical, Cultural, and Religious Study—From the Second Temple period through the current papacy emphasizing the last two hundred years. Field trips to the Synagogue of Rome and the Jewish ghetto area; conversations with members and representatives of Jewish and Christian communities. Location: Rome and Florence, Italy.

2 units, Aut (Sheehan, T)

OSPGEN 73. Mongolia: History, Culture, and Political Economy—Traditional and contemporary history and culture. Students interact with a neighborhood in Ulaanbaatar; nature of a nomadic herding economy and its transition to modernity, observed through a herder encampment; condition and role of Tibetan Buddhism in processes of change and development. Location: Ulaanbaatar, Mongolia.

2 units, Aut (Mancall, M)

OSPGEN 74. The Evolution of Darwin—Darwin's life and intellectual development; the subsequent evolution of evolutionary thought. How the Darwinian revolution altered views of the human place in the biological and physical universes and of society, history, science, and thought. Field trips to the intellectual and physical milieus that produced him; discussions with Darwin scholars. Location: United Kingdom.

2 units, Aut (Siegel, R)

PROGRAM IN STRUCTURED LIBERAL EDUCATION

Directors: Roland Greene (Comparative Literature), Mark Mancall (History)
Coordinator: Suzanne Greenberg
Lecturers: Barbara Clayton, Suzanne Greenberg, Margo Horn, Rashi Jackman, Greg Watkins

The Program in Structured Liberal Education (SLE) offers freshmen an interdisciplinary approach to the liberal arts. The program emphasizes intellectual rigor and individualized contact between faculty and students. SLE has three basic purposes: to present a coherent program of instruction; to develop a student's ability to ask effective questions of texts, teachers, the culture, and themselves; and to develop intellectual skills in logical reasoning, critical reading, expository writing, and group discussions. SLE encourages students to live a life of ideas in an atmosphere that stresses critical thinking and a tolerance for ambiguity. Neither the instructors nor the curriculum provides ready-to-serve answers to the questions being dealt with; rather, SLE encourages a sense of intellectual challenge, student initiative, and originality.

The residence hall is the informal setting for lectures and small group discussions. SLE instructors work closely with students and participate in dorm life. SLE enhances the classroom experience with other residence-based educational activities, including a weekly film series and a student-produced play each quarter.

Freshmen interested in enrolling in SLE should indicate this preference for their IHUM assignment. SLE is designed as a three quarter sequence and students should be willing to make a commitment for the entire year.

Correspondence regarding the program should be addressed to Program in Structured Liberal Education, Florence Moore Hall, Stanford University, Stanford, CA 94305.

COURSES

SLE 91,92,93. Structured Liberal Education—SLE demands approximately 60 percent of the average academic workload during freshman year. Autumn Quarter focus is on the mythological and cultural foundations of ancient Greece and Israel. Winter Quarter focus is on the religious, ideological, and aesthetic transformations that occurred in Europe, Asia, and the New World as a result of the Middle Ages, Renaissance, Scientific Revolution, and Enlightenment. Spring Quarter focus is on the social, political, and artistic forces that shape the modern world. Completion of the SLE program satisfies the GER:IHUM, DB-Hum, and the University Writing and Rhetoric requirements.

91: *9 units, Aut,* **92:** *9 units, Win,* **93:** *10 units, Spr (Staff)*

PROGRAM IN WRITING AND RHETORIC

Faculty Director: Andrea A. Lunsford
Associate Director: Marvin Diogenes
Assistant Directors: Christine Alfano, Nancy Buffington
Writing in the Major Director: Claude Reichard
Hume Writing Center Director: Clyde Moneyhun
Hume Writing Center Associate Director for Honors Writing: Hilton Obenzinger
Hume Writing Center Assistant Directors: Sohui Lee, Kristi Wilson
Lecturers: Christine Alfano, Corinne Arraez (Spring), Paul Bator, Shaleen Brawn, Nancy Buffington, Joel Burges, Subho Chakravarty, Kevin DiPirro, Mark Feldman, Marjorie Ford, Wendy Goldberg, Cheryl Greene, Patti Hanlon-Baker, Arturo Heredia, Scott Herndon, Jonathan Hunt, Donna Hunter, John Lee, Sohui Lee, Melissa Leavitt, Sangeeta Mediratta (Autumn), Kimberly Moekle, Clyde Moneyhun (Winter), Alyssa O'Brien, John Peterson, Gabrielle Ribera-Moyer, Carolyn Ross, Helle Rytkonen, Kim Savelson, Susan Schuyler, Kate Seward, John Tinker, Ann Watters, Jonah Willihnganz, Kristi Wilson, Susan Wyle, Harold Zimmerman
Teaching Affiliates: Regina Arnold (Autumn), Michael Reid (Autumn), Miruna Stanica (Autumn), Emily Wilkinson (Autumn)

Department Offices: Building 460, Room 223, Margaret Jacks Hall
Mail Code: 2085
Department Phone: (650) 723-2631
Email: pwrcourses@stanford.edu
Web Site: http://pwr.stanford.edu

Courses given in the Program in Writing and Rhetoric have the subject code PWR. For a complete list of subject codes, see Appendix.

GOALS OF THE PROGRAM IN WRITING AND RHETORIC

The Program in Writing and Rhetoric (PWR) designs and teaches courses that meet the Writing and Rhetoric requirement for undergraduates at Stanford as well as intermediate and advanced writing and rhetoric classes. For more information on the requirement, see the "Courses" section below and the "Writing and Rhetoric Requirement" section of this bulletin.

PWR courses engage students in rhetorical and contextual analysis of texts and substantive research-based argument. Students in PWR courses learn and practice time-tested rhetorical principles to gain increasing control over the intellectual and stylistic elements of their writing; they learn to analyze the ideas and persuasive strategies of others and to apply those insights to their own writing.

Toward these ends, PWR 1 focuses on elements of academic argument: understanding a writer's stance; developing a supportable argumentative thesis; discovering, developing, and deploying cogent proofs; making appropriate organizational and stylistic choices; and understanding the expectations of audiences. The course emphasizes research-based writing, including the effective use of print and non-print sources, primary and secondary sources, and data based on fieldwork. Students enrolled in PWR 1 carry out significant research and use it as the basis for a polished and persuasive research-based argument.

PWR 2 further develops students' skills in writing and oral presentation, emphasizing the ongoing development of content, organization, and style. The course addresses the dynamic interdependence of writing and speaking, as well as the importance of visual and multimedia elements in the effective presentation of research. Students enrolled in PWR 2 have opportunities to draft and revise written assignments and oral presentations as well as opportunities to present the results of scholarly inquiry, with an emphasis on how to work purposefully and well with a variety of presentation media.

As a general rule, students complete a minimum of three major assignments in both PWR 1 and 2. Written assignments vary from 5 to 15 pages in length, and students work intensively on revising each piece of writing. Oral presentations may involve collaborative work as well as multimedia elements. All assignments involve analyzing a range of texts as well as identifying, evaluating, and using multiple sources in support of academic and research-based arguments. In-class work focuses on how to read with an increasingly critical eye and how to identify, evaluate, integrate, and cite sources effectively.

Writing and Rhetoric classes enroll no more than 15 students, and all classes are conducted as seminars in which participation is crucial. In-class activities include close reading of and responding to the writing of peers; these workshops are augmented by a minimum of three individual or small group conferences with the PWR instructor during the quarter.

THE HUME WRITING CENTER

The Hume Writing Center, located in Room 020 of Margaret Jacks Hall (Building 460), supports student writing in the full range of academic and extracurricular contexts. The center emphasizes support for students writing for PWR, Introduction to the Humanities, and Stanford Introductory Seminars, while also serving all Stanford undergraduates through one-to-one and group tutorials, workshops, and seminars. Other events sponsored or hosted by the center include regular Writers' Nights featuring fiction and poetry readings, the "How I Write" series of dialogues with Stanford faculty, and spoken word performances. For further details on the center, visit the center's web site at http://hwc.stanford.edu.

PWR PEDAGOGY PROGRAM

PWR offers ENGLISH 397A, a pedagogy seminar for all graduate students (TAs) from English, Modern Thought and Literature, and Comparative Literature who teach PWR courses as part of their graduate studies. Taught in the Autumn Quarter, the pedagogy seminar focuses on syllabus design, developing writing assignments, and responding to student writing. The history of rhetoric and writing supplies a theoretical foundation as well as practical lessons for how to teach writing and research most effectively. In the Winter and Spring, graduate students continue their pedagogical development through a series of workshops and seminars focused on specific issues in the teaching of writing. Elements of the pedagogy program include class visits; group evaluation of writing assignments; workshops and lectures; a handbook on teaching; a library of teaching materials; a program web site with links to other writing program sites; and individual work with mentors and peers.

TRAINING FOR PEER WRITING CONSULTANTS

PWR offers PWR 195, a course on the tutoring of writing for undergraduates selected to serve as peer writing consultants in the Hume Writing Center and across the campus. PWR 198 serves undergraduates who plan to work as tutors in area high schools as part of the Ravenswood Writes project.

COURSES

The Writing and Rhetoric requirement approved by the Faculty Senate in May 2001 includes courses at three levels. The first-level course, taken in the first year, can be satisfied by courses in PWR or Structured Liberal Education; the curriculum emphasizes analysis and research-based argument. The second-level course, to be completed by the end of the sophomore year, is a writing and oral/multimedia presentation course taught by the Program in Writing and Rhetoric and by other programs and departments; completion of Structured Liberal Education also satisfies the second-level requirement. The third-level course is a Writing in the Major (WIM) course taught in each major, providing students with systematic opportunities to develop skills for writing in their chosen fields. A list of certified WIM courses may be found in the table of "Undergraduate Major Unit Requirements" in the "Undergraduate Degrees and Programs" section of this bulletin. WIM course descriptions may be found under individual department and program sections.

The sequence of required courses provides a coordinated approach responsive to how students mature as writers, researchers, and presenters during their undergraduate years. At each level, students develop greater sophistication in conducting inquiry and producing scholarly work in progressively more specific disciplinary contexts.

Before the term in which students enroll in the first two levels of the requirement, they review course descriptions on the program web site at http://pwr.stanford.edu. After reviewing the offerings, students submit a list of top choices, and the PWR office assigns students to courses based on these preferences.

THE WRITING AND RHETORIC 2 REQUIREMENT

As noted above, the second-level course requirement may be satisfied through completion of courses offered through PWR or by other programs and departments. Before the quarter in which students are assigned to enroll in the second-level course, they will be able to review all available courses that meet the requirement on the program web site at http://pwr.stanford.edu. In addition to PWR 2, designated Center for the Teaching of Learning (CTL) courses and Stanford Introductory Seminars (SIS) satisfy the second-level Writing and Rhetoric requirement (Write-2). SIS courses require an additional application form; see http://introsems.stanford.edu/ and the SIS Winter and Spring supplements for more information.

COMMUNITY WRITING PROJECT (CWP)

Students may elect to enroll in a section of PWR 1 or 2 designated as "CWP" on the PWR web site. Students in CWP sections complete at least one project during the term (a grant proposal, pamphlet, news article, profile, or web site) for a local community service agency. The program provides an orientation for each CWP section, including a description of participating agencies. Community Writing Project assignments are then made in consultation with the instructor, the agencies, and the program.

PWR 1. Writing and Rhetoric 1—Fulfills first level of the writing requirement. Rhetorical and contextual analysis of readings, research, and argument. Focus is on development of a substantive research-based argument using multiple sources. Individual conferences with instructor.
4 units, Aut, Win, Spr (Staff)

PWR 2. Writing and Rhetoric 2—Further work in developing skills in argument and research-based writing, with emphasis on oral presentations of research-based arguments. Individual conferences with instructor. Prerequisite: PWR 1.
4 units, Aut, Win, Spr (Staff)

PWR 4. Directed Writing—Further work on developing writing. Analysis and research-based argument, writing for a range of audiences and in varied disciplinary contexts. Workshops and individual conferences. May be repeated for credit. Prerequisite: first two levels of the writing requirement or equivalent transfer credit.
3-4 units, Aut, Win, Spr (Staff)

PWR 5. Independent Writing—Individual writing project under the guidance of a PWR instructor. May be repeated for credit. Prerequisite: first two levels of the writing requirement or equivalent transfer credit.
1-5 units, Aut, Win, Spr (Diogenes, M)

PWR 6. Writing Workshop
1 unit, Aut (Staff)

PWR 91. Intermediate Writing—For students who have completed the first two levels of the writing requirement and want further work in developing skills in argument and research-based writing, emphasizing discipline-specific contexts and nonfiction genres. Individual conferences with instructor and peer workshops. Prerequisite: first two levels of the writing requirement or equivalent transfer credit.
3 units, Spr (Staff)

PWR 191. Advanced Writing—Open to undergraduates and graduate students. Crafting nonfiction prose in a range of genres. Focus is on the relationship of genre and form; attention to developing stylistic versatility. Individual conferences with instructor. Prerequisite: first two levels of the writing requirement or equivalent transfer credit.
3 units, Spr (Diogenes, M)

PWR 192. Projects in Research, Writing, and Rhetoric—Advanced work on research projects, early drafts of theses, expository excursions, manifestos, scripts, first-hand accounts, investigative reports, proposals, comic disputations, and other textual, rhetorical and imaginative explorations. Shared work, discussions, and examination of methods, rhetorics, and styles in all disciplines. May be repeated for credit. Prerequisite: first two levels of the writing requirement or equivalent transfer credit.
1-5 units, Aut (Obenzinger, H)

PWR 193. Writing the Honors Thesis—For students from all majors in the process of writing an honors thesis. Review of key elements of thesis process, including literature reviews, structure, argumentation, style, and documentation. Group and individual workshops. Prerequisite: first two levels of the writing requirement or equivalent transfer credit.
1-5 units, Win, Spr (Obenzinger, H)

PWR 194. Topics in Writing and Rhetoric—Further work in theories and practices of rhetoric. Topics may include the intersections of technology with writing and rhetoric, rhetorical practices in different time periods and locations, and major figures in the rhetorical tradition. Prerequisite: first two levels of the writing requirement or equivalent transfer credit.
4 units, Spr (Staff)

PWR 195. Peer Writing Tutor Training Course—For students selected to serve as peer writing tutors in the Stanford Writing Center and/or at other campus sites. Readings on and reflection about writing processes, the dynamics of writing and tutoring situations, tutoring techniques, learning styles, diversity, and ethics. Observation of tutoring sessions, written responses to readings, and other written work.
3 units, Spr (Moneyhun, C)

PWR 198X. Tutoring with Adolescents: Ravenswood Writes—(Same as EDUC 198X.) Strategies and approaches for teaching writing to students from diverse backgrounds and languages, and cultural and learning styles. Course prepares students to become tutors for Ravenswood Writes. Prerequisites: application and committee approval.
3 units, Spr (Ball, A; Tinker, J)

UNDERGRADUATE ADVISING AND RESEARCH

Director: Susie Brubaker-Cole

Program Offices: Sweet Hall, first and fourth floors
Phone: (650) 723-2426
Fax: (650) 725-1436
Web Site: Advising: http://uar.stanford.edu
Email: vpue-advising@stanford.edu, vpue-research@stanford.edu
Appointments: http://vpue-fmpform1.stanford.edu/UAR/advappts/

The Office of Undergraduate Advising and Research (UAR) helps students realize the full intellectual richness of undergraduate life at Stanford. UAR advisors work directly with students in one-on-one interactions to help them develop their scholarly interests before and after they declare a major, overcome obstacles to their academic success, immerse themselves in their chosen fields, engage with faculty, take advantage of academic opportunities and resources outside their major departments, and, for some students, to prepare for post-baccalaureate study.

The UAR staff includes professional advisers in Sweet Hall, academic directors (ADs) in Florence Moore, Stern, and Wilbur residence halls, and the Athletic Academic Resource Center. Starting in Autumn 2007-08, freshmen are assigned to academic advisers according to their preliminary academic interest and residence, and to an additional UAR adviser for comprehensive academic advice. Some freshmen receive enhanced academic support through participation in Expanded Advising Programs (EAP).

UAR services include:

- assistance with curriculum planning, including overseas studies
- consultation on choosing a major
- advice on integrating research into an undergraduate program of study (see below)
- support for students considering and applying for merit-based scholarships and national fellowships (see below)
- practical advice on how to prepare for and apply to graduate and professional schools
- academic and personal advising related to academic performance
- guidance on policies and procedures concerning academic standing;
- use of the resource library and membership on email lists
- referrals to campus tutoring resources and counseling offices

SCHOLARSHIPS AND FELLOWSHIPS, AND POST-BACCALAUREATE STUDIES

Along with the Overseas Resource Center (http://icenter.stanford.edu/orc/), UAR staff help students to compete for merit scholarships and post-baccalaureate fellowships. UAR also administers campus nomination competitions for the Goldwater, Udall, Beinecke, Center for the Study of the Presidency, Jack Kent Cooke, Carnegie, Liebmann, and Truman scholarships, as well as the Goldman Sachs Global Leaders Program. Binders containing applications of previous winners are available on the first floor of Sweet Hall.

UAR offers workshops and individual consultations on choosing a graduate or professional school, such as in law or the health professions, writing personal statements, soliciting letters of recommendation, and preparing for interviews.

UNDERGRADUATE RESEARCH

UAR sponsors and supports programs that encourage undergraduates to work individually with faculty on research, advanced scholarship, and creative projects. Programs are designed to serve students new to research, and those with considerable research experience who are able to take on advanced, independent projects.

STUDENT GRANT PROGRAMS

UAR offers research grants to registered Stanford undergraduates. Grants support faculty-mentored research projects, and are typically used to pay for the research supplies, travel, and room and board. For the 2007-08 academic year, students have access to grant programs including:

Quarterly Grants provide for student projects that explore a topic of interest or contribute to the development of future intellectual pursuits. They are often used for smaller projects, preliminary research, and follow-up expenses associated with larger projects.

Major Grants support larger projects that normally span several quarters. Funded projects typically culminate in an honors thesis or some other substantial capstone product that demonstrates a focused and intellectually rigorous perspective on the topic of interest. Major grant proposals are subject to a review process that includes input from faculty in the relevant departments.

Chappell Lougee Scholarships are available to sophomores pursuing projects in the arts, humanities, and social sciences. In addition to receiving a grant, recipients become members of a research and mentoring community that includes special events, preparation for a capstone project or honors, and fellowships and graduate school advising

Angel Grants assist students in producing a finished public creative work such as an art exhibit, film, stage production, or concert.

Conference Travel Grants support students who have been invited to present their research at a professional or scholarly conference. The grants fund travel expenses to and from the conference, and normal conference registration. Students demonstrating financial need may also include conference-associated food and lodging in their budget

For current deadlines and program details, see http://studentgrants.stanford.edu/. The application for any student grant consists of

(1) a student-authored project proposal, including a line-item budget, and (2) a letter of support written by a qualified member of the Stanford faculty. UAR may also consult student transcripts as well as outside faculty reviewers. Proposals are judged on intellectual significance, rigor and feasibility of project design, and evidence of student preparedness.

Major grant and Chappell Lougee Scholarship recipients may include a stipend within their budget if they are working full-time on their project over the Summer Quarter.

UAR provides advising support for students considering a research grant, including proposal writing and project design consultation and advice on administrative policies. Students can view sample proposals at the UAR office. For more information, see http://studentgrants.stanford.edu.

DEPARTMENTAL AND FACULTY SPONSORED RESEARCH OPPORTUNITIES

Departments, interdisciplinary programs, and Stanford research centers may apply through the UAR office for VPUE Departmental Grants for Undergraduate Research to support programs that provide undergraduates with mentorship and training in scholarship and research. Typically, departments pair students with a faculty member or faculty-led research group according to their mutual scholarly interests. Students conduct substantive, directed research on a particular aspect of the faculty member's research project, and they meet frequently with their faculty mentors to discuss progress and future directions for the project. For official request for proposal form, see http://urp.stanford.edu/FacView/. Students should check with UAR staff to determine which departments and centers currently sponsor research programs.

Individual faculty members may also apply through the UAR office for VPUE Faculty Grants for Undergraduate Research. Faculty Grants provide funding for undergraduates to work closely with faculty on a directed research project. Typical student research activities include conducting literature reviews, developing and conducting research surveys, collecting and analyzing data, aiding in the development of course materials, and conducting laboratory experiments. Faculty determine student participation in this program, so students should contact departments and faculty for more information. For official request for proposal form, see http://urp.stanford.edu/FacView/.

SUMMER RESEARCH COLLEGE

Summer Research College (SRC) is a residential program directed by UAR for students engaged in faculty-mentored research endeavors on campus over the summer.

SRC aims to foster close intellectual and social contact among students and faculty in an interdisciplinary residential community. During the day, students work with their faculty advisers or research groups campus-wide. In the evenings and on weekends, they have opportunities to share in research discussions, dinners with faculty guests, social and cultural activities, and other informal gatherings with fellow researchers.

SRC is not a source of funding for student research; it is a residential program intended to enrich undergraduates' summer research experience. Residents of SRC obtain funding through UAR and non-UAR funding programs. For more information about SRC, including registration procedures and college policies, see http://src.stanford.edu.

BING HONORS COLLEGE

Bing Honors College brings students who are writing honors theses to campus in September before the start of the regular school year for a program of intensive scholarship and writing guided by faculty from participating departments and programs. By concentrating solely on the thesis for nearly three weeks, the college participants begin the senior year with a commitment to independent scholarship in an atmosphere of shared intellectual purpose. The college sponsors crossdisciplinary forums, such as writing workshops and methodology panels, as well as residential activities, and a celebratory concluding event to which students invite their research advisers. Students participating in the college receive room and board, and access to computers.

GRADUATE EDUCATION

Vice Provost for Graduate Education: Patricia J. Gumport
Associate Vice Provost for Special Programs: Mark Horowitz
Associate Vice Provost for Graduate Education: Chris Golde
Assistant Dean for Research and Graduate Policy: Ann George
Director and SGF Program Officer: Pat Cook
Associate Director, Programs and Administration: Rebecca Jantzen

Web site: http://vpge.stanford.edu
Office: Building 310
Phone: (650) 736-9796
Mail code: 94305-2102

The Vice Provost for Graduate Education (VPGE) is responsible for initiating and managing policies and programs that enhance the quality of graduate education for master's, doctoral, and professional students across Stanford's seven schools. In addition to providing University-wide graduate policy direction, the VPGE office has three primary areas of program activity: administering University-wide graduate fellowship programs; advancing graduate student diversity; and promoting cross-school learning opportunities. The Vice Provost for Graduate Education reports to the Provost.

The Committee on Graduate Studies (C-GS) formulates policy concerning the substance and process of graduate education as well as the evaluation and recording of graduate achievement, and reviews the implementation of such policy. The Committee also monitors the academic quality and effectiveness of the University's graduate interdisciplinary and joint degree-granting programs. Committee members include the Vice Provost for Graduate Education or her delegated staff (ex officio) and representatives from the faculty at large, administration (such as the Office of the University Registrar), and students. The Graduate Student Council, along with the Associated Students of Stanford University (ASSU) nominations committee, selects student members.

GRADUATE POLICY

VPGE recommends, promulgates, and interprets University policies related to graduate education. VPGE oversees administrative and financial systems related to graduate student support, including policies related to requirements for research and teaching assistantships, and minimum compensation levels for those positions. For other policies related to graduate admissions and degree requirements, see relevant sections of this bulletin.

HONOR CODE AND FUNDAMENTAL STANDARD

The Honor Code and Fundamental Standard establish the conditions for academic work at Stanford and represent an agreement between students and faculty about their responsibilities for learning and teaching. The Interpretations and Applications of the Honor Code, the Student Judicial Charter of 1997, the Student Conduct Penalty Code, statistics, and other documents related to Judicial Affairs are available at the Judicial Affairs web site at http://judicialaffairs.stanford.edu/.

VISAS

In order to register as students, Stanford University requires that all those who are not U.S. citizens or U.S. registered permanent residents must obtain and maintain an appropriate visa status for their stay in the United States. Contact the Bechtel International Center for more information at http://icenter.stanford.edu/.

RELATED RESEARCH POLICIES

Graduate education and research are interrelated enterprises. Many Stanford graduate students are conducting research under the guidance and sponsorship of Stanford faculty members. The Dean of Research has primary responsibility for oversight of the research enterprise. Several policies in that arena are particularly relevant to graduate students. These include:

Academic Authorship—Guidelines related to academic authorship, such as the allocation of responsibility and credit for scholarly publications. For complete text of the guidelines, see Research Policy Handbook memo 2.8, On Academic Authorship, at http://www.stanford.edu/dept/DoR/rph/2-8.html.

Intellectual Property—Policies on copyrights and patents resulting from University work. Graduate students and postdoctoral fellows, as well as all faculty, staff, and visitors engaged in research, must sign the Stanford University Patent and Copyright Agreement. For complete text of the currently applicable versions of these policies, see Research Policy Handbook chapter 5, Intellectual Property, at http://www.stanford.edu/dept/DoR/rph/Chpt5.html.

Openness in Research—Policy on openness in research, such as the principle of freedom of access by all interested persons to the underlying data, processes, and final results of research. Stanford University does not accept funding for research projects that require secrecy. For complete text of the currently applicable version of this policy, see Research Policy Handbook memo 2.6, Openness in Research, at http://www.stanford.edu/dept/DoR/rph/2-6.html.

Relationships between Students and Outside Organizations—Summary of policies on the establishment of relationships between students and outside entities, such as private companies or nonprofit organizations, as part of or outside the student's academic program at Stanford. This covers open versus proprietary nature of the work, ownership of intellectual property, and possible conflicts of commitment and interest. For complete text of the currently applicable versions of these policies, see Research Policy Handbook memo 2.11, Relationships Between Students (Including Postdoctoral Scholars) and Outside Entities, at http://www.stanford.edu/dept/DoR/rph/2-11.html.

Research Compliance—Seven administrative panels review and approve research projects to safeguard the rights and welfare of all human research subjects, ensure the humane care and use of laboratory animals, and protect the safety of personnel and the general public in the areas of biosafety and radiological safety. For more information, contact the Research Compliance Office, http://researchcompliance.stanford.edu.

Research Misconduct—Policy on allegations, investigations, and reporting of research misconduct. Each member of the University community has a responsibility to foster an environment which promotes intellectual honesty and integrity, and which does not tolerate misconduct in any aspect of research or scholarly endeavor. For complete text of the currently applicable version of this policy, see Research Policy Handbook memo 2.5, Research Misconduct: Policy on Allegations, Investigations and Reporting, at http://www.stanford.edu/dept/DoR/rph/2-5.html.

COMPETITIVE GRADUATE FELLOWSHIP PROGRAMS

Several University-wide graduate fellowship programs are administered by the VPGE, including the Stanford Graduate Fellowships Program in Science and Engineering (SGF) and the Stanford Interdisciplinary Graduate Fellowship (SIGF) program. VPGE also administers several smaller University-wide fellowships programs to new and continuing doctoral students that require nomination by faculty or deans.

STANFORD GRADUATE FELLOWSHIPS PROGRAM IN SCIENCE AND ENGINEERING (SGF)

Web site: http://sgf.stanford.edu

SGF competitively awards approximately 100 two- and three-year fellowships providing tuition support and stipend to outstanding students pursuing a doctoral degree in the sciences and engineering. SGF Fellows can explore labs in a variety of fields. Nominations for SGF fellowships are submitted by science and engineering departments and programs.

STANFORD INTERDISCIPLINARY GRADUATE FELLOWSHIPS (SIGF)

Web site: http://sigf.stanford.edu

Beginning in 2008-09, the new SIGF program awards fellowships on a competitive basis to doctoral students engaged in interdisciplinary research. The fellowships enable Stanford doctoral students to pursue questions that cross traditional disciplinary boundaries. Nominations for SIGF fellowships are submitted by faculty.

GRADUATE STUDENT DIVERSITY

VPGE works to diversify the graduate student population by supporting recruitment and retention programs in collaboration with faculty and staff in each of the schools. VPGE funds recruiting activities to expand the pool of qualified applicants, such as visits to campus and travel grants. VPGE offers resources to groups within and across schools for activities that enhance the quality of students' educational experiences and improve retention. VPGE also works collaboratively to develop programs that cultivate interest in academic careers and diversify the pipeline for future faculty.

CROSS-SCHOOL LEARNING OPPORTUNITIES

VPGE provides seed funding to initiatives that foster cross-school interactions for graduate students. The Stanford Graduate Summer Institute (SGSI) offers noncredit interdisciplinary short courses exclusively for Stanford graduate students and postdoctoral scholars. VPGE also seeks to facilitate enrollment in courses outside of students' home departments and schools.

Leadership, pedagogy, communication, and entrepreneurship are topics of interest to graduate students across the University. VPGE collaborates with other departments, such as the Center for Teaching and Learning, the Graduate Life Office, and the Writing Center to raise the visibility and expand the breadth of these offerings.

STANFORD GRADUATE SUMMER INSTITUTE (SGSI)

Web site: http://sgsi.stanford.edu

SGSI courses introduce graduate students to multidisciplinary and interdisciplinary thinking. Students from across the University have the opportunity to meet others outside their fields, to create networks and foster cross-disciplinary collaborations. Most SGSI courses are small and taught in an intensive workshop format at the end of Summer Quarter. Courses do not bear academic credit, nor are students charged tuition or fees.

GRADUATE SCHOOL OF BUSINESS

Emeriti: (Professors) David P. Baron, William H. Beaver, Charles P. Bonini, Alain C. Enthoven,* Robert J. Flanagan,* Gayton E. Germane, Charles A. Holloway,* Charles T. Horngren, James E. Howell, Robert K. Jaedicke, Harold J. Leavitt, James G. March, Joanne Martin, Gerald M. Meier, Arjay Miller, James R. Miller III, William F. Miller, David B. Montgomery, George G. C. Parker,* Jerry I. Porras, James T. S. Porterfield, Michael L. Ray, Henry S. Rowen, Myron S. Scholes, William F. Sharpe, George P. Shultz, A. Michael Spence, James C. Van Horne,* Robert B. Wilson*; *(Associate Professor)* Andrea Shepard; *(Senior Lecturers) David L. Bradford,** Steven Brandt, Kirk O. Hanson; *(Lecturer)* Robert Augsburger

Dean: Robert L. Joss

Senior Associate Deans: Mary E. Barth, David M. Kreps, D. John Roberts, Daniel N. Rudolph, Kenneth J. Singleton

Associate Deans: Gale H. Bitter, Christina Einstein, Sharon J. Hoffman, David Kennedy, Karen A. Wilson

Assistant Deans: Derrick Bolton, Andrew Chan, Robert Urstein, Randy Yee

Professors: Jennifer L. Aaker, Anat R. Admati, William P. Barnett, Mary E. Barth, Jonathan Bendor, David W. Brady, Anthony S. Bryk, Jeremy I. Bulow, Robert A. Burgelman, Glenn R. Carroll, Peter M. DeMarzo, J. Darrell Duffie, George Foster, Steven R. Grenadier, Deborah H. Gruenfeld, Michael T. Hannan, J. Michael Harrison, Chip Heath, Peter B. Henry, Robert L. Joss, Daniel P. Kessler, Roderick M. Kramer, Keith Krehbiel, David M. Kreps, Sunil Kumar, David F. Larcker, James M. Lattin, Edward P. Lazear, Hau L. Lee, John G. McDonald, Maureen F. McNichols, Haim Mendelson, Dale T. Miller, Margaret A. Neale, Charles A. O'Reilly, James M. Patell, Jeffrey Pfeffer, Paul C. Pfleiderer, Evan L. Porteus, Madhav Rajan, Hayagreeva Rao, Stefan J. Reichelstein, Peter C. Reiss, D. John Roberts, Paul M. Romer, Garth Saloner, Kathryn L. Shaw, Itamar Simonson, Kenneth J. Singleton, Venkataraman Srinivasan, Larissa Z. Tiedens, Lawrence M. Wein, Seungjin Whang, Stefanos Zenios

Associate Professors: C. Lanier Benkard, Ernesto Dal Bó, Jerker Denrell, Michaela M. Draganska, Yossi Feinberg, Francis J. Flynn, Ron Kasznik, Ilan Kremer, Phillip Leslie, Brian S. Lowery, Paul Oyer, III, Joseph D. Piotroski, Erica L. Plambeck, Baba Shiv, Kenneth W. Shotts, Andrzej Skrzypacz, Alan T. Sorensen, Jesper Sørensen, Zakary L. Tormala, Romain Wacziarg, S. Christian Wheeler, Jeffrey H. Zwiebel

Assistant Professors: Anne Beyer, Ilan Guttman, Wesley Hartmann, John W. Hatfield, Joy Ishii, Alan D. Jagolinzer, Dirk Jenter, Uzma Khan, Arthur G. Korteweg, Elizabeth Mullen, Stefan Nagel, Harikesh S. Nair, Sridhar Narayanan, Michael Ostrovsky, Ilya A. Strebulaev, Tunay I. Tunca

Professor (Teaching): James A. Phills, Jr.

Courtesy Professors: Timothy F. Bresnahan, Robert M. Daines, Alan M. Garber, Warren H. Hausman, Ronald A. Howard, Mark G. Kelman, Larry Kramer, Daniel A. McFarland, Debra E. Meyerson, Paul R. Milgrom, Walter W. Powell, Ilya Segal, Myra H. Strober, Robert I. Sutton, Paul Yock

Senior Lecturers: Jeffrey H. Moore, John D. Schramm

Lecturers: Douglas Abbey, Dick Allen, Laura K. Arrillaga, Rick Aubry, Wasim Azhar, Scott Bristol, Robert B. Chess, Margaret L. Eaton, R. James Ellis, Robert H. Fairbank, Richard P. Francisco, John W. Glynn Jr., Andrew S. Grove, William Guttentag, Brad Handler, David Hornik, Florence M. Hoylman, John Hurley, Franklin P. Johnson Jr., Mark Leslie, Leo E. Linbeck III, David Lockwood, Michael E. Marks, R. Bruce McKern, William L. McLennan, William F. Meehan III, Robert Miller, Marie Mookini, John P. Morgridge, Robert Pearl, Joel C. Peterson, Andrew Rachleff, Michael L. Rierson, Carole Robin, Dennis M. Rohan, Diane W. Savage, Eric E. Schmidt, Carl S. Spetzler, F. Victor Stanton, Peter C. Wendell, Evelyn Willliams, John C. Williams

Consulting Professors: H. Irving Grousbeck, Mark A. Wolfson

Visiting Professors: Terry L. Anderson, Christophe Crombez, Katharine C. Lyall

Visiting Associate Professors: Andrea Larson, Sanjog Misra

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* Recalled to active duty.

The mission of the Graduate School of Business is to create ideas that deepen and advance the understanding of management and, with these ideas, develop innovative, principled, and insightful leaders.

The two-year Master of Business Administration (M.B.A.) degree program is for students who aspire to contribute to society through leadership in business, government, and the nonprofit sector. The general management curriculum rests on a foundation of social science principles and management functions layered with interdisciplinary themes of leadership, entrepreneurship, global management, and social responsibility. The M.B.A. curriculum stresses breadth rather than depth, but includes options for certificates in Global Management and Public Management. A number of joint degree programs allow the M.B.A. to be combined with degrees in the Schools of Education, Law, and Medicine, as well as interdisciplinary degrees in Public Policy and Environmental Studies. The primary criteria for admission are demonstrated leadership potential, intellectual vitality, and diversity among students. No specific undergraduate major or courses are required for admission, but experience with analytic and quantitative concepts is important. Some students enter directly following undergraduate study, but most obtain one or more years of work experience.

The Stanford Sloan Program is an intensive, one-year course of study for middle management executives leading to the degree of Master of Science in Management. Participants must have demonstrated superior achievement and are normally sponsored by their company.

Those interested in college teaching and research are served by the Doctor of Philosophy program.

For detailed information on programs, curricula, and faculty, see the School's web site at http://www.gsb.stanford.edu.

SCHOOL OF EARTH SCIENCES

Dean: Pamela A. Matson

The School of Earth Sciences includes the departments of Geological and Environmental Sciences, Geophysics, Energy Resources Engineering (formerly Petroleum Engineering), the interdisciplinary Earth Systems undergraduate program, the graduate-level Interdisciplinary Program in Environment and Resources (IPER), and the graduate-level Earth, Energy, and Environmental Sciences Graduate Program (EEES). The Earth Systems Program offers study of biophysical and social dimensions of the Earth system focusing on environment and resource issues.

The aims of the school are (1) to prepare students for careers in the fields of biogeochemistry, environment and sustainable resource studies, geology, geochemistry, geomechanics, geophysics, geostatistics, hydrogeology, petroleum engineering, and petroleum geology; (2) to conduct research in the Earth sciences; and (3) to provide opportunities for Stanford undergraduates to learn about the planet's history, to understand the natural energy and resource base that supports humanity, and to appreciate the geological and geophysical hazards that affect human societies, as well as those factors that contribute to the quality of our environment.

To accomplish these objectives, the school offers a variety of programs adaptable to the needs of the individual student: four-year undergraduate programs leading to the degree of Bachelor of Science (B.S.); five-year programs leading to the coterminal Bachelor of Science and Master of Science (M.S.); and graduate programs offering the degrees of Master of Science, Engineer, and Doctor of Philosophy as described below. Details of individual degree programs are found in the section for each department or program.

UNDERGRADUATE PROGRAMS

Any undergraduate student admitted to the University may declare a major in one of the Earth Science departments or programs by contacting the appropriate department or program office.

Requirements for the B.S. degree are listed in each department or program section. Departmental academic advisers work with students to define a career or academic goal and assure that the student's curricular choices are appropriate to the pursuit of that goal. Advisers can help devise a sensible and enjoyable course of study that meets degree requirements and provides the student with opportunities to experience advanced courses, seminars, and research projects. To maximize such opportunities, students are encouraged to complete basic science and mathematics courses in high school or during their freshman year.

Each department offers an honors program involving research during the senior year. Each department also offers an academic minor for those undergraduates majoring in compatible fields. The Earth Systems Program also offers an honors program in Environmental Science, Technology, and Policy through the Woods Institute for the Environment.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

The Stanford coterminal degree plan enables an undergraduate to embark on an integrated program of study leading to the master's degree before requirements for the bachelor's degree have been completed. This may result in more expeditious progress towards the advanced degree than would otherwise be possible, making the program especially important to Earth scientists because the master's degree provides an excellent basis for entry into the profession. The coterminal plan permits students to apply for admission to a master's program after earning 120 units, but no later than the quarter prior to the expected completion of the undergraduate degree.

Under the plan, the student may meet the degree requirements in the more advantageous of the following two ways: by first completing the 180 units required for the B.S. degree and then completing the three quarters required for the M.S. degree; or by completing a total of 15 quarters during which the requirements for the two degrees are completed concurrently. In either case, the student has the option of receiving the B.S. degree upon meeting all the B.S. requirements or of receiving both degrees at the end of the coterminal program. Students earn degrees in the same department or program, in two different departments, or even in different schools; for example, a B.S. in Physics and an M.S. in Geological and Environmental Sciences. Students are encouraged to discuss the coterminal program with their advisers during their junior year. Additional information is available in the individual department offices.

GRADUATE PROGRAMS

Admission to the Graduate Program—A student who wishes to enroll for graduate work in the school must be qualified for graduate standing in the University and also must be accepted by one of the school's three departments or the interdisciplinary Ph.D. program. One requirement for admission is submission of scores on the verbal and quantitative sections of the Graduate Record Exam. Admission to one department of the school does not guarantee admission to other departments.

Faculty Adviser—Upon entering a graduate program, the student should report to the head of the department or program who arranges with a member of the faculty to act as the student's adviser, if that has not already been established through prior student-faculty discussions. The student, in consultation with the adviser, then arranges a course of study for the first quarter and ultimately develops a complete plan of study for the degree sought.

Financial Aid—Detailed information on scholarships, fellowships, and research grants is available from the school's individual departments and programs. Applications should be filed by the various dates listed in the application packet for awards that become effective in Autumn Quarter of the following academic year.

EARTH, ENERGY, AND ENVIRONMENTAL SCIENCES GRADUATE PROGRAM (EEES)

Director: Kevin R. Arrigo
Associate Director: Deana Fabbro-Johnston
Academic Oversight Committee: Kevin Arrigo (Geophysics), Biondo Biondi (Geophysics), Jef Caers (Energy Resources Engineering), Louis Durlofsky (Energy Resources Engineering), Scott Fendorf (Geological and Environmental Sciences)
Program Offices: Mitchell Building, Room 138
Mail Code: 2210
Phone: (650) 725-3183
Email: deana@stanford.edu
Web Site: http://earthsci.stanford.edu/EEES/

The goal of the Earth, Energy, and Environmental Sciences (EEES) is to complement the disciplinary Earth Science and Engineering programs offered within the departments of the School of Earth Sciences and to train graduate students to integrate knowledge from these disciplines through tools and methods needed to evaluate the linkages among physical, chemical, and biological systems of the Earth, and understand the dynamics or evolution of these integrated systems and the resources they provide.

Students in EEES must make significant headway in, and combine insights from, more than one scientific discipline. For example, a student whose goal is to understand the structure of the Earth's interior using computational methods might design a study plan that includes high-level mathematics, numerical modeling, and geophysical imaging techniques. A student interested in water management might integrate water flow analysis and modeling, geophysical imaging, geostatistics, and satellite remote sensing of changes in agricultural intensity and land use. A student interested in marine carbon cycling might use knowledge and tools from numerical modeling, marine biogeochemistry and geochemistry, oceanography, and satellite imaging. The key to the program is its academic flexibility and ability to exploit an increasingly interdisciplinary faculty, particularly in the School of Earth Sciences, but also in the greater Stanford community.

GRADUATE PROGRAMS

To ensure that students are appropriately placed in this program, a statement of purpose submitted with the application for admission must reflect the student's reasoning for pursuit of a crossdisciplinary program of study in contrast to a more traditional disciplinary one readily provided by a department in the School of Earth Sciences.

The University's basic requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

The objective of the M.S. degree in Earth, Energy, and Environmental Sciences is to prepare the student either for a professional career or for doctoral studies.

Students in the M.S. degree program must fulfill the following requirements:

1. Complete a 45-unit program of study, of which a minimum of 30 units must be course work, with the remainder consisting of no more than 15 research units.
2. Course work units must be divided among two or more scientific and/or engineering disciplines and can include the three core courses required for the Ph.D. degree.
3. The program of study must be approved by the research adviser and the academic oversight committee.
4. All students are required to complete a M.S. thesis, approved by the student's thesis committee.

DOCTOR OF PHILOSOPHY

In addition to the University's basic requirements for the doctorate, the Interdepartmental Program in Earth, Energy, and Environmental Sciences has the following requirements:

1. Prior to the formation of a thesis committee, the student works with research advisers and the academic oversight committee to design a course of study with depth in at least two areas of specialization and preparation in analytical methods and skills. Ph.D. students must take the three core courses: EEES 300, Earth Sciences Seminar; EEES 301, Earth Dynamics; and EEES 302, Challenges and Best Practices in Crossdisciplinary Research and Teaching. The research advisers and academic oversight committee have primary responsibility for the adequacy of the course of study.
2. Students must complete a minimum of 13 courses, including the three core courses and five courses from each of the two areas of specialization. At least half of the ten non-core classes must be at a 200 level or higher and all must be taken for a letter grade. Students obtaining their M.S. from within the program can apply all master's units toward Ph.D. requirements. Students with an M.S. degree or other specialized training from outside EEES may be able to waive some of the non-core course requirements, depending on the nature of the prior courses or training. The number and distribution of courses to be taken by these students is determined with input from the research advisers and academic oversight committee.
3. During Spring Quarter of each year, students must undergo an annual review by their thesis committee to allow the committee to monitor the progress of the student and make recommendations, where necessary.
4. Prior to taking the oral qualifying examination at or before the end of their 6th academic quarter, the student must have completed 24 units of letter-graded course work, developed a written crossdisciplinary dissertation proposal suitable for submission to a funding organization, and selected a thesis committee.
5. To be admitted to candidacy for the Ph.D. degree, the student must pass an oral qualifying examination. At least two of the minimum four-member examining committee must be faculty within the School of Earth Sciences. During the exam, students present and defend their proposed thesis research work; the exam generally takes the form of a 20-30 minute presentation by the student, followed by 1-2 hours of questioning.
6. The research advisers and two other faculty members comprise the dissertation reading committee. Upon completion of the thesis, the student must pass a University Oral Examination in defense of the dissertation.

In addition to the three core courses, students can select other courses from departments of the School of Earth Sciences and other University departments as appropriate. All courses must be approved by the student's thesis committee or by the academic oversight committee.

Additional information may be found in the *Graduate Student Handbook* at http://www.stanford.edu/dept/DoR/GSH/.

COURSES

Additional courses may be listed in the quarterly *Time Schedule.*

EEES 300. Earth Sciences Seminar—(Same as EARTHSYS 300, GES 300, GEOPHYS 300, IPER 300, ENERGY 300.) Required for incoming graduate students except coterms. Research questions, tools, and approaches of faculty members from all departments in the School of Earth Sciences. Goals are: to inform new graduate students about the school's range of scientific interests and expertise; and introduce them to each other across departments and research groups. Two faculty members present work at each meeting. May be repeated for credit.
1 unit, Aut (Matson, P; Graham, S)

EEES 301. Earth Dynamics—Required EEES core course. Features and dynamics characteristic of the atmosphere, ocean, and solid earth, and the physical, chemical, and biological connections that link them.
1 unit, Win (Staff)

EEES 302. Challenges and Practices in Crossdisciplinary Research and Teaching—Required EEES core course. Presentations by Earth Sciences faculty. Pedagogical tools to present interdisciplinary concepts to a non-specialist audience.

1 unit, Spr (Arrigo, K; Kennedy, J)

EEES 400. Research in Earth, Energy, and Environmental Sciences—May be repeated for credit.

1-15 units, Aut, Win, Spr, Sum (Staff)

EARTH SYSTEMS PROGRAM

Director: Robert B. Dunbar
Associate Director, Academics: Julie Kennedy, Senior Lecturer
Associate Director, Administration: Deana Fabbro-Johnston
Committee of the Whole: Kevin Arrigo (Geophysics, Earth, Energy and Environmental Sciences), Gregory Asner (Department of Global Ecology, Carnegie Institution), Carol Boggs (Biological Sciences), Margaret Caldwell (Law), Page Chamberlain (Geological and Environmental Sciences), Gretchen Daily (Biological Sciences, Interdisciplinary Program in Environment and Resources), Mark Denny (Biological Sciences, Hopkins Marine Station), Rodolfo Dirzo (Biological Sciences), Robert B. Dunbar (Geological and Environmental Sciences), William Durham (Anthropology), Gary Ernst (Geological and Environmental Sciences, emeritus), Walter Falcon (Freeman Spogli Institute for International Studies), Scott Fendorf (Geological and Environmental Sciences), Christopher Field (Department of Global Ecology, Carnegie Institution), Christopher Francis (Geological and Environmental Sciences), David Freyberg (Civil and Environmental Engineering), Margot Gerritsen (Energy Resources Engineering), Deborah Gordon (Biological Sciences), Lawrence Goulder (Economics), Elizabeth Hadly (Biological Sciences), George Hilley (Geological and Environmental Sciences), David Howell (Earth Systems), David Kennedy (History), Donald Kennedy (Biological Sciences, Freeman Spogli Institute for International Studies; emeritus), Julie Kennedy (Earth Systems), Rosemary Knight (Geophysics), Jeffrey Koseff (Civil and Environmental Engineering), Anthony Kovscek (Energy Resources Engineering), Gilbert Masters (Civil and Environmental Engineering), Pamela Matson (Dean, School of Earth Sciences, Freeman Spogli Institute for International Studies), Stephen Monismith (Civil and Environmental Engineering), Harold Mooney (Biological Sciences), Rosamond Naylor (Freeman Spogli Institute for International Studies), Franklin M. Orr, Jr. (Global Climate and Energy Project, Energy Resources Engineering), Jonathan Payne (Geological and Environmental Sciences), Joan Roughgarden (Biological Sciences), Stephen H. Schneider (Biological Sciences, Freeman Spogli Institute for International Studies), Gary Schoolnik (Medicine), Karen Seto (Geological and Environmental Sciences, Freeman Spogli Institute for International Studies), Jonathan Stebbins (Geological and Environmental Sciences), James Sweeney (Management Science and Engineering), Barton Thompson (Law), David Victor (Freeman Spogli Institute for International Studies), Peter Vitousek (Biological Sciences), Virginia Walbot (Biological Sciences), Mark Zoback (Geophysics)
Program Offices: Mitchell Building, Room 138
Mail Code: 94305-2210
Phone: (650) 725-7427
Email: deana@stanford.edu
Web Site: http://pangea.stanford.edu/ESYS/

Courses given in Earth Systems Program have the subject code EARTHSYS. For complete list of subject codes, see Appendix.

The Earth Systems Program is an interdisciplinary environmental studies major. Students learn about and independently investigate complex environmental problems caused by human activities in interaction with natural changes in the Earth System. Earth Systems majors become skilled in those areas of science, economics, and policy needed to tackle the globe's most pressing environmental problems, becoming part of a generation of scientists, professionals, and citizens who approach and solve problems in a new way: a systematic, interdisciplinary way.

For students to be effective contributors to solutions for such problems, their training and understanding must be both broad and deep. To this end, Earth Systems students take courses in the fundamentals of biology, calculus, chemistry, geology, and physics, as well as in computer science, economics and policy, and statistics. After completing breadth training, they concentrate on advanced work in one of five focus areas: biology, energy, environmental economics and policy, land management, or oceanography. Along with formal course requirements, Earth Systems students complete a 9-unit (270-hour) internship. The internship provides a hands-on academic experience working on a supervised field, laboratory, government, or private sector project of their choice.

The following is an outline of the sequential topics covered and skills developed in this major.

1. The fundamental components of the Earth Systems Program help students understand current environmental problems against the backdrop of natural change through introductory course work in geology, biology, and economics. Depending on the Earth Systems track chosen, training may also include introductions to the study of energy systems, microbiology, oceans, or soils. Students find that many programs and departments at Stanford offer courses that approach the role that humans play in affecting these systems. Students are encouraged to come to the Earth Systems office for course selection advice and to pick up a current list of environmental courses at Stanford.
2. Focus is on the fundamental interactions among the physical, biological, and human components of the Earth system: the dynamics of the interplay between natural variation and human-imposed influences is understood to achieve effective solutions to environmental problems.

   Earth Systems courses that introduce students to the dynamic and multiple interactions that characterize global change problems include EARTHSYS 10, Introduction to Earth Systems, and two core courses concerning, respectively, the biogeosphere and the anthrosphere: EARTHSYS 111, Biology and Global Change, and EARTHSYS 112, Environmental Economics and Policy.

   Competence in understanding system-level interactions is critical to development as an Earth Systems thinker, so additional classes that meet this objective are excellent choices as electives.
3. Development of skills to recognize, quantify, and report change in the environment: key analytical and computational tools and measurement systems are used for insight into global and regional environmental change, and in the development of solutions.

   Required foundation and breadth classes and track classes, students build skills in the student's ability to recognize, describe, quantify, and help solve complex problems that face society. For example, training in satellite remote sensing and geographic information systems is either required or recommended for all tracks. Quantification of environmental problems requiring training in calculus, linear algebra, chemistry, physics, programming, and statistics are required of majors. Specialized training, such as in laboratory or field methods, is recommended.

   Workable solutions to environmental problems require the ability to effectively communicate ideas and results. Writing intensive courses (WIM) help students to communicate complex concepts to expert and non-expert audiences. Stanford requires that each student complete one WIM course in the major. The WIM requirement is met through completion of the senior seminar. Other Earth Systems courses also focus on effective written and oral communication.
4. Work to design solutions to environmental problems that take into consideration natural processes as well as human needs: human needs must be met in sustainable ways that focus on ecosystem health, human prosperity, and long-term effectiveness.

A comprehensive list of environmental courses, and advice on those that focus on problem solving, is available in the program office. Students can also review the quarterly *Time Schedule* for solution-based courses. Among others, the following departments and programs may provide subject areas that are a useful guide: Anthropology, Biological Sciences, Civil and Environmental Engineering, Earth Systems, Economics, Geological and Environmental Sciences, Geophysics, Human Biology, International Policy Studies, International Relations, Law, Energy Resources Engineering, Political Science, Public Policy, and Urban Studies. Earth Systems emphasizes the importance of workable solutions through a required 9-unit internship, knowledge synthesis in the senior seminar, an optional upper division course on environmental problem solving, or an honors project. The Earth Systems Program provides an advising network that includes faculty, staff, and student peer advisers.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The B.S. in Earth Systems (ESYS) requires the completion of at least 110 units that can be divided into three levels of courses. The student must complete a series of courses comprising a broad base of specialized study and must complete five required and three elective courses in that track. Finally, the student must carry out a senior-level research or internship project and participate in the senior seminar (WIM). *Note:* students interested in earning a California Teaching Credential for general high school science through the STEP program should contact the program office for guidelines.

REQUIRED CORE

Subject and Catalog Number	*Units*
EARTHSYS 10. Introduction to Earth Systems	4
EARTHSYS 111. Biogeosphere	4
EARTHSYS 112. Environmental Economics and Policy	5
EARTHSYS 210. Senior Seminar	4
EARTHSYS 260. Internship *or* EARTHSYS 250. Directed Research	9

REQUIRED FOUNDATION AND BREADTH COURSES

Biology (any one course below):

BIOSCI 41. Genetics, Biochemistry, and Molecular Biology	5
or BIOSCI 43. Plant Biology, Evolution, and Ecology	5
or BIOSCI 101. Ecology	3
or HUMBIO 2A,B. Genetics, Evolution and Ecology; Culture Evolution, and Society	10

Chemistry:

CHEM 31A. Chemical Principles I	4
CHEM 31B. Chemical Principles II	4
or CHEM 31X. Chemical Principles	4

Computer Programming:

CS 106. Programming Methodology	5

Economics:

ECON 1A. Elementary Microeconomics	5
ECON 50. Economic Analysis I	5

Geological and Environmental Sciences:

GES 1. Fundamentals of Geology	5

Mathematics:

MATH 19. Calculus	3
MATH 20. Calculus	3
MATH 21. Calculus	4
or MATH 41. Calculus	5
MATH 42. Calculus	5
and MATH 51. Linear Equations and Differential Calculus of Several Variables	5

Probability and Statistics (any one course below):

BIOHOPK 174H. Experimental Design and Probability	3
BIOSCI 141 (same as STATS 141). Biostatistics	4
ECON 102A. Introduction to Statistical Methods	5
GES 160. Statistical Methods for Earth and Environmental Sciences	4
GES 161. Geostatistics	4
STATS 110. Statistical Methods in Engineering and Physical Sciences	4
STATS 116. Theory of Probability	3-5
STATS 160. Introduction to Statistical Methods	5

Physics:

PHYSICS 41. Mechanics	4

More extensive work in mathematics and physics may be expected for those planning graduate study. Graduate study in ecology and evolutionary biology and in economics requires familiarity with differential equations, linear algebra, and stochastic processes. Graduate study in geology, oceanography, and geophysics may require more physics and chemistry. Students should consult their adviser for recommendations beyond the requirements specified above.

TRACKS

BIOSPHERE

ADDITIONAL FOUNDATION AND BREADTH COURSES:

BIOSCI 41. Genetics, Biochemistry, and Molecular Biology	5
BIOSCI 43. Plant Biology, Evolution, and Ecology	5
CHEM 33. Structure and Reactivity	4

Biogeochemistry (choose one):

BIOSCI 216 (Same as GES 220). Terrestrial Biogeochemistry	4
EARTHSYS 189. Field Studies in Earth Systems	5
GEOPHYS 131. Marine Biogeochemistry	3-4
GES 175. Science of Soils	3

Conservation Biology (choose one):

HUMBIO 112. Conservation Biology	4
BIOHOPK 173H. Marine Conservation Biology	1-3

Ecology (choose two):

BIOSCI 101. Ecology	3
BIOSCI 125. Ecosystems of California	3
BIOSCI 136. Evolutionary Paleobiology	4
BIOSCI 145. Behavioral Ecology	4

Ecosystems and Society (choose one):

ANTHSCI 162. Indigenous Peoples and Environmental Problems	3-5
ANTHSCI 164. Ecological Anthropology	3-5
ANTHSCI 179. Environmental Change and Emerging Infectious Diseases	3-5

ANTHROSPHERE

ADDITIONAL FOUNDATION AND BREADTH COURSES:

CHEM 33. Structure and Reactivity	4
PHYSICS 45. Light and Heat	4

Choose one course in each of the three sub-categories, total six required. At least one of the six must be a skills class marked with and asterisk (*).

Economics and Environmental Policy:

ECON 51. Economic Analysis II	5
ECON 102B.* Introduction to Econometrics	5
ECON 150. Economic Policy Analysis	5
ECON 154. Economics of Legal Rules and Institutions	5
ECON 243. Economics of the Environment	2-5
EARTHSYS 147. Controlling Climate Change in the 21st Century	3
EARTHSYS 175. The California Coast: Science, Policy, and Law	3-4
MSE 243. Energy and Environmental Policy Analysis	3
MSE 248. Economics of Natural Resources	3-4

Social Entrepreneurship and the Environment:

MSE 245G. Finance 1 for Non-MBAs	4
MSE 280. Organizational Behavior: Evidence in Action	3-4
MSE 285. Negotiation	3
URBANST 132.* Concepts and Analytical Skills for the Social Sector	4
URBANST 133. Social Entrepreneurship Collaboratory	4

Sustainable Development:

ANTHSCI 162. Indigenous Peoples and Environmental Problems	3-5
ANTHSCI 163. Human Behavioral Ecology	3-5
ANTHSCI 164. Ecological Anthropology	3-5
BIOSCI 102. Demography: Health, Development, Environment	3
CASA 185. Environmental Ethics	3-5
CASA 343. Culture as Commodity	5
CASA 349. Anthropology of Capitalism	4-5
CASA 364. The Anthropology of Development	5
CEE 124. Sustainable Development Studio	1-5
CEE 142A. Sustainable Development	3
EARTHSYS 180. Fundamentals of Sustainable Agriculture	3
ECON 52. Economic Analysis III	5
POLISCI 140. Political Economy of Development	5
POLISCI 143. Nongovernmental Organizations and Development in Poor Countries	5
POLISCI 441. Politics of Development	5
URBANST 163. Land Use Control	4

LAND SYSTEMS

ADDITIONAL FOUNDATION AND BREADTH COURSES:

EARTHSYS 144. Fundamentals of GIS	4
or EARTHSYS 142. Remote Sensing of Land Cover and Land Use	4

Choose six courses, with at least one from each grouping:

Land:

BIOSCI 125. Ecosystems of California	3
BIOSCI 144. Conservation Biology	3-4
EARTHSYS 180. Fundamentals of Sustainable Agriculture	3
EARTHSYS 189. Field Studies in Earth Systems	5
ECON 106. World Food Economy	5
GES 175. Science of Soils	4
HISTORY 254. Popular Culture and American Nature	5

Water:

CEE 101B. Mechanics of Fluids	4
CEE 166A. Watersheds and Wetlands	3
CEE 171. Environmental Planning Methods	3
CEE 265D. Water and Sanitation in Developing Countries	3
EARTHSYS 104. The Water Course	3
GES 130. Soil Physics and Hydrology	3

Urban:

CEE 176A. Energy Efficient Buildings	3
GES 138. Urbanization, Global Change, and Sustainability	3
HISTORY 252G. Environmental History of Urban America	5
HISTORY 267E. The Suburban West	5
HISTORY 267F. Cities in the North American West, 1840-1940	4-5
URBANST 110. Introduction to Urban Studies	4
URBANST 113. Introduction to Urban Design	5
URBANST 163. Land Use Control	4
URBANST 165. Sustainable Urban and Regional Transportation Planning	4-5

ENERGY SCIENCE AND TECHNOLOGY

CEE 176A. Energy Efficient Buildings	3-4
CEE 176B. Electric Power: Renewables and Efficiency	3-4
EARTHSYS 101. Energy and the Environment	3
or EARTHSYS 103. Energy Resources	4-5
ENGR 30. Engineering Thermodynamics	3
PHYSICS 43. Electricity and Magnetism	3

OCEANS

ADDITIONAL FOUNDATION AND BREADTH COURSES:

GES 8. The Oceans: An Introduction to the Marine Environment	3
PHYSICS 45. Light and Heat	4

Physics of the Sea:

CEE 164. Introduction to Physical Oceanography	4

Biological Oceanography (choose one):

BIOHOPK 163H. Oceanic Biology	4
GEOPHYS 131. Marine Biogeochemistry	3-4

Remote Sensing of the Ocean (choose one):

GEOPHYS 141. Remote Sensing of the Ocean	4
GES 144. Fundamentals of Geographic Information Science (GIS)	4

Additional Requirement (choose one):

One quarter Stanford at Sea (EARTHSYS 323)
One quarter abroad at the Stanford in Australia Program
One quarter at the Hopkins Marine Station

UPPER-DIVISION ELECTIVES

Three intermediate to advanced courses, 100 level or above, minimum of 3 units, consistent with the primary track are required of majors and must be approved. Eligible upper-division electives are listed below. Additional courses may be selected; see the program office for the most current list.

BIOSPHERE TRACK

BIOHOPK 161H. Invertebrate Zoology	5
BIOHOPK 163H. Oceanic Biology	4
BIOHOPK 164H. Marine Botany	4
BIOSCI 120. General Botany	3-5
BIOSCI 139. Biology of Birds	3
BIOSCI 184. Principles of Biosystematics	4
BIOSCI 215. Biochemical Evolution	3
BIOSCI 216. Terrestrial Biogeochemistry	3
EARTHSYS 180. Fundamentals of Sustainable Agriculture	3

ANTHROSPHERE TRACK

ANTHSCI 160B. Conservation Anthropology	5
CEE 171. Environmental Planning Methods	4
CEE 266A. Watersheds and Wetlands	3
CEE 266B. Floods and Droughts, Dams and Aqueducts	3
CEE 266C. Water Resources and Water Hazards Field Trips	2
ECON 158. Antitrust and Regulation	5
ECON 165. International Economics	5
MSE 241. Economic Analysis	3-4
PUBLPOL 103B. Ethics and Public Policy	5
GSBGEN 339. Environmental Entrepreneurship	4

LAND SYSTEMS TRACK

Only two electives are required for the Land Systems track.

CEE 166B. Floods and Droughts, Dams and Aqueducts	3
CEE 173A. Energy Resources	4-5
CEE 175A. California Coast: Science, Policy, and Law	3-4
GES 112. Mapping the Geological Environment	3
GES 131. Environmental Earth Sciences II: Fluvial Systems and Landscape Evolution	3
HISTORY 268S. American Wests: Studies in Culture and the Environment	4-5
INTNLREL 161A. Global Human Geography: Asia and Africa	5
INTNLREL 161B. Global Human Geography: Europe and Americas	5
URBANST 132. Concepts and Analytic Skills for the Social Sector	4

ENERGY SCIENCE AND TECHNOLOGY TRACK

CEE 156. Building Systems	4
EARTHSYS 102. Renewable Energy Sources and Greener Energy Processes	3
ECON 158. Antitrust and Regulation	5
EE 293A. Fundamentals of Energy Processes	3
EE 293B. Fundamentals of Energy Processes	3
ENERGY120. Fundamentals of Petroleum Engineering	3
ENERGY 260. Groundwater Pollution and Oil Slicks: Environmental Problems in Petroleum Engineering	3
ENERGY269. Geothermal Reservoir Engineering	3
GEOPHYS 200A. Oil and Water: Oil Peaks and Oil Panics	2-3
ME 131A. Heat Transfer	3

OCEANS TRACK

BIOHOPK 161H. Invertebrate Zoology	5
BIOHOPK 163H. Principles of Oceanic Biology	4
BIOHOPK 164H. Marine Botany	4
EARTHSYS 175. The California Coast: Science, Policy, and Law	3-4

SUMMARY OF COURSE REQUIREMENTS AND UNITS

Earth Systems Introduction and Core	26
Required allied courses	49-62
Tracks:	
Anthrosphere	24-30
Biosphere	23
Energy Science and Technology	24
Land Systems	23
Oceans	28
Upper-division electives	9-15
Senior research or internship	9
Senior seminar	4
Total units (depending on track, electives)...	110-140

HONORS

The honors program in Earth Systems provides students with an opportunity to pursue individual research within a specific area or between areas of Earth Systems, through a year-long mentored research project with an Earth Systems-affiliated faculty member that culminates in a written thesis.

To be admitted to the honors program, applicants must maintain a minimum GPA of 3.3 in Earth Systems course work. Potential honors students should complete the Biogeosphere and Anthrosphere sequence by the end of the junior year. Qualified students apply in Spring Quarter of the junior year, or the fourth quarter before graduation, by submitting a detailed research proposal and a brief statement of support from a faculty research adviser. Students who elect to do an honors thesis should begin planning no later than Winter Quarter of the junior year.

A maximum of 9 units is awarded for thesis research through EARTHSYS 199. Those 9 units may not substitute for any other required parts of the Earth Systems curriculum. All theses are evaluated for acceptance by the thesis faculty adviser and one additional member of the Earth Systems committee of the whole.

Honors students are encouraged to present their research through the School of Earth Sciences Annual Research Review, which highlights undergraduate and graduate research in the school during the annual visit of the School of Earth Sciences external advisory board. Faculty advisers are encouraged to sponsor presentation of student research results at professional society meetings.

Students interested in a group-oriented, interdisciplinary honors experience should investigate the Goldman Interschool Honors Program in Environmental Science, Technology, and Policy, a program of the Woods Institute for the Environment. More information on Goldman cmay be obtained by phoning (650) 723-5697.

COTERMINAL B.S. AND M.S. DEGREES

The Stanford coterminal degree enables an undergraduate to embark on an integrated program of study leading to the master's degree before requirements for the bachelor's degree have been completed. An undergraduate majoring in Earth Systems may apply to work simultaneously toward B.S. and M.S. degrees. The M.S. degree in Earth Systems provides the student with enhanced tools to evaluate the primary literature of the discipline most closely associated with the student's track and allows an increased specialization through additional course work that may include 9 units of thesis research. Integration of earth systems concepts is furthered by participation in the master's seminar.

To apply, complete and return to the Earth Systems office an application that includes: a statement of purpose; a Stanford transcript; two letters of recommendation, one of which must be from the master's adviser; and a list of courses that fulfill degree requirements signed by the Associate Director, Academics, and the master's adviser. Applications must be submitted by the quarter preceding the anticipated quarter of graduation. A $50 application fee is assessed by the Registrar's Office for coterminal applications. Students may either (1) complete 180 units required for the B.S. degree and then complete the three quarters required for the M.S. degree, or (2) complete a total of 15 quarters during which the requirements of the degrees are fulfilled concurrently. The student has the option of receiving the B.S. degree after completing that degree's requirements or receiving two degrees concurrently at the end of the master's program.

These requirements must be fulfilled to receive an M.S. degree:

1. All requirements for the B.S. degree.
2. Further course work (and/or thesis research), all of which should be at the 100-level or above, including 22 units at the 200-level or above, leading to further focus within the student's track.
3. Participation in the master's seminar.

The program consists of a minimum of 45 units of course work and/or thesis research, at least 22 of which must be at the 200-level or above.

The student must devise a program of study that shows a level of specialization appropriate to the master's level, as determined in consultation with the adviser. The program should demonstrate further specialization and focus within the student's undergraduate track.

With the adviser's approval, 9 units may be in the form of research. This may culminate in the preparation of a master's thesis; however, a thesis is not required for the degree. Master's students must take part in the Winter Quarter master's seminar (EARTHSYS 290) and have additional responsibilities appropriate to the master's level (thesis presentation, modeling problems, and so on), 2 units.

A more detailed description of the coterminal master's degree program may be obtained from the program office. For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

COURSES

WIM indicates that the course satisfies Writing in the Major requirements.

UNDERGRADUATE

EARTHSYS 10. Introduction to Earth Systems—For non-majors and prospective Earth Systems majors. Multidisciplinary approach using the principles of geology, biology, engineering, and economics to describe how the Earth operates as an interconnected, integrated system. Goal is to understand global change on all time scales. Focus is on sciences, technological principles, and sociopolitical approaches applied to solid earth, oceans, water, energy, and food and population. Case studies: environmental degradation, loss of biodiversity, and resource sustainability. GER:DB-NatSci
4 units, Win (Ernst, G)

EARTHSYS 45N. Energy Issues Confronting the World—(Same as GES 45N.) Stanford Introductory Seminar. Preference to freshman. Geologic, economic, and policy issues shaping energy use and contrasting human perceptions of energy security. Topics include discourse of resources, history and future of fossil fuels, curse of oil, global climate change, adaptation versus mitigation, relationship between wealth and energy, demand and strategies for efficiency and conservation, alternative energy prospects, geopolitics of energy trading, and energy flow among countries of the world. Game simulation, outside readings, class brainstorming, and student oral presentations on country energy profiles. GER:DB-NatSci
3 units, Win (Howell, D; Graham, S)

EARTHSYS 85. Troubled Waters—Adjunct to the public lecture series Troubled Waters which includes a primer on water, discussions about the state of water sources, pollution challenges, the dynamics of water in rivers and aqueducts, the effects of levees and dams, water risks in the form of floods and droughts, and the outlook for freshwater in the future. Corequisite: attendance at the lecture series.
1 unit, Win (Howell, D), offered once only

EARTHSYS 100. Exploring Interdisciplinary Problem Solving—Preference to Earth Systems sophomores and juniors. The relationship between the Earth Systems curriculum and environmental problem solving. Interdisciplinary problem solving processes from problem definition to solution development and evaluation. The rationale behind components of Earth Systems training and its relationship to applied interdisciplinary environmental analysis. Case studies and guest speakers.
3 units, not given this year

EARTHSYS 101. Energy and the Environment—(Same as ENERGY 101.) Energy use in modern society and the consequences of current and future energy use patterns. Case studies illustrate resource estimation, engineering analysis of energy systems, and options for managing carbon emissions. Focus is on energy definitions, use patterns, resource estimation, pollution. Recommended: MATH 21 or 42, ENGR 30. GER:DB-EngrAppSci
3 units, Win (Kovscek, A; Durlofsky, L; Gerritsen, M)

EARTHSYS 102. Renewable Energy Sources and Greener Energy Processes—(Same as ENERGY 102.) The energy sources that power society are rooted in fossil energy although energy from the core of the Earth and the sun is almost inexhaustible; but the rate at which energy can be drawn from them with today's technology is limited. The renewable energy resource base, its conversion to useful forms, and practical methods of energy storage. Geothermal, wind, solar, biomass, and tidal energies; resource extraction and its consequences. Recommended: 101, MATH 21 or 42. GER:DB-NatSci
3 units, Spr (Kovscek, A; Gerritsen, M)

EARTHSYS 103. Energy Resources—(Same as CEE 173A/207A.) Oil, natural gas, coal, nuclear, hydro, solar, geothermal, biomass, wind, and ocean energy resources in terms of supply, distribution, recovery and conversion, environmental impacts, economics, policy, and technology. The opportunities for energy efficiency, electric power basics, the changing role of electric utilities, transportation basics, and energy use in developing countries. Field trips. Recommended: CEE 70. GER:DB-EngrAppSci
4-5 units, Aut (Woodward, J)

EARTHSYS 104. The Water Course—(Same as GEOPHYS 104.) The pathway that water takes from rainfall to the tap using student home towns as an example. How the geological environment controls the quantity and quality of water; taste tests of water from around the world. Current U.S. and world water supply issues. GER:DB-NatSci

3 units, Spr (Knight, R)

EARTHSYS 108/208. Coastal Wetlands—Ecological structure and function of wetlands emphasizing local, coastal wetlands. Topics include: wetland distribution, classification, and history; and interactions between biotic and abiotic components of wetland ecosystems. Labs and local field trips for exposure to landscape patterns, and common sampling equipment and methods. Recommended: 104 or CEE 166A. GER:DB-NatSci

3 units, alternate years, not given this year

EARTHSYS 111. Biology and Global Change—(Same as BIOSCI 117, GEOPHYS 117.) The biological causes and consequences of anthropogenic and natural changes in the atmosphere, oceans, and terrestrial and freshwater ecosystems. Topics: glacial cycles and marine circulation, greenhouse gases and climate change, tropical deforestation and species extinctions, and human population growth and resource use. Prerequisite: Biological Sciences or Human Biology core or graduate standing. GER:DB-NatSci

4 units, Win (Vitousek, P; Arrigo, K)

EARTHSYS 112. Environmental Economics and Policy—(Same as ECON 155.) Economic sources of environmental problems and alternative policies for dealing with them (technology standards, emissions taxes, and marketable pollution permits). Evaluation of policies addressing regional air pollution, global climate change, water allocation in the western U.S., and the use of renewable resources. Connections between population growth, economic output, environmental quality, and human welfare. Prerequisite: ECON 50. GER:DB-NatSci

5 units, Win (Goulder, L)

EARTHSYS 113. Earthquakes and Volcanoes—(Same as GEOPHYS 113.) Earthquake location, magnitude and intensity scales, seismic waves, styles of eruptions and volcanic hazards, tsunami waves, types and global distribution of volcanoes, volcano forecasting. Plate tectonics as a framework for understanding earthquake and volcanic processes. Forecasting; earthquake resistant design; building codes; and probabilistic hazard assessment. For non-majors and potential earth scientists. GER:DB-EngrAppSci

3 units, not given this year

EARTHSYS 114. Field Course on Tropical Biogeochemistry: Amazon as Case Study—(Same as BIOSCI 114.) Post-field seminar for students who went on the two-week field trip to the Amazon in September with Brazilian students under Professor Martinelli of the University of São Paulo and Stanford Latin American Studies. Land use changes over the last 30 years including the conversion of natural forest for cattle ranching and soy beans in the Amazon, the largest continuous area of tropical forests on Earth with the greatest number of plant and animal species. In English.

3 units, Aut (Vitousek, P)

EARTHSYS 123. From Local to Global: Collaborations for International Environmental Education—(Same as EDUC 122X.) A collaboration with three universities in Africa. Discourse and debate using Internet and mobile technology interactions. Topics include the global environment, climate change, sustainable development, and food security.

2 units, Aut (Goldman, S)

EARTHSYS 124/224. Environmental Justice: Local, National, and International Dimensions—Focus is on whether minorities and low income citizens suffer disproportionate environmental and health impacts resulting from government and corporate decision making in contexts such as the siting of industrial facilities and waste dumps, toxic chemical use and distribution, and the enforcement of environmental mandates and policies. Implications of environmental justice issues at the international level, emphasizing climate change.

4 units, Aut (Burns, W)

EARTHSYS 141/241. Remote Sensing of the Oceans—(Same as GEOPHYS 141/241.) How to observe and interpret physical and biological changes in the oceans using satellite technologies. Topics: principles of satellite remote sensing, classes of satellite remote sensors, converting radiometric data into biological and physical quantities, sensor calibration and validation, interpreting large-scale oceanographic features. GER:DB-NatSci

3 units, Win (Arrigo, K)

EARTHSYS 142/242. Remote Sensing of Land Use and Land Cover—(Same as GES 142.) The use of satellite remote sensing to monitor land use and land cover, with emphasis on terrestrial changes. Topics include pre-processing data, biophysical properties of vegetation observable by satellite, accuracy assessment of maps derived from remote sensing, and methodologies to detect changes such as urbanization, deforestation, vegetation health, and wildfires.

4 units, not given this year

EARTHSYS 144. Fundamentals of Geographic Information Science (GIS)—(Same as GES 144.) Survey of geographic information including maps, satellite imagery, and census data, approaches to spatial data, and tools for integrating and examining spatially-explicit data. Emphasis is on fundamental concepts of geographic information science and associated technologies. Topics include geographic data structure, cartography, remotely sensed data, statistical analysis of geographic data, spatial analysis, map design, and geographic information system software. Computer lab assignments. GER:DB-NatSci

4 units, Spr (Seto, K)

EARTHSYS 145/245. Energy Flow and Policy: The Pacific Rim—(Same as GES 145/245.) Factors shaping energy use and development throughout the Pacific Rim. Topics include fossil and alternative energy resources, supply and trade vulnerabilities, the geopolitics of energy use, and the environmental and social impacts of waste streams. Class develops a game simulation based on critical energy issues, student-initiated energy projections, and assessment of the principal stakeholders.

3 units, alternate years, not given this year

EARTHSYS 147/247. Controlling Climate Change in the 21st Century—(Same as BIOSCI 147/247, HUMBIO 116.) The science, economics, and environmental diplomacy of global climate change. Topics: the science of climate change, climate change and global environmental law; global economic approaches to carbon abatement, taxes, and tradable permits; joint implementation, consensus, and division in the EU; gaining the support of China, other developing countries, and U.S. corporations; alternative energy and energy efficiencies for less carbon-intensive electric power and transport. GER:DB-NatSci

3 units, alternate years, not given this year

EARTHSYS 164. Introduction to Physical Oceanography—(Same as CEE 164/262D.) The dynamic basis of oceanography. Topics: physical environment; conservation equations for salt, heat, and momentum; geostrophic flows; wind-driven flows; the Gulf Stream; equatorial dynamics and ENSO; thermohaline circulation of the deep oceans; and tides. Prerequisite: PHYSICS 41 (formerly 53). GER:DB-NatSci

4 units, Spr (Hench, J)

EARTHSYS 165. Promoting Behavior Change—(Same as HUMBIO 165.) How to apply principles of behavioral change to a real world public health problem: climate change and environmental sustainability. Sources include theory, research, and practice from perspectives such as social and cognitive psychology, media and communication, education, behavioral medicine, social marketing, and consumer behavior. Student groups create an intervention to help high school students reduce their environmental footprint. Research performed in local high schools to develop optimally feasible, acceptable, and effective interventions. Prerequisite: Human Biology core or equivalent, or consent of instructor.

4 units, Spr (Robinson, T)

EARTHSYS 167/267. Social Policy for Sustainable Resource Use—(Same as ANTHSCI 167/267.) The development of social policies that foster a positive human role in the ecosystem. Goal is to develop group skills in a team setting while researching case studies of forest peoples impacted by integration into the global economy. The case of voluntary forest product certification under the Forest Stewardship Council system. Local participation in policy development, the effectiveness of certification, tenure and institutional aspects of sustainability, indigenous rights and forest conservation, and the role of local communities and workers in sustaining forests over the long term. Prerequisite: consent of instructor. GER:DB-SocSci

5 units, Spr (Irvine, D)

EARTHSYS 167C/267C. Managing the Commons: Evolving Theories for Sustainable Resource Use—(Same as ANTHSCI 167C/267C.) Development of common property theory since Hardin's article on the tragedy of the commons. Interdisciplinary theorizing about sustainable management of common-pool resources such as grazing, forest, or marine resources; debates about sustainability of commons management within heterogeneous state and global systems; and new commons such as atmosphere or the information commons. Links among theory, methods, and policy. Prerequisite: ANTHSCI 190 or consent of instructor. GER:DB-SocSci

5 units, Aut (Irvine, D)

EARTHSYS 175/275. The California Coast: Science, Policy, and Law—(Same as CEE 175A/275A, LAW 514.) Interdisciplinary. The legal, science, and policy dimensions of managing California's coastal resources. Coastal land use and marine resource decision making. The physics, chemistry, and biology of the coastal zone, tools for exploring data from the coastal ocean, and the institutional framework that shapes public and private decision making. Field work: how experts from different disciplines work to resolve coastal policy questions.

3-4 units, Win (Caldwell, M; Boehm, A; Sivas, D)

EARTHSYS 180/280. Fundamentals of Sustainable Agriculture—(Same as BIOSCI 180/280.) Ecological, economic, and social dimensions of sustainable agriculture in the context of a growing world population. Focus is on management and technological approaches, and historical content of agricultural growth and change, organic agriculture, soil and water resource management, nutrient and pest management, biotechnology, ecosystem services, and climate change. GER:DB-NatSci

3 units, alternate years, not given this year

EARTHSYS 180B. Local Sustainable Agriculture—Field-based training in ecologically sound agricultural practices at the Stanford Community Farm; guest lectures from Bay Area farmers, agricultural educators, and food policy advocates; and a field trip to an educational farm. Weekly fieldwork led by an instructor with extensive organic farming experience. Topics include bed preparation, starting seedlings, composting, irrigation techniques, and harvesting methods. May be repeated for credit.

1 unit, Aut, Spr (Staff)

EARTHSYS 181/281. Concepts of Urban Agriculture—For advanced undergraduates and graduate students from all fields. Seminar. Current status of and potential for global urban agriculture. Topics include: environmental and economic dimensions of urban food production and sourcing; city policy and land-use planning; and an ecosystem services approach to urban agriculture. Developed and developing world contexts. Two field trips to nearby cities; guest lectures; case studies; group projects. Prerequisite: application.

2 units, Win (Matson, P)

EARTHSYS 189. Field Studies in Earth Systems—(Same as BIOSCI 206.) For advanced upper-division undergraduates and graduate students. Field-based, focusing on the components and processes by which terrestrial ecosystems function. Topics from biology, chemistry, ecology, geology, and soil science. Standard field techniques, experimental design, data analysisa, and written and oral presentation. Small team projects test the original questions in the functioning of natural ecosystems. Admission by application. Prerequisites: BIOSCI 141 or GES 160, or equivalent. GER:DB-NatSci

5 units, alternate years, not given this year

EARTHSYS 199. Honors Program in Earth Systems

1-9 units, Aut, Win, Spr, Sum (Staff)

EARTHSYS 205. Political Economy of Energy Policy—Theoretical frameworks used by political scientists, sociologists, economists, and other intellectuals to understand how societies make and implement public policies related to energy and how the energy industry responds. Topics include theories of the state, monopoly and regulation, public choice, organizational behavior, international agreements, and innovation. Applications of those theories to energy policy issues, such as ethanol, climate change, energy security, the role of national oil companies in the world oil market, the functioning of OPEC, and the California electricity crisis. Prerequisite: application.

4 units, Spr (Victor, D)

EARTHSYS 210. Senior Seminar—Oral and written communication skills. Each student presents results of the Earth Systems internship and leads discussion. Group project analyzing local environmental problems with Earth Systems approach. Peer reviews of internship papers. WIM

4 units, Aut, Spr (Kennedy, J)

EARTHSYS 215. Perspectives on the Environmental Implications of the North American Free Trade Agreement—New forms of environmental governance stipulated within NAFTA policy. Topics include: theories of free trade, economic liberalization, and transnational environmental governance; green technology transfers; agricultural and industrial economies and implications for workers; transboundary conservation, water, and air quality issues in the N. American west.

4-5 units, Spr (Staff)

EARTHSYS 250. Directed Research—Independent research related to student's primary track, carried out after the junior year, during the summer, and/or during the senior year. Student develops own project with faculty supervision. 10-15 page thesis. May be repeated for credit.

1-9 units, Aut, Win, Spr, Sum (Staff)

EARTHSYS 260. Internship—Supervised field, lab, private sector, or advocacy project, normally through an internship sponsored by government agencies or research institutions, or independently developed by the student with the written approval of the Associate Director of Academics. 10-15 page report.

1-9 units, Aut, Win, Spr, Sum (Staff)

EARTHSYS 290. Master's Seminar—Open to Earth Systems master's students only. Independent research, oral presentation of results, and preparation of an original proposal for innovative Earth Systems science/policy research.

2 units, Win (Kennedy, J)

EARTHSYS 297. Directed Individual Study in Earth Systems—Under supervision of an Earth Systems faculty member on a subject of mutual interest.

1-9 units, Aut, Win, Spr, Sum (Staff)

EARTHSYS 298. Advanced Topics in Earth Systems—For Earth Systems master's students only. Continuation of EARTHSYS 290. May be repeated for credit.

2 units, Spr (Kennedy, J)

EARTHSYS 299. M.S. Thesis

1-9 units, Aut, Win, Spr, Sum (Staff)

EARTHSYS 300. Earth Sciences Seminar—(Same as EEES 300, GES 300, GEOPHYS 300, IPER 300, ENERGY 300.) Required for incoming graduate students except coterms. Research questions, tools, and approaches of faculty members from all departments in the School of Earth Sciences. Goals are: to inform new graduate students about the school's range of scientific interests and expertise; and introduce them to each other across departments and research groups. Two faculty members present work at each meeting. May be repeated for credit.

1 unit, Aut (Matson, P; Graham, S)

EARTHSYS 323. Stanford at Sea—(Same as BIOHOPK 182H/323H.) Five weeks of marine science including oceanography, marine physiology, policy, maritime studies, conservation, and nautical science at Hopkins Marine Station, followed by five weeks at sea aboard a sailing research vessel in the Pacific Ocean. Shore component comprised of three multidisciplinary courses meeting daily and continuing aboard ship. Students develop an independent research project plan while ashore, and carry out the research at sea. In collaboration with the Sea Education Association of Woods Hole, MA. Only 6 units may count towards the BioSci major. GER:DB-NatSci

16 units, alternate years, not given this year

COGNATE COURSES

ANTHSCI 160B. Conservation Anthropology
5 units, not given this year

ANTHSCI 162/262. Indigenous Peoples and Environmental Problems
3-5 units, not given this year

ANTHSCI 163/263. Human Behavioral Ecology—(Same as HUMBIO 117.)
3-5 units, Aut (Bird, R)

ANTHSCI 164. Ecological Anthropology
3-5 units, not given this year

ANTHSCI 179/279. Environmental Change and Emerging Infectious Diseases—(Same as HUMBIO 114.)
3-5 units, Aut (Durham, W; Jones, J)

BIOHOPK 163H. Oceanic Biology
4 units, not given this year

BIOHOPK 164H/264H. Marine Botany
5 units, not given this year

BIOHOPK 174H/274H. Experimental Design and Probability
3 units, Spr (Watanabe, J)

BIOSCI 41. Genetics, Biochemistry, and Molecular Biology
5 units, Aut (Simoni, R; Bergmann, D)

BIOSCI 43. Plant Biology, Evolution, and Ecology
5 units, Spr (Gordon, D; Petrov, D; Mudgett, M)

BIOSCI 101. Ecology
3 units, Aut (Vitousek, P; Dirzo, R)

BIOSCI 102. Demography: Health, Development, Environment—(Same as HUMBIO 119)
3 units, not given this year

BIOSCI 125. Ecosystems of California
3 units, Spr (Mooney, H)

BIOSCI 136. Evolutionary Paleobiology
4 units, not given this year

BIOSCI 139. Biology of Birds
3 units, Spr (Root, T)

BIOSCI 141. Biostatistics—(Same as STATS 141.)
4-5 units, Aut (Rogosa, D)

BIOSCI 145. Behavioral Ecology—(Same as BIOSCI 245.)
4 units, Spr (Gordon, D)

BIOSCI 215. Biochemical Evolution
3 units, Win (Watt, W)

BIOSCI 216. Terrestrial Biogeochemistry
3 units, Spr (Vitousek, P), alternate years, not given next year

CASA 343. Culture as Commodity
5 units, Aut (Ebron, P)

CASA 349. Anthropology of Capitalism
4-5 units, Aut (Yanagisako, S)

CASA 364. The Anthropology of Development
5 units, not given this year

CEE 63/263C. Weather and Storms
3 units, Aut (Jacobson, M)

CEE 101B. Mechanics of Fluids
4 units, Spr (Koseff, J)

CEE 124. Sustainable Development Studio
1-5 units, Aut (Staff), Win (Staff), Spr (Staff)

CEE 142A/242A. Creating Sustainable Development
3 units, Win (Christensen, S)

CEE 151/251. Negotiation—(Same as ME 207, MS&E 285.)
3 units, Spr (Christensen, S)

CEE 156/256. Building Systems
4 units, Spr (Daly, A)

CEE 166A/266A. Watersheds and Wetlands
3 units, Aut (Freyberg, D)

CEE 166B/266B. Floods and Droughts, Dams and Aqueducts
3 units, Win (Freyberg, D)

CEE 171. Environmental Planning Methods
3 units, Win (Ortolano, L)

CEE 176A. Energy Efficient Buildings
3-4 units, Win (Masters, G)

CEE 176B. Electric Power: Renewables and Efficiency
3-4 units, Spr (Masters, G)

CEE 265D. Water and Sanitation in Developing Countries
3 units, Win (Davis, J)

CEE 266C. Advanced Topics in Hydrology and Water Resources
3 units, not given this year

CHEM 31A. Chemical Principles I
4 units, Aut (Chidsey, C)

CHEM 31B. Chemical Principles II
4 units, Win (Andersen, H)

CHEM 31X. Chemical Principles
4 units, Aut (Waymouth, R; Fayer, M), Sum (Staff)

CHEM 33. Structure and Reactivity
4 units, Win (Stack, T; Du Bois, J), Spr (Wender, P), Sum (Staff)

CS 106A. Programming Methodology—(Same as ENGR 70A)
3-5 units, Aut (Sahami, M), Win, Spr (Young, P), Sum (Staff)

ECON 1A. Introductory Economics A
5 units, Aut (Clerici-Arias, M), Win (Makler, C), Sum (Lampe, R)

ECON 50. Economic Analysis I
5 units, Aut (Abramitzky, R), Spr (Tendall, M), Sum (Aturupane, C)

ECON 51. Economic Analysis II
5 units, Aut (Tendall, M), Win (Einav, L), Sum (Nicholson, S)

ECON 52. Economic Analysis III
5 units, Win (Jaimovich, N), Spr (Klenow, P), Sum (Desmet, K)

ECON 102A. Introduction to Statistical Methods (Postcalculus) for Social Scientists
5 units, Aut, Win (Steiner, F)

ECON 102B. Introduction to Econometrics
5 units, Win (Mahajan, A), Spr (Staff)

ECON 118. Development Economics
5 units, Aut (Jayachandran, S)

ECON 154. Economics of Legal Rules and Institutions—(Same as PUBLPOL 106.)
5 units, Aut (Staff)

ECON 158. Antitrust and Regulation
5 units, Spr (Steiner, F)

ECON 165. International Trade and Finance
5 units, Aut (Fitzgerald, D), Win (Staiger, R; Sykes, A), Sum (Desmet, K)

ECON 243. Economics of Environment
2-5 units, Spr (Staff), not given next year

EE 140. The Earth From Space: Introduction to Remote Sensing
3 units, Win (Zebker, H)

EE 293A. Fundamentals of Energy Processes
3 units, Aut (da Rosa, A)

EE 293B. Fundamentals of Energy Processes
3 units, Win (da Rosa, A; Parker, M)

ENERGY 161. Statistical Methods for the Earth and Environmental Sciences: Geostatistics—(Same as GES 161.)
3-4 units, Win (Boucher, A)

ENERGY 269. Geothermal Reservoir Engineering
3 units, alternate years, not given this year

ENGR 30. Engineering Thermodynamics
3 units, Aut (Edwards, C), Win (Mitchell, R)

FINANCE 221. Finance for Non-MBAs—(Same as ECON 135, MS&E 245G.)
4 units, not given this year

GEOPHYS 136/236. Aerosols, Clouds, and Climate Change—(Same as CEE 161T/261T.)
3 units, Win (Tabazadeh, A)

GEOPHYS 161/261. Atmosphere and Global Environmental Change—(Same as CEE 161S/261S.)
3 units, Aut (Tabazadeh, A)

GEOPHYS 263. Atmospheric Heterogeneous Processes—(Same as CEE 261U.)
3 units, Spr (Tabazadeh, A)

GES 1. Dynamic Earth: Fundamentals of Earth Science
4 units, Aut, Spr (Scherer, H)

GES 8. The Oceans: An Introduction to the Marine Environment
3 units, Spr, Sum (Ingle, J)

GES 90. Introduction to Geochemistry
3-4 units, Win (Stebbins, J)

GES 112. Mapping the Geological Environment
3 units, Win (Pollard, D)

GES 130. Soil Physics and Hydrology
3 units, Aut (Loague, K)

GES 131. Fluvial Systems and Landscape Evolution
3 units, Win (Loague, K)

GES 138. Urbanization, Global Change, and Sustainability
3 units, Spr (Seto, K)

GES 160. Statistical Methods for Earth and Environmental Sciences: General Introduction
3 units, Spr (Switzer, P)

GES 175. Science of Soils
4 units, Spr (Fendorf, S)

GES 206. Antarctic Marine Geology
3 units, alternate years, not given this year

IPER 339. Environmental Entrepreneurship
4 units, Aut (Plambeck, E)

HISTORY 254. Popular Culture and American Nature
5 units, Spr (White, R)

HUMBIO 2A. Genetics, Evolution, and Ecology
5 units, Aut (Boggs, C; Durham, W; Francke, U)

HUMBIO 2B. Culture, Evolution, and Society
5 units, Aut (Klein, R; Brown, M)

HUMBIO 112. Conservation Biology—(Same as BIOSCI 144.)
3-4 units, Win (Boggs, C; Launer, A)

HUMBIO 118. Ecological Anthropology—(Same as ANTHSCI 164/264.)
3-5 units, not given this year

HUMBIO 174. Foundations of Bioethics
3 units, Win (Magnus, D)

INTNLREL 161B. Global Human Geography: Europe and Americas—(Same as HISTORY 106B.)
5 units, Win (Lewis, M)

MATH 19. Calculus
3 units, Aut (Lee, B), Win, Sum (Staff)

MATH 20. Calculus
3 units, Win (Lee, B), Spr (Staff)

MATH 21. Calculus
4 units, Spr (Lee, B)

MATH 41. Calculus
5 units, Aut (Lucianovic, M)

MATH 42. Calculus
5 units, Aut, Win (Butscher, A)

MATH 51. Linear Algebra and Differential Calculus of Several Variables
5 units, Aut, Win (Staff), Spr (Lucianovic, M), Sum (Staff)

MS&E 241. Economic Analysis
3-4 units, Win (Weber, T)

MS&E 248. Economics of Natural Resources
3-4 units, Aut (Sweeney, J)

MS&E 280. Organizational Behavior: Evidence in Action
3-4 units, Win (Sutton, R), Spr (Siino, R)

PHYSICS 41. Mechanics
4 units, Win (Susskind, L)

PHYSICS 43. Electricity and Magnetism
4 units, Spr (Osheroff, D)

PHYSICS 45. Light and Heat
4 units, Aut (Gratta, G), Sum (Staff)

POLISCI 140. Political Economy of Development
5 units, Win (Díaz-Cayeros, A)

POLISCI 143. Nongovernmental Organizations and Development in Poor Countries—(Same as INTNLREL 143.)
5 units, Win (Abernethy, D)

POLISCI 441. Politics of Development
5 units, Win (Díaz-Cayeros, A)

PSYCH 10. Introduction to Statistical Methods: Precalculus—(Same as STATS 60/160.)
5 units, Aut (Thomas, E), Win (Walther, G), Spr, Sum (Staff)

PUBLPOL 101. Politics and Public Policy—(Same as POLISCI 123.)
5 units, not given this year

PUBLPOL 104. Economic Policy Analysis—(Same as ECON 150.)
5 units, Spr (Staff)

STATS 110. Statistical Methods in Engineering and the Physical Sciences
4-5 units, Aut (Srinivasan, B), Sum (Staff)

STATS 116. Theory of Probability
3-5 units, Aut (Donoho, D), Spr (Wong, W), Sum (Staff)

STS 110. Ethics and Public Policy—(Same as MS&E 197, PUBLPOL 103B.)
5 units, Win (McGinn, R)

URBANST 110. Introduction to Urban Studies
4 units, Aut, Win (Stout, F)

URBANST 113. Introduction to Urban Design: Contemporary Urban Design in Theory and Practice
5 units, Win (Gast, G)

URBANST 132. Concepts and Analytic Skills for the Social Sector
4 units, Win (Kieschnick, M)

URBANST 133. Social Entrepreneurship Collaboratory
4 units, Aut (Edwards, M), Spr (Scher, L)

URBANST 163. Land Use Control
4 units, not given this year

URBANST 165. Sustainable Urban and Regional Transportation Planning
4-5 units, Spr (Kott, J)

OVERSEAS STUDIES

Courses approved for the Earth Systems major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

AUSTRALIA

OSPAUSTL 10. Coral Reef Ecosystems
3 units, Aut (Hoegh-Guldberg, O; Ward, S; Arrigo, K; Anthony, K)

OSPAUSTL 20. Coastal Resource Management
3 units, Aut (Johnstone, R; Chiffings, T)

OSPAUSTL 30. Coastal Forest Ecosystems
3 units, Aut (Hall, J; Duke, N)

SANTIAGO

OSPSANTG 58. Living Chile: A Land of Extremes
5 units, Aut, Spr (Staff)

ENERGY RESOURCES ENGINEERING

Emeriti: (Professors) John W. Harbaugh, Sullivan S. Marsden, Jr.
Chair: Louis J. Durlofsky
Professors: Khalid Aziz, Louis J. Durlofsky, Roland N. Horne, André Journel,* Franklin M. Orr, Jr.
Associate Professors: Jef Caers, Anthony R. Kovscek, Hamdi Tchelepi
Assistant Professor: Margot Gerritsen
Courtesy Professor: Stephan A. Graham
Lecturer: Louis M. Castanier
Consulting Professors: Warren K. Kourt, Robert G. Lindblom, Kiran Pande, Marco R. Thiele
Acting Assistant Professor: James Lambers

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Courses given in Energy Resources Engineering have the subject code ENERGY. For a complete list of subject codes, see Appendix.

Effective September 1, 2007, the Department of Energy Resources Engineering (ERE) now awards the following degrees: the Bachelor of Science, Master of Science, Engineer, and Doctor of Philosophy in Energy Resources Engineering. The department continues to award the Master of Science, Engineer, and Doctor of Philosophy in Petroleum Engineering. The Department no longer awards undergraduate degrees in Petroleum Engineering except in cases where students declared Petroleum Engineering as their major prior to academic year 2007-08. Current students who are at the early stages of their degree programs may, if they wish, be able to obtain a degree in Energy Resources Engineering rather than Petroleum Engineering. Consult the ERE student services office to determine the relevant program.

Energy resources engineers are concerned with the design of processes for energy recovery. Included in the design process are characterizing the spatial distribution of hydrocarbon reservoir properties, drilling wells, designing and operating production facilities, selecting and implementing methods for enhancing fluid recovery, examining the environmental aspects of petroleum exploration and production, monitoring reservoirs, and predicting recovery process performance. The Energy Resources Engineering curriculum provides a sound background in basic sciences and their application to practical problems to address the complex and changing nature of the field. Course work includes the fundamentals of chemistry, computer science, engineering, geology, geophysics, mathematics, and physics. Applied courses cover most aspects of energy resources engineering and some related fields like geothermal engineering and geostatistics. The curriculum emphasizes the fundamental aspects of fluid flow in the subsurface. These principles apply equally well to optimizing oil recovery from petroleum reservoirs and remediating contaminated groundwater systems. The program also has a strong interest in related energy topics such as renewable energy, global climate change, and CO_2 sequestration.

Faculty and graduate students conduct research in areas including: enhanced oil recovery by thermal means, gas injection, and the use of chemicals; flow of fluids in pipes; geostatistical reservoir characterization and mathematical modeling; geothermal engineering; natural gas engineering; carbon sequestration optimization; properties of petroleum fluids; reservoir simulation using computer models; and well test analysis. Undergraduates are encouraged to participate in research projects.

M.S., Engineer, and Ph.D. degrees may be awarded with field designations for students who follow programs of study in the fields of geostatistics, geothermal, crustal fluids, or environmental specialties.

The department is housed in the Green Earth Sciences Building and it operates laboratories for research in enhanced oil recovery processes and geothermal engineering. Students have access to a variety of computers for research and course work. Computers available for instruction and research include ten multiprocessor NT servers within the department, as well as campus-wide computer clusters. Each graduate student office has one 3 GHz Pentium 4 computer per student.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The four-year program leading to the B.S. degree provides a foundation for careers in many facets of the energy industry. The curriculum includes basic science and engineering courses that provide sufficient depth for a wide spectrum of careers in the energy and environmental industries.

One of the goals of the program is to provide experience integrating the skills developed in individual courses to address a significant design problem. In ENERGY 180, taken in the senior year, student teams design facilities for a real petroleum reservoir to meet specific management objectives.

PROGRAM

The requirements for the B.S. degree in Energy Resources Engineering are similar to those described in the "School of Engineering" section of this bulletin. Students must satisfy the University general education, writing, and language requirements. The normal Energy Resources Engineering undergraduate program automatically satisfies the University General Education Requirements (GERs) in the Disciplinary Breadth areas of Natural Sciences, Engineering and Applied Sciences, and Mathematics. Engineering fundamentals courses and Energy Resources Engineering depth and elective courses must be taken for a letter grade.

The Energy Resources Engineering undergraduate curriculum is designed to prepare students for participation in the energy industry or for graduate studies, while providing requisite skills to evolve as the energy landscape shifts over the next half century. The program provides a background in mathematics, basic sciences, and engineering fundamentals such as multiphase fluid flow in the subsurface. In addition, the curriculum is structured with flexibility that allows students to explore energy topics of particular individual interest.

In brief, the unit and subject requirements are:

Subject	*Minimum Units*
Energy Resources Core	18
Energy Resources Depth	18
Mathematics	25
Engineering Fundamentals and Depth	24
Science	30
Technology in Society	3-5
University Requirements:	
IHUM, GERs, Writing, Language	60-67
Total	180-186

The following courses constitute the normal program leading to a B.S. in Energy Resources Engineering. The program may be modified to meet a particular student's needs and interests with the adviser's prior approval.

REQUIRED CORE IN ENERGY RESOURCES ENGINEERING

The following courses constitute the core program in Energy Resources Engineering:

ENERGY 101. Energy Resources and the Environment	3
ENERGY 104. Technology in the Greenhouse: Options for Reducing Greenhouse Gas Emissions	3
ENERGY 120. Fundamentals of Petroleum Engineering	3
ENERGY 175. Well Test Analysis	3
ENERGY 161. Statistical Methods for the Earth and	4
Environmental Sciences	3-4
ENERGY 199. Senior Project and Seminar in Energy Resources (WIM)	4
Total	18

MATHEMATICS

MATH 41. Single Variable Calculus
and MATH 42. Single Variable Calculus
or MATH 19. Calculus
and MATH 20. Calculus
and MATH 21. Calculus
MATH 51. Linear Algebra and Differential Calculus of Several Variables
MATH 52. Integral Calculus of Several Variables
MATH 53. Ordinary Differential Equations with Linear Algebra
or CME 102. Ordinary Differential Equations for Engineers

SCIENCE

CHEM 31A. Chemical Principles
CHEM 31B. Chemical Principals II
or CHEM 31X may be substituted for CHEM 31A,B
CHEM 33. Structure and Reactivity
CHEM 171. Physical Chemistry
GES 1. Fundamentals of Geology
PHYSICS 29. Electricity and Magnetism
PHYSICS 41. Mechanics
PHYSICS 43. Electricity and Magnetism
PHYSICS 45. Light and Heat
PHYSICS 46. Light and Heat Laboratory

ENGINEERING FUNDAMENTALS

CS 106A. Programming Methodology
CS 106B. Programming Abstractions
or CS 106X may be substituted for CS 106A,B
ENGR 14. Applied Mechanics: Statics
ENGR 30. Engineering Thermodynamics
ENGR 60. Engineering Economy
ME 70. Introductory Fluids Engineering
Technology in Society, 1 course

EARTH AND ENERGY DEPTH CONCENTRATION

Choose courses from the list below for a total of at least 18 units. At least one course must be completed in each category. Courses must be planned in consultation with the student's academic adviser. Appropriate substitutions are allowed with the consent of the adviser.

Fluid Flow and the Subsurface

ENERGY 121. Fundamentals of Multiphase Flow	3
ENERGY 130. Well Log Analysis	3
ENERGY 175. Well Test Analysis	3
ENERGY 160. Groundwater Pollution and Oil Spills	3
ENERGY 180. Production Engineering	3
ENGR 62. Introduction to Optimization	4

3D Modeling of Subsurface Structures

ENERGY 141. Practice of 3D Subsurface Modeling	3
ENERGY 146. Reservoir Characterization	3
GEOPHYS 182. Reflection Seismology	3
GEOPHYS 112. Exploring the Geosciences with Matlab	3
GES 151. Sedimentary Geology	3

Earth and Energy Systems

ENERGY 102. Renewable Energy Resources	3
ENERGY 169. Geothermal Reservoir Engineering	3
CEE 70. Environmental Science and Technology	3
CEE 64. Air Pollution	3
CEE 173B. The Coming Energy Revolution	3
CEE 176B. Electric Power	3-4
GEOPHYS 104. The Water Course	3

MINOR

The minor in Energy Resources Engineering requires the following three courses plus three additional electives. Courses must be planned in consultation with an ERE adviser. Appropriate substitutions are allowed with the consent of the advisor.

Required courses:

ENERGY 101. Energy Resources and the Environment	3
ENERGY 120. Fundamentals of Petroleum Engineering	3
ENERGY 161. Statistics for Earth, Energy, and Environmental Sciences	3-4

Elective courses (at least 3 courses from the list below):

ENERGY 102. Renewable Energy Resources
ENERGY 104. Technology in the Greenhouse
ENERGY 121. Fundamentals of Multiphase Flow
ENERGY 130. Well Log Analysis
ENERGY 141. Practice of Geostatistics and Seismic Data Integration
ENERGY 146. Reservoir Characterization
ENERGY 169. Geothermal Reservoir Engineering
ENERGY 175. Well Test Analysis
ENERGY 180. Production Engineering
GEOPHYS 182. Reflection Seismology
GES 151. Sedimentary Geology

HONORS PROGRAM

A limited number of majors may be admitted to the honors program at the beginning of their senior year.

To be admitted, the student must have a grade point average (GPA) of at least 3.0 in all course work in the University. In addition to the minimum requirements for the B.S. degree, the student must complete 6 units of advanced energy resources engineering courses and at least 3 units of research (ENERGY 193).

Students who wish to be admitted to the honors program should consult with their adviser before the start of their senior year. Those who do not meet all of the formal requirements may petition the department for admission. Those completing the program receive the B.S. degree in Energy Resources Engineering with honors. An overall 3.5 GPA is required in all energy resources engineering courses for graduation with honors.

COTERMINAL B.S. AND M.S. PROGRAM

The coterminal B.S./M.S. program offers an opportunity for Stanford University students to pursue a graduate experience while completing the B.S. degree in any relevant major. Energy Resources Engineering graduate students generally come from backgrounds such as chemical, civil, or mechanical engineering; geology or other earth sciences; or physics or chemistry. Students should have a background at least through MATH 51A and CS 106 before beginning graduate work in this program.

The two types of M.S. degrees, the course work only degree and the research degree, as well as the courses required to meet degree requirements, are described below in the M.S. section. Both degrees require 45 units and may take from one to two years to complete depending on circumstances unique to each student.

Requirements to enter the program are two letters of recommendation from faculty members or job supervisors, a statement of purpose, scores from the GRE general test, and a copy of Stanford University transcripts. While the department does not require any specific GPA or GRE score, potential applicants are expected to compete favorably with graduate student applicants.

A Petroleum Engineering or Energy Resources Engineering master's degree can be used as a terminal degree for obtaining a professional job in the petroleum or geothermal industry, or in any related industry where analyzing flow in porous media or computer simulation skills are required. It can also be a stepping stone to a Ph.D. degree, which usually leads to a professional research job or an academic position.

Students should apply to the program any time after they have completed 105 undergraduate units, and in time to take ENERGY 120, the basic introductory course in Autumn Quarter of the year they wish to begin the program. Contact the Department of Energy Resources Engineering to obtain additional information. For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

The Energy Resources Engineering department offers two distinct degree programs at both the M.S and Ph.D. levels. One program leads to the degrees of M.S. or Ph.D. in Petroleum Engineering, and the other leads to the degrees of M.S. or Ph.D. in Energy Resources Engineering. The Engineer degree, which is offered in either Petroleum Engineering or Energy Resources Engineering, is an extended form of the M.S. degree with additional course work and research.

The University's basic requirements for M.S., Engineer, and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

The following are minimum requirements for a student in the Department of Energy Resources Engineering to remain in good academic standing regarding course work:

1. no more than one incomplete grade at any time
2. a cumulative grade point average (GPA) of 3.0
3. a grade point average (GPA) of 2.7 each quarter
4. a minimum of 15 units completed within each two quarter period (excluding Summer Quarter).

Unless otherwise stated by the instructor, incomplete grades in courses within the department are changed to 'NP' (not passed) at the end of the quarter after the one in which the course was given. This one quarter limit is a different constraint from the maximum one-year limit allowed by the University.

Academic performance is reviewed each quarter by a faculty committee. At the beginning of the next quarter, any student not in good academic standing receives a letter from the committee or department chair stating criteria that must be met for the student to return to good academic standing. If the situation is not corrected by the end of the quarter, possible consequences include termination of financial support, termination of departmental privileges, and termination from the University.

Students funded by research grants or fellowships from the department are expected to spend at least half of their time (a minimum of 20 hours per week) on research. Continued funding is contingent upon satisfactory research effort and progress as determined by the student's adviser. After Autumn Quarter of the first year, students receive a letter from the department chair concerning their research performance. If problems are identified and they persist through the second quarter, a warning letter is sent. Problems persisting into a third quarter may lead to loss of departmental support including tuition and stipend. Similar procedures are applied in subsequent years.

A balanced master's degree program including engineering course work and research requires a minimum of one maximum-tuition academic year beyond the baccalaureate to meet the University residence requirements. Most full-time students spend at least one additional summer to complete the research requirement. An alternative master's degree program based only on course work is available, also requiring at least one full tuition academic year to meet University residence requirements.

M.S. students who anticipate continuing in the Ph.D. program should follow the research option. M.S. students receiving financial aid normally require two academic years to complete the degree. Such students must take the research option and are limited to a 10-unit course load per quarter.

The degree of Engineer requires a comprehensive maximum-tuition, two-year program of graduate study. This degree permits more extensive course work than the master's degree, with an emphasis on professional practice. All Engineer degree students receiving financial aid are limited to a 10-unit course load per quarter and need at least ten quarters of work to complete the degree.

The Ph.D. degree is awarded primarily on the basis of completion of significant, original research. Extensive course work and a minimum of 90 units of graduate work beyond the master's degree are required. Doctoral candidates planning theoretical work are encouraged to gain experimental research experience in the M.S. program. Ph.D. students receiving financial assistance are limited to 10 units per quarter and often require more than three years to complete the Ph.D.

In special cases, the M.S., Engineer, and Ph.D. degrees may be awarded with field designations for students who follow programs of study in the particular fields of (1) geostatistics, (2) geothermal, or (3) environment. For example, students may be awarded the degree Master of Science in Petroleum Engineering (Geothermal).

MASTER OF SCIENCE IN PETROLEUM ENGINEERING

The objective is to prepare the student for professional work in the energy industry through completion of fundamental courses in the major field and in related sciences as well as independent research.

Students entering the graduate program are expected to have an undergraduate-level energy resources engineering background. Competence in computer programming in a high-level language (CS 106X or the equivalent) and knowledge of energy resources engineering and geological fundamentals (ENERGY 120, 130, and GES 151) are prerequisites for taking most graduate courses.

The candidate must fulfill the following requirements:

1. Register as a graduate student for at least 45 units.
2. Submit a program proposal for the Master's degree approved by the adviser during the first quarter of enrollment.
3. Complete 45 units with at least a grade point average (GPA) of 3.0. This requirement is satisfied by taking the core sequence, selecting one

of the seven elective sequences, an appropriate number of additional courses from the list of technical electives, and completing 6 units of master's level research. Students electing the course work only M.S. degree are strongly encouraged to select an additional elective sequence in place of the research requirement. Students interested in continuing for a Ph.D. are expected to choose the research option and enroll in 6 units of ENERGY 361. All courses must be taken for a letter grade.

4. Students entering without an undergraduate degree in Petroleum Engineering must make up deficiencies in previous training. Not more than 10 units of such work may be counted as part of the minimum total of 45 units toward the M.S. degree.

Research subjects include certain groundwater hydrology and environmental problems, energy industry management, flow of non-Newtonian fluids, geothermal energy, natural gas engineering, oil and gas recovery, pipeline transportation, production optimization, reservoir characterization and modeling, carbon sequestration, reservoir engineering, reservoir simulation, and transient well test analysis.

RECOMMENDED COURSES AND SEQUENCES

The following list is recommended for most students. With the prior special consent of the student's adviser, courses listed under technical electives may be substituted based on interest or background.

CORE SEQUENCE

Subject and Catalog Number	*Units*
ENERGY 175. Well Test Analysis	3
or ENERGY 130. Well Log Analysis	3
ENERGY 221. Fundamentals of Multiphase Flow	3
ENERGY 222. Reservoir Engineering*	3
ENERGY 246. Reservoir Characterization and Flow Modeling with Outcrop Data	3
ENERGY 251. Thermodynamics of Equilibria†	3
CME 200. Linear Algebra with Application to Engineering Computations	3
CME 204. Partial Differential Equations in Engineering	3
Total	21

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* Students taking the Environmental sequence may substitute ENERGY 227.

† Optional for students taking the Geostatistics and Reservoir Modeling sequence.

ELECTIVE SEQUENCE

Choose one of the following:

Crustal Fluids:

GES 230. Physical Hydrogeology	4
GES 231. Contaminant Hydrogeology	4
GEOPHYS 200. Fluids and Tectonics	3
Total	11

Environmental:

ENERGY 227. Enhanced Oil Recovery	3
GES 231. Contaminant Hydrogeology	4

Plus two out of the following courses:

ENERGY 240. Geostatistics	3-4
ENERGY 260. Environmental Problems in Petroleum Engineering	3
CEE 270. Movement, Fate, and Effect of Contaminants in Surface Water and Groundwater	3
CEE 273. Aquatic Chemistry	3
CEE 274A. Environmental Microbiology	3
GES 230. Physical Hydrogeology	4
Total	13-14

Enhanced Recovery:

ENERGY 225. Theory of Gas Injection Processes	3
ENERGY 226. Thermal Recovery Methods	3
ENERGY 227. Enhanced Oil Recovery	3
Total	9

Geostatistics and Reservoir Modeling:

ENERGY 240. Geostatistics for Spatial Phenomena	3-4
ENERGY 241. Practice of Geostatistics	3-4
GEOPHYS 182. Reflection Seismology	3
or GEOPHYS 262. Rock Physics	3
Total	9-11

Geothermal:

ENERGY 269. Geothermal Reservoir Engineering	3
or ENERGY 102. Renewable Energy Sources	3
CHEMENG 120B. Energy and Mass Transport	4
ME 131A. Heat Transfer	3
Total	10

Reservoir Performance:

ENERGY 223. Reservoir Simulation	3-4
ENERGY 280. Oil and Gas Production Engineering	3
GEOPHYS 202. Reservoir Geomechanics	3
Total	9-11

Simulation and Optimization:

ENERGY 223. Reservoir Simulation	3-4
ENERGY 224. Advanced Reservoir Simulation	3
ENERGY 284. Optimization	3
Total	9-10

Renewable Energy:

ENERGY 102. Renewable Energy Sources	3
EE 293A. Fundamentals of Energy Processes	3-4
EE 293B. Fundamentals of Energy Processes	3-4
Total	9-11

RESEARCH SEQUENCE

ENERGY 361. Master's Degree Research in Petroleum Engineering*	6
Total units required for M.S. degree	45

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* Students choosing the company sponsored course-work-only for the M.S. degree may substitute an additional elective sequence in place of the research.

TECHNICAL ELECTIVES

Technical electives from the following list of advanced-level courses usually complete the M.S. program. In unique cases, when justified and approved by the adviser prior to taking the course, courses listed here may be substituted for courses listed above in the elective sequences.

ENERGY 130. Well Log Analysis	3
ENERGY 224. Advanced Reservoir Simulation	3
ENERGY 230. Advanced Topics in Well Logging	3
ENERGY 260. Environmental Aspects of Petroleum Engineering	3
ENERGY 267. Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities and Properties	3
ENERGY 269. Geothermal Reservoir Engineering	3
ENERGY 273. Special Production Engineering Topics in Petroleum Engineering	1-3
ENERGY 280. Oil and Gas Production	3
ENERGY 281. Applied Mathematics in Reservoir Engineering	3
ENERGY 284. Optimization	3
CME 204. Partial Differential Equations to Engineering	3
EE 293A. Fundamentals of Energy Processes	3-4
EE 293B. Fundamentals of Energy Processes	3-4
GEOPHYS 182. Reflection Seismology	3
GEOPHYS 190. Near Surface Geophysics	3
GEOPHYS 202. Reservoir Geomechanics	3

MASTER OF SCIENCE IN ENERGY RESOURCES ENGINEERING

The objective of the M.S. degree in Energy Resources Engineering is to prepare the student either for a professional career or for doctoral studies.

Students in the M.S. degree program must fulfill the following:

1. Complete a 45-unit program of study. The degree has two options:
   a) a course work degree, requiring 45 units of course work
   b) a research degree, of which a minimum of 39 units must be course work, with the remainder consisting of no more than 6 research units.
2. Course work units must be divided among two or more scientific and/or engineering disciplines and can include the core courses required for the Ph.D. degree.
3. The program of study must be approved by the academic adviser and the department graduate program committee.
4. Students taking the research-option degree are required to complete an M.S. thesis, approved by the student's thesis committee.

RECOMMENDED COURSES AND SEQUENCES

The following list is recommended for most students. With the prior consent of the student's adviser, courses listed under technical electives may be substituted based on interest or background.

CORE SEQUENCE

Subject and Catalog Number	*Units*
ENERGY 221. Fundaments of Multiphase Flow	3
ENERGY 246. Reservoir Characterization and Flow Modeling	3
CME 200. Linear Algebra with Application to Engineering Computations	3
CME 204. Partial Differential Equations in Engineering	3
CS 106X. Programming Methodology and Abstractions	3
EE 293A. Fundamentals of Energy Processes	3-4

EE 293B. Fundaments of Energy Processes	3-4
MS&E 248. Economics of Natural Resources	3-4
Total	24-27

SUBJECT SEQUENCE ALTERNATIVES

Geothermal:

ENERGY 223. Reservoir Simulation	3
ENERGY 269. Geothermal Reservoir Engineering	3
CHEMENG 120B. Energy and Mass Transport	4
GES 217. Faults, Fractures, and Fluid Flow	3
ME 131. Heat Transfer	3
ME 370. Energy Systems I	3
Total	15

Oil and Gas:

ENERGY 210. Technology in the Greenhouse	3
ENERGY 222. Advanced Reservoir Engineering	3
ENERGY 223. Reservoir Engineering	3
ENERGY 240. Geostatistics for Spatial Phenomena	3
ENERGY 251. Thermodynamics of Equilibria	3
Total	19

Natural Resource Characterization

ENERGY 240. Geostatistics	3
ENERGY 241. Practice of Geostatistics	3
ENERGY 244. Modeling of 3D Geological Objects	3
GEOPHYS 262. Rock Physics	3
GES 144. Geographic Information Systems	3
Total	15

TECHNICAL ELECTIVES

ENERGY 23. Reservoir Simulation
ENERGY 104. Technology in the Greenhouse
ENERGY 102. Renewable Energy Sources and Greener Energy Processes
ENERGY 120. Fundamentals of Petroleum Engineering
ENERGY 260. Groundwater Pollution and Oil Spills
ENERGY 284. Optimization
CEE 176A. Energy Efficient Buildings
CEE 176B. Electric Power: Renewables and Efficiency
EARTHSYS 145/245. Energy Flow and Policy: The Pacific Rim
EARTHSYS 147/247. Controlling Climate Change in the 21st Century
ECON 250A. Natural Resource and Energy Economics
ECON 250B. Environmental Economics
GES 138. Urbanization, Global Change, and Sustainability
GES 230. Physical Hydrogeology
GES 231. Contaminant Hydrogeology
MATSCI 316. Nanoscale Science, Engineering, and Technology
ME 131A. Heat Transfer
ME 150. Internal Combustion Engines
ME 260. Fuel Cell Science Technology
ME 370B. Energy Systems II: Modeling and Advanced Concepts

M.S. IN INTEGRATED RESERVOIR MODELING

This M.S. degree requires a minimum of 45 units of which 39 should be course units. The following courses are suggested for this program.

MATH SEQUENCE

Subject and Catalog Number	*Units*
CME 200. Linear Algebra with Application to Engineering Computations	3
CME 204. Partial Differential Equations in Engineering	3

ENERGY RESOURCES ENGINEERING SEQUENCE

ENERGY 246. Reservoir Characterization and Flow Modeling	3
ENERGY 130. Well Logging	3
or ENERGY 175. Well Test Analysis	3
ENERGY 221. Fundamentals of Multiphase Flow	3
or ENERGY 222. Advanced Reservoir Engineering	3
ENERGY 223. Reservoir Simulation	3-4

GEOSTATISTICS SEQUENCE

ENERGY 240. Geostatistics for Spatial Phenomena	3-4
ENERGY 241. Practice of Geostatistics and Seismic Data Integration	3-4

GEOLOGY SEQUENCE

GES 151. Sedimentary Geology	4
GES 253. Petroleum Geology	3

GEOPHYSICS SEQUENCE

GEOPHYS 182 Reflection Seismology	3
or GEOPHYS 183. Reflection Seismology Interpretation	1-4
GEOPHYS 262. Rock Physics	3

ENGINEER

The objective is to broaden training through additional work in engineering and the related sciences and by additional specialization.

Basic requirements include completion of 90 units of course work including 15 units of research (ENERGY 362), and including all course requirements of the department's master's degree (39 units, excluding research). If the candidate has received credit for research in the M.S. degree, this credit ordinarily would be transferable to the Engineer degree, in which case a total of 9 additional research units would be required. No more than 10 of the 90 required units can be applied to overcoming deficiencies in undergraduate training.

At least 30 units in Engineering and closely allied fields must be taken in advanced work, that is, work beyond the master's degree requirements and in addition to research (ENERGY 362). These may include courses from the Ph.D. degree list below or advanced-level courses from other departments with prior consent of the adviser. All courses must be taken for a letter grade. The student must have a grade point average (GPA) of at least 3.0 in courses taken for the degree of Engineer. A thesis based on 15 units of research must be submitted and approved by the adviser and one other faculty member.

DOCTOR OF PHILOSOPHY IN PETROLEUM ENGINEERING OR ENERGY RESOURCES ENGINEERING

The Ph.D. degree is conferred upon demonstration of high achievement in independent research and by presentation of the research results in a written dissertation and oral defense.

In addition to University and the Department of Energy Resources Engineering basic requirements for the doctorate, the Petroleum Engineering Ph.D. and Energy Resources Engineering Ph.D. degrees have the following requirements:

1. Students must complete a minimum of 36 course units and 54 research units (a total of 90 units) beyond the M.S. degree. At least half of the classes must be at a 200 level or higher and all must be taken for a letter grade. Students with an M.S. degree or other specialized training from outside ERE are generally expected to include ENERGY 221, 223, and 240, or their equivalents. The number and distribution of courses to be taken is determined with input from the research advisers and department graduate program committee.
2. The student must complete 24 units of letter-graded course work, develop a written Ph.D. research proposal, and choose a dissertation committee.
3. The research advisor(s) and two other faculty members comprise the dissertation reading committee. Upon completion of the dissertation, the student must pass a University oral examination in defense of the dissertation.
4. Complete 135 units of graduate work.
5. Act as a teaching assistant at least once, and enroll in ENERGY 359.

36 units of course work is a minimum; in some cases the research adviser may specify additional requirements to strengthen the student's expertise in particular areas. The 36 units of course work does not include required teaching experience (ENERGY 359) nor required research seminars. Courses must be taken for a letter grade, and a grade point average (GPA) of at least 3.25 must be maintained.

The dissertation must be submitted in its final form within five calendar years from the date of admission to candidacy. Candidates who fail to meet this deadline must submit an Application for Extension of Candidacy for approval by the department chair if they wish to continue in the program.

Ph.D. students entering the department are required to hold an M.S. degree in a relevant science or engineering discipline, although it need not be in Energy Resources Engineering.

PH.D. DEGREE QUALIFICATION

The procedure for the Ph.D. qualification differs depending upon whether the student entered the department as an M.S. or Ph.D. student. In either case, previous written and oral exams have been replaced by a written Ph.D. proposal followed by a proposal defense.

For students who complete an M.S. in the Energy Resources Engineering Department—In the second year of the M.S. degree program, the student formally applies to the Ph.D. program. The student is considered for admission to the Ph.D. program along with external applicants. The admission decision is based upon course work and research progress. During or before the third quarter as a Ph.D. student, generally corresponding to the Spring Quarter in the third year at Stanford, the student must present a Ph.D. proposal to a committee of three faculty members. This entails a written document, including material such as a literature review or proposed work, and an oral presentation. Following the presentation, the student is questioned on the research topic and general field of study. The student can pass, pass with qualifications requiring more classes or teaching assistancies, or fail. A Student who substantially changes topics between the M.S. and Ph.D. may petition for an extra quarter before presenting the Ph.D.

For students who enter directly into the Ph.D. program after receiving an M.S. from another university—After the second quarter at Stanford, a faculty committee evaluates the student's progress. If a student is found to be deficient in course work and/or research, a written warning is issued. After the third quarter, the faculty committee decides whether or not funding should be continued for the student. Students denied funding after the third quarter are advised against proceeding with the Ph.D. proposal, though the student may choose to proceed under personal funding. Before the end of their fourth quarter at Stanford (not counting Summer Quarter), continuing Ph.D. students must present a Ph.D. proposal as described above.

COURSE WORK

The 36 units of course work may include graduate courses in Energy Resources Engineering (numbered 200 and above) and courses chosen from the following list. Other courses may be substituted with prior approval of the adviser. In general, non-technical courses are not approved.

MATH AND APPLIED MATH

Subject and Catalog Number	*Units*
AA 210A. Fundamentals of Compressible Flow	3
AA 214A. Numerical Methods in Fluid Mechanics	3
AA 214B. Numerical Computation of Compressible Flow	3
CHEMENG 300. Applied Mathematics in Chemical Engineering	3
CEE 268. Groundwater Flow	3-4
CME 108. Introduction to Scientific Computing	3-4
CME 302. Numerical Linear Algebra	3
CME 306. Numerical Solution of Partial Differential Equations	3
CS 106X. Programming Methodology and Abstractions	5
CS 193D. Professional Software Development with C++	3
MATH 106. Functions of a Complex Variable	3
MATH 113. Linear Algebra and Matrix Theory	3
MATH 114. Linear Algebra and Matrix Theory II	3
MATH 115. Functions of a Real Variable	3
MATH 131. Partial Differential Equations I	3
MATH 132. Partial Differential Equations II	3
MATH 220A,B,C. Partial Differential Equations of Applied Mathematics	3 ea.
CME 200. Linear Algebra with Application to Engineering Computations	3
CME 204. Partial Differential Equations in Engineering	3
CME 206. Introduction to Numerical Methods for Engineering	3
ME 331A,B. Classical Dynamics	3 ea.
ME 335A,B,C. Finite Element Analysis	3 ea.
STATS 110. Statistical Methods in Engineering and Physical Sciences	4
STATS 116. Theory of Probability	4
STATS 200. Introduction to Statistical Inference	3
STATS 202. Data Analysis	3

SCIENCE

GES 231. Contaminant Hydrogeology	4
GES 253. Petroleum Geology and Exploration	3
GEOPHYS 182. Reflection Seismology	3
GEOPHYS 190. Near Surface Geophysics	3
GEOPHYS 262. Rock Physics	3

ENGINEERING

CHEMENG 110. Equilibrium Thermodynamics	3
CHEMENG 120A. Fluid Mechanics	3
CHEMENG 120B. Energy and Mass Transport	3
CHEMENG 310A. Microscale Transport in Chemical Engineering	3
ENGR 298. Seminar in Fluid Mechanics	1

PH.D. MINOR

To be recommended for a Ph.D. degree with Petroleum Engineering as a minor subject, a student must take 20 units of selected graduate-level lecture courses in the department. These courses must include ENERGY 221 and 222. The remaining courses should be selected from ENERGY 175, 223, 224, 225, 227, 240, 241, 251, 280, 281, and 284.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

ENERGY 101. Energy and the Environment—(Same as EARTHSYS 101.) Energy use in modern society and the consequences of current and future energy use patterns. Case studies illustrate resource estimation, engineering analysis of energy systems, and options for managing carbon emissions. Focus is on energy definitions, use patterns, resource estimation, pollution. Recommended: MATH 21 or 42, ENGR 30. GER:DB-EngrAppSci

3 units, Win (Kovscek, A; Durlofsky, L)

ENERGY 102. Renewable Energy Sources and Greener Energy Processes—(Same as EARTHSYS 102.) The energy sources that power society are rooted in fossil energy although energy from the core of the Earth and the sun is almost inexhaustible; but the rate at which energy can be drawn from them with today's technology is limited. The renewable energy resource base, its conversion to useful forms, and practical methods of energy storage. Geothermal, wind, solar, biomass, and tidal energies; resource extraction and its consequences. Recommended: 101, MATH 21 or 42. GER:DB-NatSci

3 units, Spr (Kovscek, A; Gerritsen, M)

ENERGY 104. Technology in the Greenhouse—Technologies that might be employed to reduce emissions of greenhouse materials, such as carbon dioxide, methane, nitrous oxide, and black soot, produced by the generation and use of energy. Sources of greenhouse materials in the current energy mix and evidence for global geochemical and climate changes. Advantages and limitations of technologies to reduce emissions. Examples include renewable sources such as wind and solar energy, more efficient use of energy, hydrogen, capture and storage of carbon dioxide, and nuclear power.

3 units, Spr (Orr, F)

ENERGY 120. Fundamentals of Petroleum Engineering—(Same as ENGR 120.) Lectures, problems, field trip. Engineering topics in petroleum recovery; origin, discovery, and development of oil and gas. Chemical, physical, and thermodynamic properties of oil and natural gas. Material balance equations and reserve estimates using volumetric calculations. Gas laws. Single phase and multiphase flow through porous media. GER:DB-EngrAppSci

3 units, Aut (Horne, R)

ENERGY 121. Fundamentals of Multiphase Flow—(Same as 221.) Multiphase flow in porous media. Wettability, capillary pressure, imbibition and drainage, Leverett J-function, transition zone, vertical equilibrium. Relative permeabilities, Darcy's law for multiphase flow, fractional flow equation, effects of gravity, Buckley-Leverett theory, recovery predictions, volumetric linear scaling, JBN and Jones-Rozelle determination of relative permeability. Frontal advance equation, Buckley-Leverett equation as frontal advance solution, tracers in multiphase flow, adsorption, three-phase relative permeabilities. GER:DB-EngrAppSci

3 units, Win (Tchelepi, H)

ENERGY 130. Well Log Analysis I—For earth scientists and engineers. Interdisciplinary, providing a practical understanding of the interpretation of well logs. Lectures, problem sets using real field examples: methods for evaluating the presence of hydrocarbons in rock formations penetrated by exploratory and development drilling. The fundamentals of all types of logs, including electric and non-electric logs.

3 units, Aut (Staff)

ENERGY 155. Undergraduate Report on Energy Industry Training—On-the-job practical training under the guidance of on-site supervisors. Required report detailing work activities, problems, assignments and key results. Prerequisite: written consent of instructor.

1-3 units, Aut, Win, Spr, Sum (Staff)

ENERGY 161. Statistical Methods for the Earth and Environmental Sciences: Geostatistics—(Same as GES 161.) Statistical analysis and graphical display of data, common distribution models, sampling, and regression. The variogram as a tool for modeling spatial correlation; variogram estimation and modeling; introduction to spatial mapping and prediction with kriging; integration of remote sensing and other ancillary information using co-kriging models; spatial uncertainty; introduction to geostatistical software applied to large environmental, climatological, and reservoir engineering databases; emphasis is on practical use of geostatistical tools. GER: DB-NatSci

3-4 units, Win (Boucher, A)

ENERGY 167. Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties—(Same as 267.) Appraisal of development and remedial work on oil and gas wells; appraisal of producing properties; estimation of productive capacity, reserves; operating costs, depletion, and depreciation; value of future profits, taxation, fair market value; original or guided research problems on economic topics with report. Prerequisite: consent of instructor. GER:DB-EngrAppSci

3 units, Win (Kourt, W; Pande, K)

ENERGY 175. Well Test Analysis—Lectures, problems. Application of solutions of unsteady flow in porous media to transient pressure analysis of oil, gas, water, and geothermal wells. Pressure buildup analysis and drawdown. Design of well tests. Computer-aided interpretation.

3 units, Spr (Horne, R)

ENERGY 180. Oil and Gas Production Engineering—(Same as 280.) Design and analysis of production systems for oil and gas reservoirs. Topics: well completion, single-phase and multi-phase flow in wells and gathering systems, artificial lift and field processing, well stimulation, inflow performance. Prerequisite: 120. Recommended: 130. WIM

3 units, Spr (Tchelepi, H)

ENERGY 192. Undergraduate Teaching Experience—Leading field trips, preparing lecture notes, quizzes under supervision of the instructor. May be repeated for credit.

1-3 units, Aut, Win, Spr, Sum (Staff)

ENERGY 193. Undergraduate Research Problems—Original and guided research problems with comprehensive report. May be repeated for credit.

1-3 units, Aut (Staff), Win (Horne, R; Kovscek, A; Gerritsen, M; Caers, J; Durlofsky, L), Spr, Sum (Staff)

ENERGY 194. Special Topics in Energy and Mineral Fluids—May be repeated for credit.

1-3 units, Aut, Win, Spr, Sum (Staff)

ENERGY 211. Computer Programming in C++ for Earth Scientists and Engineers—(Same as CME 211.) Computer programming methodology emphasizing modern software engineering principles: object-oriented design, decomposition, encapsulation, abstraction, and modularity. Fundamental data structures. Time and space complexity analysis. The basic facilities of the programming language C++. Numerical problems from various science and engineering applications.

3 units, Aut (Lambers, J)

ENERGY 221. Fundamentals of Multiphase Flow—(For graduate students; see 121.)

3 units, Win (Tchelepi, H)

ENERGY 222. Advanced Reservoir Engineering—Lectures, problems. General flow equations, tensor permeabilities, steady state radial flow, skin, and succession of steady states. Injectivity during fill-up of a depleted reservoir, injectivity for liquid-filled reservoirs. Flow potential and gravity forces, coning. Displacements in layered reservoirs. Transient radial flow equation, primary drainage of a cylindrical reservoir, line source solution, pseudo-steady state. May be repeated for credit. Prerequisite: 221.

3 units, Spr (Durlofsky, L)

ENERGY 223. Reservoir Simulation—Fundamentals of petroleum reservoir simulation. Equations for multicomponent, multiphase flow between gridblocks comprising a petroleum reservoir. Relationships between black-oil and compositional models. Techniques for developing black-oil, compositional, thermal, and dual-porosity models. Practical considerations in the use of simulators for predicting reservoir performance. Class project. Prerequisite: 221 and 246, or consent of instructor. Recommended: CME 206.

3-4 units, Win (Durlofsky, L; Gerritsen, M; Tchelepi, H)

ENERGY 224. Advanced Reservoir Simulation—Topics include modeling of complex wells, coupling of surface facilities, compositional modeling, dual porosity models, treatment of full tensor permeability and grid nonorthogonality, local grid refinement, higher order methods, streamline simulation, upscaling, algebraic multigrid solvers, unstructured grid solvers, history matching, other selected topics. Prerequisite: 223 or consent of instructor. May be repeated for credit.

3 units, Aut (Durlofsky, L; Tchelepi, H)

ENERGY 225. Theory of Gas Injection Processes—Lectures, problems. Theory of multicomponent, multiphase flow in porous media. Miscible displacement: diffusion and dispersion, convection-dispersion equations and its solutions. Method of characteristic calculations of chromatographic transport of multicomponent mixtures. Development of miscibility and interaction of phase behavior with heterogeneity. May be repeated for credit. Prerequisite: CME 200.

3 units, Win (Orr, F)

ENERGY 226. Thermal Recovery Methods—Theory and practice of thermal recovery methods: steam drive, cyclic steam injections, and in situ combustion. Models of combined mass and energy transport. Estimates of heated reservoir volume and oil recovery performance. Wellbore heat losses, recovery production, and field examples.

3 units, alternate years, not given this year

ENERGY 227. Enhanced Oil Recovery—The physics, theories, and methods of evaluating chemical, miscible, and thermal enhanced oil recovery projects. Existing methods and screening techniques, and analytical and simulation based means of evaluating project effectiveness. Dispersion-convection-adsorption equations, coupled heat, and mass balances and phase behavior provide requisite building blocks for evaluation.

3 units, Spr (Staff)

ENERGY 230. Advanced Topics in Well Logging—(Same as GEOPHYS 230.) State of the art tools and analyses; the technology, rock physical basis, and applications of each measurement. Hands-on computer-based analyses illustrate instructional material. Guest speakers on formation evaluation topics. Prerequisites: 130 or equivalent; basic well logging; and standard practice and application of electric well logs.

3 units, Spr (Lindblom, R)

ENERGY 240. Geostatistics for Spatial Phenomena—(Same as GES 240.) Probabilistic modeling of spatial and/or time dependent phenomena. Kriging and cokriging for gridding and spatial interpolation. Integration of heterogeneous sources of information. Multiple-point geostatistics and training image-based stochastic imaging of reservoir/field heterogeneities. Introduction to GSLIB and SGEMS software. Case studies from the oil and mining industry and environmental sciences. Prerequisites: introductory calculus and linear algebra, STATS 116, GES 161, or equivalent.

3-4 units, Win (Journel, A)

ENERGY 242. Topics in Advanced Geostatistics—(Same as GES 242.) Conditional expectation theory and projections in Hilbert spaces; parametric versus non-parametric geostatistics; Boolean, Gaussian, fractal, indicator, and annealing approaches to stochastic imaging; multiple point statistics inference and reproduction; neural net geostatistics; Bayesian methods for data integration; techniques for upscaling hydrodynamic properties. May be repeated for credit. Prerequisites: 240, advanced calculus, C++/Fortran.

3-4 units, not given this year

ENERGY 245. Probability Theory—(Same as GEOPHYS 245.) Probabilistic formulations and solutions to inverse problems. Monte Carlo methods for solving inverse problems. Metropolis algorithm. Deterministic solutions using maximum likelihood, gradient methods. Dealing with prior probability and data uncertainty. Gaussian and non-Gaussian model formulations. Application to Earth Science problems. Prerequisite: introduction to probability theory course.

3 units, Win (Staff)

ENERGY 246. Reservoir Characterization and Flow Modeling with Outcrop Data—(Same as GES 246.) Project addressing a reservoir management problem by studying an outcrop analog, constructing geostatistical reservoir models, and performing flow simulation. How to use outcrop observations in quantitative geological modeling and flow simulation. Relationships between disciplines. Weekend field trip.

3 units, Aut (Graham, S; Tchelepi, H; Boucher, A)

ENERGY 247. Stochastic Simulation—Characterization and inference of statistical properties of spatial random function models; how they average over volumes, expected fluctuations, and implementation issues. Models include point processes (Cox, Poisson), random sets (Boolean, truncated Gaussian), and mixture of Gaussian random functions. Prerequisite: 240.

3 units, not given this year

ENERGY 251. Thermodynamics of Equilibria—Lectures, problems. The volumetric behavior of fluids at high pressure. Equation of state representation of volumetric behavior. Thermodynamic functions and conditions of equilibrium, Gibbs and Helmholtz energy, chemical potential, fugacity. Phase diagrams for binary and multicomponent systems. Calculation of phase compositions from volumetric behavior for multicomponent mixtures. Experimental techniques for phase-equilibrium measurements. May be repeated for credit.

3 units, Aut (Kovscek, A)

ENERGY 255. Master's Report on Energy Industry Training—On-the-job training for master's degree students under the guidance of on-site supervisors. Students submit a report detailing work activities, problems, assignments, and key results. May be repeated for credit. Prerequisite: consent of adviser.

1-3 units, Sum (Staff)

ENERGY 259. Presentation Skills—For teaching assistants in Energy Resources Engineering. Five two-hour sessions in the first half of the quarter. Awareness of different learning styles, grading philosophies, fair and efficient grading, text design; presentation and teaching skills, PowerPoint slide design; presentation practice in small groups. Taught in collaboration with the Center for Teaching and Learning.

1 unit, Spr (Gerritsen, M)

ENERGY 267. Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties—(For graduate students; see 167.)

3 units, Win (Kourt, W; Pande, K)

ENERGY 269. Geothermal Reservoir Engineering—Conceptual models of heat and mass flows within geothermal reservoirs. The fundamentals of fluid/heat flow in porous media; convective/conductive regimes, dispersion of solutes, reactions in porous media, stability of fluid interfaces, liquid and vapor flows. Interpretation of geochemical, geological, and well data to determine reservoir properties/characteristics. Geothermal plants and the integrated geothermal system.

3 units, not given this year

ENERGY 273. Special Topics in Petroleum Engineering

1-3 units, Aut, Win, Spr, Sum (Staff)

ENERGY 280. Oil and Gas Production Engineering—(For graduate students; see 180.)

3 units, Spr (Tchelepi, H.)

ENERGY 281. Applied Mathematics in Reservoir Engineering—The philosophy of the solution of engineering problems. Methods of solution of partial differential equations: Laplace transforms, Fourier transforms, wavelet transforms, Green's functions, and boundary element methods. Prerequisites: CME 204 or MATH 131, and consent of instructor.

3 units, Spr (Lambers, J)

ENERGY 284. Optimization: Deterministic and Stochastic Approaches—Deterministic and stochastic methods for optimization in earth sciences and engineering. Linear and nonlinear regression, classification and pattern recognition using neural networks, simulated annealing and genetic algorithms. Deterministic optimization using non-gradient-based methods (simplex) and gradient-based methods (conjugated gradient, steepest descent, Levenberg-Marquardt, Gauss-Newton), eigenvalue and singular value decomposition. Applications in petroleum engineering, geostatistics, and geophysics. Prerequisite: CME 200 or consent of instructor.

3 units, Aut (Caers, J)

ENERGY 285. Research Seminars—Focused study in research areas within the department. Graduate students may participate in advanced work in areas of particular interest prior to making a final decision on a thesis subject. May be repeated for credit. Prerequisite: consent of instructor.

ENERGY 285A. SUPRI-A Research Seminar: Enhanced Oil Recovery

1 unit, Aut, Win, Spr (Staff)

ENERGY 285B. SUPRI-B Research Seminar: Reservoir Simulation

1 unit, Aut, Win, Spr (Staff)

ENERGY 285C. SUPRI-C Research Seminar: Gas Injection Processes

1 unit, Aut, Win, Spr (Staff)

ENERGY 285D. SUPRI-D Research Seminar: Well Test Analysis

1 unit, Aut, Win, Spr (Staff)

ENERGY 285F. SCRF Research Seminar: Geostatistics and Reservoir Forecasting

1 unit, Aut, Win, Spr (Staff)

ENERGY 285G. Geothermal Reservoir Engineering Research Seminar

1 unit, Aut, Win, Spr (Staff)

ENERGY 285H. SUPRI-HW Research Seminar: Horizontal Well Technology

1 unit, Aut, Win, Spr (Staff)

ENERGY 290. Numerical Modeling of Fluid Flow in Heterogeneous Porous Media—How to mathematically model and solve elliptic partial differential equations with variable and discontinuous coefficients describing flow in highly heterogeneous porous media. Topics include finite difference and finite volume approaches on structured grids, efficient solvers for the resulting system of equations, Krylov space methods, preconditioning, multi-grid solvers, grid adaptivity and adaptivity criteria, multiscale approaches, and effects of anistropy on solver efficiency and accuracy. MATLAB programming and application of commercial or public domain simulation packages. Prerequisite: CME 200, 201, and 202, or equivalents with consent of instructor.

3 units, not given this year

ENERGY 300. Earth Sciences Seminar—(Same as EARTHSYS 300, EEES 300, GES 300, GEOPHYS 300, IPER 300.) Required for incoming graduate students except coterms. Research questions, tools, and approaches of faculty members from all departments in the School of Earth Sciences. Goals are: to inform new graduate students about the school's range of scientific interests and expertise; and introduce them to each other across departments and research groups. Two faculty members present work at each meeting. May be repeated for credit.
1 unit, Aut (Matson, P; Graham, S)

ENERGY 301. The Energy Seminar—(Same as CEE 301.) Interdisciplinary exploration of current energy challenges and opportunities, with talks by faculty, visitors, and students. May be repeated for credit.
1 unit, Aut, Win, Spr (Horne, R)

ENERGY 355. Doctoral Report on Energy Industry Training—On-the-job training for doctoral students under the guidance of on-site supervisors. Students submit a report on work activities, problems, assignments, and results. May be repeated for credit. Prerequisite: consent of adviser.
1-3 units, Sum (Staff)

ENERGY 359. Teaching Experience in Petroleum Engineering—For TAs in Energy Resources Engineering. Course and lecture design and preparation; lecturing practice in small groups. Classroom teaching practice in an Energy Resources Engineering course for which the participant is the TA (may be in a later quarter). Taught in collaboration with the Center for Teaching and Learning.
1 unit, Spr (Gerritson, M)

ENERGY 360. Advanced Research Work in Petroleum Engineering—Graduate-level work in experimental, computational, or theoretical research. Special research not included in graduate degree program. May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

ENERGY 361. Master's Degree Research in Petroleum Engineering—Experimental, computational, or theoretical research. Advanced technical report writing. Limited to 6 units total. (Staff)
1-6 units, Aut, Win, Spr, Sum (Staff)

ENERGY 362. Engineer's Degree Research in Petroleum Engineering—Graduate-level work in experimental, computational, or theoretical research for Engineer students. Advanced technical report writing. Limited to 15 units total, or 9 units total if 6 units of 361 were previously credited.
1-10 units, Aut, Win, Spr, Sum (Staff)

ENERGY 363. Doctoral Degree Research in Petroleum Engineering—Graduate-level work in experimental, computational, or theoretical research for Ph.D. students. Advanced technical report writing.
1-10 units, Aut, Win, Spr, Sum (Staff)

ENERGY 365. Special Research Topics in Petroleum Engineering—Graduate-level research work not related to report, thesis, or dissertation. May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSE

See department listing for course description.

GEOPHYS 202. Reservoir Geomechanics
3 units, Win (Zoback, M), alternate years, not given next year

GEOPHYS 257. Introduction to Computational Earth Sciences
2-4 units, Spr (Clapp, R; Harris, J)

GEOLOGICAL AND ENVIRONMENTAL SCIENCES

Emeriti: (Professors) Robert Coleman, Robert R. Compton, Marco T. Einaudi, W. Gary Ernst,* William R. Evitt, John W. Harbaugh, James C. Ingle, Jr.,* Juhn G. Liou,* Ronald J. P. Lyon, George A. Parks, Irwin Remson, Tjeerd H. Van Andel

Chair: Stephan A. Graham

Associate Chairs: Scott E. Fendorf, Donald R. Lowe

Professors: Dennis K. Bird, Gordon E. Brown, Jr., C. Page Chamberlain, Robert B. Dunbar, Scott E. Fendorf, Steven M. Gorelick,† Stephan A. Graham, Andre G. Journel,** Keith Loague, Donald R. Lowe, Gail A. Mahood, Pamela A. Matson,†† Elizabeth L. Miller, David D. Pollard, Jonathan F. Stebbins, Paul Switzer***

Assistant Professors: Christopher Francis, George Hilley, Jonathan Payne, Karen Seto,†† Wendy Mao

Professors (Research): Atilla Aydin, J. Michael Moldowan

Courtesy Professors: Ronaldo I. Borja, Francisco Chavez, Peter Kitanidis, James O. Leckie, Stephen Monismith, Charles Paul, Peter M. Vitousek

Courtesy Associate Professors: Kevin R. Arrigo, James P. Barry, Ken Caldeira, David L. Freyberg, Elizabeth Hadly, Simon L. Klemperer, Anders Nilsson, Alfred M. Spormann

Courtesy Assistant Professor: Gregory P. Asner

Lecturers: Anne E. Egger, Bob Jones, Hannah H. Scherer

Consulting Professors: Edmund Chang, Alan Cooper, Brent Constantz, Francois Farges, Thomas L. Holzer, Paul Hsieh, Jack J. Lissauer, Les Magoon, Mark S. Marley, Timothy R. McHargue, William R. Normark, Kevin Zahnle

Consulting Associate Professors: Marco Antonellini, Joseph Wooden, Robyn Wright-Dunbar

Consulting Assistant Professor: Isabelle Coutand

Visiting Professors: Gary Byerly, John Cheadle, Harry Green, Barbara E. John

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* Recalled to active duty
† Joint appointment with Geophysics
** Joint appointment with Energy Resources Engineering
†† Joint appointment with the Freeman Spogli Institute for International Studies
*** Joint appointment with Statistics

Department Offices: Braun Hall, Building 320
Mail Code: 94305-2115
Phone: (650) 723-0847
Email: ges-dept@pangea.stanford.edu
Web Site: http://pangea.stanford.edu/GES/

Courses given in Geological and Environmental Sciences have the subject code GES. For a complete list of subject codes, see Appendix.

The geological and environmental sciences are naturally interdisciplinary, and include: the study of processes that shape the Earth's surface; records of Earth's history, including climate, as documented in rocks, sediments, and ice; changes in the oceans and atmosphere; chemical and physical properties of minerals, rocks, soils, sediments, water, and ice, and interactions among them; interactions between earth materials and microbes; sources of energy resources and economic minerals; contamination of natural waters and soils; biogeochemical cycles over multiple timescales; planetary geology and astrobiology; remote sensing and classification of land use and land cover; and natural hazards like volcanoes, earthquakes, and landslides.

Most students and faculty within the department spend time in the field; recent field sites include areas in California, Chile, Antarctica, Easter Island, Hawaii, the Kamchatka peninsula, Utah, Nevada, and S.E. Asia. Departmental facilities that model, simulate, or digitize field data and samples include laboratories that provide access to state-of-the-art techniques including stable isotope analysis, geochronology, thermochronology, electron and ion microprobe analysis, nuclear magnetic resonance, scanning electron microscopy, and geographic information systems (GIS) analysis. Facilities at the Stanford Linear Accelerator Center (SLAC), the Stanford Synchrotron Radiation Laboratory (SSRL), and the U.S. Geological Survey in Menlo Park are available to researchers in the earth sciences.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The undergraduate program leading to the Bachelor of Science (B.S.) degree in Geological and Environmental Sciences (GES) is designed to leverage the diversity of the field and provide background for a wide variety of careers. Students who complete the undergraduate GES major or minor have gone on to graduate school in the earth sciences and/or employment in geological consulting, environmental engineering, land use planning, law, public service, teaching and other professions in which an understanding of the earth and a background in science are important. Students interested in the GES major should consult with the undergraduate program coordinator for information about options within the curriculum and potential career paths.

The major requires at least 81 units; letter grades are required in all courses if available. Students complete a core sequence of GES courses that introduce earth processes and the properties of earth materials. With this foundation, they focus on a more specialized area within the geological and environmental sciences. The curriculum thus includes courses in chemistry, physics, biology, and mathematics. In addition, nearly all GES students conduct independent research projects, either over the summer or as part of a year-long honors thesis.

The study of earth processes in the natural laboratory of the field is a fundamental component of the major, and most GES courses include field trips. Students must complete at least six weeks of directed field research.

Near the end of the undergraduate program and to fulfill the Writing in the Major requirement, students take a writing-intensive senior seminar (GES 150), in which students share their knowledge with each other while addressing issues at the forefront of the earth sciences.

COURSE SEQUENCE (81-92 UNITS TOTAL)

CORE GEOLOGICAL AND ENVIRONMENTAL SCIENCES COURSES

Subject and Catalog Number	*Units*
GES 1. Dynamic Earth	4
or GES 49N. Field Trip to Death Valley and Owens Valley	3
GES 2. Earth System History	3
GES 102. Earth Materials	5
GES 103. Rocks in Thin Section	3
GES 150. Senior Seminar: Issues in the Earth Sciences (WIM)	3
GES 190, other field course, or field research (6 weeks)	

Four of the following (others may count as electives):

GES 90. Introduction to Geochemistry	3-4
GES 110. Structural Geology and Tectonics	5
or GES 111A. Fundamentals of Structural Geology	3
GES 151. Sedimentary Geology and Petrography	4
GES 175. Science of Soils	4
or GES 130. Environmental Earth Sciences I	3
or GES 170. Environmental Geochemistry	4
GES 180. Igneous Processes	3-5
or GES 181. Metamorphic Processes	3-5

REQUIRED SUPPORTING MATHEMATICS

Choose one of the following equivalent series:

MATH 19. Calculus	3
MATH 20. Calculus	3
MATH 21. Calculus	4
or	
MATH 41. Calculus	5
MATH 42. Calculus	5

Choose at least one of the following (the entire series is recommended for students who plan to pursue graduate studies in the sciences or engineering):

MATH 51. Multivariate Mathematics	5
MATH 52. Multivariate Mathematics	5
MATH 53. Multivariate Mathematics	5

REQUIRED SUPPORTING COGNATE SCIENCES

Students must complete course sequences from two of the three fields of cognate sciences: chemistry, physics, and biological sciences. Advanced placement credit may be accepted for these courses as determined by the relevant departments.

Chemistry:	
CHEM 31A,B. Chemical Principles I/II	8
or CHEM 31X. Chemical Principles	4
CHEM 135. Physical Chemical Principles	3
or CHEM 171. Physical Chemistry	3
or GES 171. Geochemical Thermodynamics	3
Physics (choose one of the following series):	
PHYSICS 21. Mechanics and Heat	3
PHYSICS 22. Mechanics and Heat Lab	1
PHYSICS 23. Electricity and Optics	3
PHYSICS 24. Electricity and Optics Lab	1
or	
PHYSICS 41 (formerly 53). Mechanics	4
PHYSICS 45 (formerly 51). Light and Heat	4
PHYSICS 46 (formerly 52). Light and Heat Lab	1
or	
PHYSICS 41 (formerly 53). Mechanics	4
PHYSICS 43 (formerly 55). Electricity and Magnetism	3
PHYSICS 44 (formerly 56). Electricity and Magnetism Lab	1
Biology:	
BIOSCI 41. Genetics, Biochemistry, and Molecular Biology	5
BIOSCI 42. Cell Biology and Animal Physiology	5
or BIOSCI 43. Plant Biology, Evolution, and Ecology	5
or BIOSCI 101. Ecology	3

ELECTIVES (19 UNITS)

Majors must complete at least 19 units of upper-division electives. A majority (at least 10) of these units must be from courses within GES, excluding GES 7, introductory seminars (GES 30-60), and GES 201. Many courses from departments other than GES are also approved electives; this list is available from the undergraduate program coordinator and at http://pangea.stanford.edu/GES/undergraduates. Additional courses may satisfy this requirement but require prior approval from the undergraduate program director. A maximum of 3 elective units may be fulfilled by GES 192, 198, or an upper-level seminar. Honors research (GES 199) may fulfill up to 6 elective units. Students should discuss their electives with an adviser.

FIELD RESEARCH (6 WEEKS)

Majors must complete six weeks of field research, preferably through departmental offerings (GES 190). Approved field schools offered by another university or other faculty-directed field research projects that involve learning and application of field techniques and the preparation of a written report may be used to fulfill the field research requirement.

ENGINEERING GEOLOGY AND HYDROGEOLOGY SPECIALIZED CURRICULUM

The Engineering Geology and Hydrogeology curriculum is intended for undergraduates interested in the application of geological and engineering data and principles to the study of rock, soil, and water to recognize and interpret geological and environmental factors affecting engineering structures and groundwater resources. Students learn to characterize and assess the risks associated with natural geological hazards, such as landslides and earthquakes, and with groundwater flow and contamination. The curriculum prepares students for graduate programs and professional careers in engineering, environmental geology, geology, geotechnical engineering, and hydrogeology. Students interested in this curriculum should contact a faculty adviser: Professor Loague, Pollard, or Gorelick.

GES majors who elect the Engineering Geology and Hydrogeology curriculum are expected to complete a core course sequence and a set of courses in supporting sciences and mathematics. The core courses come from Earth Sciences and Engineering. Any substitutions for core courses must be approved by the faculty adviser and through a formal petition to the undergraduate program director. In addition, four elective courses, consistent with the core curriculum and required of all majors, are to be selected with the advice and consent of the adviser. Typically, electives are selected from the list below. Letter grades are required if available.

COURSE SEQUENCE (88-99 UNITS TOTAL)

REQUIRED GEOLOGICAL AND ENVIRONMENTAL SCIENCES (38-39 UNITS)

Subject and Catalog Number	*Units*
GES 1. Dynamic Earth	4
GES 102. Earth Materials	5
GES 111A. Fundamentals of Structural Geology	3
GES 115. Engineering Geology Practice	3
GES 144. Fundamentals of GIS	4
GES 150. Senior Seminar: Issues in the Earth Sciences (WIM)	3
GES 160. Statistical Methods for Earth and Environmental Sciences: General Introduction	4
or GES 161. Statistical Methods for the Earth and Environmental Sciences: Geostatistics	3-4
GES 230. Physical Hydrogeology	4
GEOPHYS 190. Applied Geophysical Methods	3

REQUIRED ENGINEERING (20 UNITS)

CEE 101A. Mechanics of Materials	4
CEE 101B. Mechanics of Fluids	4
CEE 101C. Geotechnical Engineering	4
CS 106A. Programming Methodology	5
ENGR 14. Applied Mechanics: Statics	3

REQUIRED SUPPORTING SCIENCES AND MATHEMATICS (23-27 UNITS)

CHEM 31A,B. Chemical Principles I/II	8
or CHEM 31X. Chemical Principles	4
MATH 51. Multivariate Mathematics	5
MATH 52. Multivariate Mathematics	5
MATH 53. Multivariate Mathematics	5
PHYSICS 41. Mechanics	4

SUGGESTED ELECTIVES (11-20 UNITS)

Choose four courses from the following list or, with faculty approval, four related courses:

CEE 180. Structural Analysis	4
CEE 270. Movement, Fate, and Effects of Contaminants in Surface Waters and Groundwater	3
CEE 293. Foundation Engineering	3
CEE 296. Experimental Soil Mechanics	2
ENGR 30. Engineering Thermodynamics	3
ENGR 50. Introductory Science of Materials	4
GEOPHYS 150. General Geophysics	4
GES 130. Environmental Earth Sciences I	3
GES 131. Environmental Earth Sciences II	3
GES 215A,B. Advanced Structural Geology and Rock Mechanics	3-5
GES 217. Characterization and Hydraulics of Rock Fracture	3
GES 231. Contaminant Hydrogeology	4
GES 235. Role of Fluids in Geologic Processes	3
GES 237. Surface and Near-Surface Hydrologic Response	3
MATH 103. Matrix Theory and its Applications	3
ME 80. Strength of Materials	3

MINOR

The minor in GES consists of a small set of required courses plus 12 elective units. A wide variety of courses may be used to satisfy these elective requirements.

REQUIRED COURSES:

GES 1. Dynamic Earth	4
or GES 49N. Field Trip to Death Valley and Owens Valley	3
GES 2. Earth System History	3
GES 102. Earth Materials	5

ELECTIVES (12 UNITS)

Electives must include at least three courses from the list below:

GES 8. The Oceans	3
GES 90. Introduction to Geochemistry	3-4
GES 103. Rocks in Thin Section	3
GES 110. Structural Geology	5
GES 111A. Fundamentals of Structural Geology	3
GES 130. Environmental Earth Sciences I	3
GES 131. Environmental Earth Sciences II	3
GES 144. Fundamentals of GIS	4
GES 151. Sedimentary Geology and Petrography	4
GES 170. Environmental Geochemistry	4
GES 175. Science of Soils	4
GES 180. Igneous Processes	3-5
GES 181. Metamorphic Processes	3-5
GES 185. Volcanology	4

Students pursuing a minor in GES are encouraged to take one of the freshman or sophomore seminars (courses with numbers 38-59) and to participate in the senior seminar (GES 150) and in field research (GES 190). Up to 3 units of Stanford Introductory Seminars may be used in fulfilling the 12-unit requirement above.

HONORS PROGRAM

The honors program provides an opportunity for year-long independent study and research on a topic of special interest, culminating in a written thesis. Students select research topics in consultation with the faculty adviser of their choosing. Research undertaken for the honors program may be of a theoretical, field, or experimental nature, or a combination of these approaches. The honors program is open to students with a GPA of at least 3.5 in GES courses and 3.0 in all University course work. Modest financial support is available from several sources to help defray laboratory and field expenses incurred in conjunction with honors research. Interested students must submit an application, including a research proposal, to the department by the end of their junior year.

Upon approval of the research proposal and entrance to the program, course credit for the honors research project and thesis preparation is assigned by the student's faculty adviser within the framework of GES 199; the student must complete a total of 9 units over the course of the senior year. Up to 6 units of GES 199 may be counted towards the elective requirement, but cannot be used as a substitute for regularly required courses.

Both a written and oral presentation of research results are required. The thesis must be read, approved, and signed by the student's faculty adviser and a second member of the faculty. In addition, honors students must participate in the GES Honors Symposium in which they present their research to the broader community. Honors students in GES are also eligible for the Firestone medal, awarded by Undergraduate Advising and Research for exceptional theses.

COTERMINAL B.S. AND M.S. DEGREES

The coterminal B.S./M.S. program offers students the opportunity to pursue graduate research and an M.S. degree concurrently with or subsequent to their B.S. studies. The M.S. degree can serve as an entrance to a professional degree in subdisciplines within the earth sciences such as engineering geology and environmental geology, or to graduate course work and research as an intermediate step to pursuit of the Ph.D. Regardless of professional goals, coterminal B.S./M.S. students are treated as members of the graduate community and are expected to meet all of the standards set for regular M.S. students. Applicants must have earned no fewer than 120 units toward graduation, and must submit their application no later than the quarter prior to the expected completion of their undergraduate degree, normally the Winter Quarter prior to Spring Quarter graduation. The application includes a statement of purpose, a current Stanford transcript, official Graduate Record Examination (GRE) scores, letters of recommendation from two members of the Stanford faculty (at least one of whom must be in the GES department), and a list of courses in which they intend to enroll to fulfill the M.S. degree requirements. Specific research interests should be noted in the statement of purpose and discussed with a member of the GES faculty prior to submission of the application. Coterminal students must complete a thesis describing research results. For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

Students must meet all requirements for both the B.S. and M.S. degrees. Students may either (1) complete 180 units required for the B.S. degree and then complete three full-time quarters (45 units at the 100-level or above) for the M.S. degree, or (2) complete a total of fifteen quarters during which the requirements of the two degrees are fulfilled concurrently. At least half of the courses used to satisfy the 45-unit requirement must be designated as being primarily for graduate students, normally at the 200-level or above. No more than 15 units of thesis research may be used to satisfy the 45-unit requirement. Further information about this program may be obtained from the GES office.

GRADUATE PROGRAMS

Graduate studies in the Department of Geological and Environmental Sciences (GES) involve academic course work and independent research. Students are prepared for careers as professional scientists in research, education, or the application of the earth sciences to mineral, energy, and water resources. Programs lead to the M.S., Engineer, and Ph.D. degrees. Course programs in the areas of faculty interest are tailored to the student's needs and interests with the aid of his or her research adviser. Students are encouraged to include in their program courses offered in other departments in the School of Earth Sciences as well as in other departments in the University. Diplomas designate degrees in Geological and Environmental Sciences and may also indicate the following specialized fields of study: Geostatistics and Hydrogeology.

Admission—For admission to graduate work in the department, the applicant must have taken the Aptitude Test (verbal, quantitative, and analytical writing assessment) of the Graduate Record Examination. In keeping with University policy, applicants whose first language is not English must submit TOEFL (Test of English as a Foreign Language) scores from a test taken within the last 18 months. Individuals who have completed a B.S. or two-year M.S. program in the U.S. or other English-speaking country are not required to submit TOEFL scores. Previously admitted students who wish to change their degree objective from M.S. to Ph.D. must petition the GES Admissions Committee.

FIELDS WITH DIPLOMA DESIGNATION

Hydrogeology—The Hydrogeology program, which leads to an M.S., Engineer, or Ph.D. degree in GES, balances research in the purely scientific and applied aspects of groundwater resources and near-surface processes.

The program requires students to obtain a broad background in earth sciences and engineering. Students in the program must have a strong general scientific background in basic physics, chemistry, computer science, and mathematics, and a demonstrated aptitude for solving quantitative problems. They must complete a core curriculum involving courses in fluid mechanics, hydrogeology, hydrology, and water quality. A list of required and recommended courses is supplied upon request.

Geostatistics—The Geostatistics program leads to an M.S. or Ph.D. degree in GES. Strong interactions have been developed with faculty and students in the departments of Geophysics and Energy Resources Engineering.

The program requires a geological background and a fair level of calculus and programming (Fortran and/or C++). Recent graduates have found jobs in the extractive (mining, oil) and environmental (EPA) fields.

MASTER OF SCIENCE

Objectives—The purpose of the master's program in Geological and Environmental Sciences is to continue a student's training in one of a broad range of earth science disciplines and to prepare students for either a professional career or doctoral studies.

Procedures—The graduate coordinator of the department appoints an academic adviser during registration with appropriate consideration of the student's background, interests, and professional goals. In consultation with the adviser, the student plans a program of course work for the first year. The student should select a thesis adviser within the first year of residence and submit to the thesis adviser a proposal for thesis research as soon as possible. The academic adviser supervises completion of the department requirements for the M.S. program (as outlined below) until the research proposal has been accepted; responsibility then passes to the thesis adviser. The student may change either thesis or academic advisers by mutual agreement and after approval of the graduate coordinator.

Requirements—The University's requirements for M.S. degrees are outlined in the "Graduate Degrees" section of this bulletin. Practical training (GES 385) may be required by some programs, with adviser approval, depending on the background of the student. Additional department requirements include the following:

1. A minimum of 45 units of course work at the 100 level or above.
    a. Half of the courses used to satisfy the 45-unit requirement must be intended as being primarily for graduate students, usually at the 200 level or above.
    b. No more than 15 units of thesis research may be used to satisfy the 45-unit requirement.
    c. Some students may be required to make up background deficiencies in addition to these basic requirements.
2. By the end of Winter Quarter of their first year in residence, students must complete at least three courses taught by a minimum of two different GES faculty members.
3. Each student must have a research adviser who is a faculty member in the department and is within the student's thesis topic area or specialized area of study.
4. Each student must complete a thesis describing his or her research. Thesis research should begin during the first year of study at Stanford and should be completed before the end of the second year of residence.
5. Early during the thesis research period, and after consultation with the student, the thesis adviser appoints a second reader for the thesis, who must be approved by the graduate coordinator; the thesis adviser is the first reader. The two readers jointly determine whether the thesis is acceptable for the M.S. degree in the department.

ENGINEER DEGREE

The Engineer degree is offered as an option for students in applied disciplines who wish to obtain a graduate education extending beyond that of an M.S., yet do not have the desire to conduct the research needed to obtain a Ph.D. A minimum of two years (six quarters) of graduate study is required. The candidate must complete 90 units of course work, no more than 10 of which may be applied to overcoming deficiencies in undergraduate training. The student must prepare a substantial thesis that meets the approval of the thesis adviser and the graduate coordinator.

DOCTOR OF PHILOSOPHY

Objectives—The Ph.D. is conferred upon candidates who have demonstrated substantial scholarship, high attainment in a particular field of knowledge, and the ability to conduct independent research. To this end, the objectives of the doctoral program are to enable students to develop the skills needed to conduct original investigations in a particular discipline or set of disciplines in the earth sciences, to interpret the results, and to present the data and conclusions in a publishable manner.

Requirements—The University's requirements for the Ph.D. degree are outlined in the "Graduate Degrees" section of this bulletin. Practical training (GES 385) may be required by some programs, with adviser approval, depending on the background of the student. A summary of additional department requirements is presented below:

1. Ph.D. students must complete the required courses in their individual program or in their specialized area of study with a grade point average (GPA) of 3.0 (B) or higher, or demonstrate that they have completed the equivalents elsewhere. Ph.D. students must complete a minimum of four letter-grade courses of at least 3 units each from four different faculty members on the Academic Council in the University. By the end of Winter Quarter of their first year in residence, students must complete at least three courses taught by a minimum of two different GES faculty members.
2. Each student must qualify for candidacy for the Ph.D. by the end of the sixth quarter in residence, excluding summers. Department procedures require selection of a faculty thesis adviser, preparation of a written research proposal, approval of this proposal by the thesis adviser, selection of a committee for the Ph.D. qualifying examination, and approval of the membership by the graduate coordinator and chair of the department. The research examination consists of three parts: oral presentation of a research proposal, examination on the research proposal, and examination on subject matter relevant to the proposed research. The exam should be scheduled prior to May 1, so that the outcome of the exam is known at the time of the annual spring evaluation of graduate students.
3. Upon qualifying for Ph.D. candidacy, the student and thesis adviser, who must be a department faculty member, choose a research committee that includes a minimum of two faculty members in the University in addition to the adviser. Annually, in the month of March or April, the candidate must organize a meeting of the research committee to present a brief progress report covering the past year.

4. Under the supervision of the research advisory committee, the candidate must prepare a doctoral dissertation that is a contribution to knowledge and is the result of independent research. The format of the dissertation must meet University guidelines. The student is strongly urged to prepare dissertation chapters that, in scientific content and format, are readily publishable.
5. The doctoral dissertation is defended in the University oral examination. The research adviser and two other members of the research committee are determined to be readers of the draft dissertation. The readers are charged to read the draft and to certify in writing to the department that it is adequate to serve as a basis for the University oral examination. Upon obtaining this written certification, the student is permitted to schedule the University oral examination.

PH.D. MINOR

Candidates for the Ph.D. degree in other departments who wish to obtain a minor in Geological and Environmental Sciences must complete, with a GPA of 3.0 (B) or better, 20 units in the geosciences in lecture courses intended for graduate students. The selection of courses must be approved by the student's GES adviser and the department chair.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

UNDERGRADUATE

GES 1. Dynamic Earth: Fundamentals of Earth Science—For non-majors or prospective majors in Geological and Environmental Sciences or Earth Systems. Activity-based; field trips. Processes that shape the earth's landforms, produce minerals and rocks, create soils, deform its crust, and move continents; surficial processes involving water, wind, and ice, and their role in erosion and sediment production; processes within the earth's interior with emphasis on global tectonics; determining the ages of rocks and geologic events; hazards including earthquakes, volcanoes, flooding, landslides, and their mitigation; and nonrenewable resources, energy, and environmental problems. Recommended: high school chemistry and physics. GER:DB-NatSci

4 units, Aut, Spr (Scherer, H)

GES 2. Earth System History—The evolution of Earth's systems from formation to the present. Couplings and relationships among biosphere, lithosphere, hydrosphere, and atmosphere. Topics include the evolution of life, origin of the oceans, atmosphere and continents, and changes in climate. Modern climate change and anthropogenic effects. GER:DB-NatSci

3 units, Win (Scherer, H)

GES 3. Current Research Topics in Earth and Environmental Sciences—Primarily for freshmen and sophomores. Introduction to faculty and research areas in the School of Earth Sciences, including biogeochemistry, oceanography, paleobiology, geophysics, tectonics, geostatistics, soil science, hydrogeology, energy resources, and seismology. Winter seminar includes faculty from Biological Sciences. May be repeated for credit.

1 unit, Aut, Win (Egger, A)

GES 7A,B. An Introduction to Wilderness Skills—Living, traveling, and working in the wilderness for those planning fieldwork in the backcountry. Local geology, environmental ethics, trip planning, first aid, and leadership techniques. Four mandatory weekend outings focus on backcountry travel, minimum impact camping, equipment use and maintenance, rock climbing, and navigation. 7A emphasizes wilderness travel and climbing. 7B emphasizes winter camping skills and backcountry skiing. Food, group, and major personal gear provided. Guest speakers. Fee. See http://www.stanford.edu/class/ges7, or email oep-teachers@lists.stanford.edu.

1 unit, **A:** *Aut,* **B:** *Win (Bird, D)*

GES 7C. Advanced Wilderness Skills—For students with prior backcountry experience. Backcountry skiing, mountaineering, climbing, first aid, and trip planning. Focus is on outdoor leadership experience and trip management techniques. Food, group, and major personal gear provided. Four mandatory weekend trips. Fee. See http://www.stanford.edu/class/ges7/ for information or contact oep-teachers@lists.stanford.edu. Prerequisite: application.

1 unit, Spr (Bird, D)

GES 8. The Oceans: An Introduction to the Marine Environment—For non-majors and earth science and environmental majors. Topics: topography and geology of the sea floor; evolution of ocean basins; circulation of ocean and atmosphere; nature of sea water, waves, and tides; and the history of the major ocean basins. The interface between continents and ocean basins, emphasizing estuaries, beaches, and continental shelves with California margin examples. Relationships among the distribution of inorganic constituents, ocean circulation, biologic productivity, and marine environments from deep sea to the coast. One-day field trip to measure and analyze waves and currents. GER:DB-NatSci

3 units, Spr, Sum (Ingle, J)

GES 37N. Energy and the Environment on the Back of an Envelope—Stanford Introductory Seminar. Preference to freshmen. How quantitative understanding of the Earth helps inform decisions about energy supply. How can enough energy be provided to support future growth and development throughout the world without damaging the natural environment? Focus is on simple quantitative observations and calculations that facilitate evaluation of potential solutions to this problem; algebra only, no calculus.

3 units, Aut (Caldeira, K)

GES 38N. The Worst Journey in the World: The Science, Literature, and History of Polar Exploration—Stanford Introductory Seminar. Preference to freshmen. The isolation of polar explorers under the harshest conditions on Earth, and the chronicles of their explorations and hardships dating to the 1500s for the Arctic and the 1700s for the Antarctic. Focus is on scientific and geographic achievements. Sources include *The Worst Journey in the World* by Apsley Cherry-Garrard who in 1911 participated in a midwinter Antarctic sledging trip to recover emperor penguin eggs. Class jointly authors essay on themes from such literature. Optional field trip into the high Sierra in December. GER:DB-NatSci

3 units, Win (Dunbar, R)

GES 42N. Landscapes and Tectonics of the San Francisco Bay Area—Stanford Introductory Seminar. Preference to freshmen. Active faulting and erosion in the Bay Area, and its effects upon landscapes. Earth science concepts and skills through investigation of the valley, mountain, and coastal areas around Stanford. Faulting associated with the San Andreas Fault, coastal processes along the San Mateo coast, uplift of the mountains by plate tectonic processes, and landsliding in urban and mountainous areas. Field excursions; student projects.

4 units, Aut (Hilley, G)

GES 43N. Environmental Problems—Stanford Introductory Seminar. Preference to freshmen. Components of multidisciplinary environmental problems and ethical questions associated with decision making in the regulatory arena. Students lead discussions on environmental issues such as groundwater contamination from point and nonpoint sources, cumulative watershed effects related to timber and mining practices, acid rain, and subsurface disposal of nuclear waste. GER:DB-NatSci

3 units, Win (Loague, K)

GES 45N. Energy Issues Confronting the World—(Same as EARTHSYS 45N) Stanford Introductory Seminar. Preference to freshman. Geologic, economic, and policy issues shaping energy use and contrasting human perceptions of energy security. Topics include discourse of resources, history and future of fossil fuels, curse of oil, global climate change, adaptation versus mitigation, relationship between wealth and energy, demand and strategies for efficiency and conservation, alternative forms of energy prospects, geopolitics of energy trading, and energy flow among countries of the world. Game simulation, outside readings, class brainstorming, and student oral presentations on country energy profiles.

3 units, Win (Howell, D; Graham, S)

GES 46N. Exploring the Critical Interface between the Land and Monterey Bay: Elkhorn Slough—Stanford Introductory Seminar. Preference to freshmen. Field trips to sites in the Elkhorn Slough, a small agriculturally impacted estuary that opens into Monterey Bay, a model ecosystem for understanding the complexity of estuaries, and one of California's last remaining coastal wetlands. Readings include Jane Caffrey's *Changes in a California Estuary: A Profile of Elkhorn Slough*. Basics of biogeochemistry, microbiology, oceanography, ecology, pollution, and environmental management.

3-5 units, Spr (Francis, C)

GES 49N. Field Trip to Death Valley and Owens Valley—Stanford Introductory Seminar. Preference to freshmen. California's Death Valley and Owens Valley as natural laboratories for exploring a billion years of earth history: ancient ocean sediments, mountain building, earthquake faulting, glacial landscapes, volcanic eruptions, prehistoric climate changes, and historic human impacts. Six-day field trip to these areas during Spring Break. Term paper is written as a chapter for a field trip guidebook. Oral presentation on the outcrop at the field trip stop described in the guidebook chapter. The basics of plate tectonics and geology. Rock identification, reading topographic and geologic maps, and interpreting remote sensing imagery. Camping and moderate hiking required. GER:DB-NatSci

3 units, Win (Mahood, G)

GES 55Q. The California Gold Rush: Geologic Background and Environmental Impact—Stanford Introductory Seminar. Preference to sophomores. Topics include: geologic processes that led to the concentration of gold in the river gravels and rocks of the Mother Lode region of California; and environmental impact of the Gold Rush due to population increase, mining operations, and high concentrations of arsenic and mercury in sediments from hard rock mining and milling operations. Recommended: introductory geology. GER:DB-NatSci, Write-2

3 units, Win (Bird, D)

GES 56Q. Changes in the Coastal Ocean: The View From Monterey and San Francisco Bays—Stanford Introductory Seminar. Preference to sophomores. Recent changes in the California current, using Monterey Bay as an example. Current literature introduces principles of oceanography. Visits from researchers from MBARI, Hopkins, and UCSC. Optional field trip to MBARI and Monterey Bay. GER:DB-NatSci

3 units, Spr (Dunbar, R)

GES 90. Introduction to Geochemistry—The chemistry of the solid earth and its atmosphere and oceans, emphasizing the processes that control the distribution of the elements in the earth over geological time and at present, and on the conceptual and analytical tools needed to explore these questions. The basics of geochemical thermodynamics and isotope geochemistry. The formation of the elements, crust, atmosphere and oceans, global geochemical cycles, and the interaction of geochemistry, biological evolution, and climate. Recommended: introductory chemistry. GER:DB-NatSci

3-4 units, Win (Stebbins, J)

GES 101. Environmental and Geological Field Studies in the Rocky Mountains—Three-week, field-based program in the Greater Yellowstone/Teton and Wind River Mountains of Wyoming. Field-based exercises covering topics including: basics of structural geology and petrology; glacial geology; western cordillera geology; paleoclimatology; chemical weathering; aqueous geochemistry; and environmental issues such as acid mine drainage and changing land-use patterns. GER:DB-NatSci

3 units, Aut (Chamberlain, P)

GES 102. Earth Materials—The minerals, rocks, soils, and liquids that comprise the earth. How to identify, classify, and interpret rock-forming minerals and igneous, metamorphic, and sedimentary rock types. Emphasis is on information provided by common minerals and rocks about the earth's major processes including magmatism, metamorphism, weathering, erosion, and deposition; the relationship of these processes to plate tectonics and earth cycles. Prerequisite: introductory geology course. Recommended: introductory chemistry. GER:DB-NatSci

5 units, Aut (Brown, G; Mattinson, C)

GES 103. Rocks in Thin Section—How to identify minerals and common mineral associations in igneous, metamorphic, and sedimentary rocks. How to describe typical crystallization relations and textures of igneous rocks, mineral growth and reaction relations in metamorphic rocks, and deformational textures and their relation to mineral growth. The petrographic microscope. Prerequisite: 102.

3 units, Win (Miller, E)

GES 110. Structural Geology and Tectonics—Techniques, principles, and theory to describe, measure, analyze, and interpret deformation-related structures in rocks and minerals. Techniques of structural data collection in the field; lab and computer analysis of structural data; theory and principles of brittle deformation, faulting, and folding; interpretation of geologic maps and principles of cross-section contruction; strain measurement and the structural analysis of metaphorphic rocks; evolution of fold and thrust belts, rift-related sedimentary basins, and strike-slip fault systems. Prerequisites: 1, calculus. Recommended: 102. GER:DB-NatSci

5 units, Spr (Miller, E)

GES 111A. Fundamentals of Structural Geology—(Same as CEE 195A.) Techniques for structural mapping; using differential geometry to characterize structures; dimensional analysis and scaling relations; kinematics of deformation and flow; measurement and analysis of stress. Sources include field and laboratory data integrated with conceptual and mechanical models. Models of tectonic processes are constructed and solutions visualized using MATLAB. Prerequisites: GES 1, MATH 51, 52. GER:DB-NatSci

3 units, Aut (Pollard, D)

GES 111B. Fundamentals of Structural Geology—(Same as CEE 195B.) Continuation of GES 111A/CEE 195A. Conservation of mass and momentum in a deformable continuum; linear elastic deformation and elastic properties of rock; brittle deformation including fracture and faulting; linear viscous flow including folding and magma dynamics; model development and methodology. Sources include field and laboratory data integrated with conceptual and mechanical models. Models of tectonic processes are constructed and solutions visualized using MATLAB. Prerequisite: GES 111A/CEE 195B.

3 units, Win (Pollard, D)

GES 112. Mapping the Geological Environment—Geological mapping tools and techniques. Field training with GPS and laser ranging tools. Data sets from modern surveying and mapping campaigns employing lab and field-based laser scanning, field-based total stations, airborne photography and laser swath mapping (ALSM), the satellite Global Positioning System (GPS), and 3D seismic reflection surveys. These data analyzed using elementary differential geometry. MATLAB introduced as the computational and graphics engine. Prerequisites: GES 1, MATH 51, 52. GER:DB-NatSci

3 units, Win (Pollard, D)

GES 115. Engineering Geology Practice—(Same as CEE 196.) The application of geologic fundamentals to the planning and design of civil engineering projects. Field exercises and case studies emphasize the impact of site geology on the planning, design, and construction of civil works such as buildings, foundations, transportation facilities, excavations, tunnels and underground storage space, and water supply facilities. Topics: Quaternary history and tectonics, formation and physical properties of surficial deposits, site investigation techniques, geologic hazards, and professional ethics. Prerequisite: GES 1 or consent of instructor. GER:DB-NatSci

3 units, Spr (Holzer, T)

GES 120. Planetary and Early Biological Evolution Seminar—(Same as GES 220.) Interdisciplinary. For upper division science undergraduates and graduate students. Synthesis of biology, geology, physics, and chemistry. Recent approaches for identifying traces of past life on Earth. How to look for life on other planets such as Mars, Europa, and Titan. May be repeated for credit.

2-3 units, not given this year (Lowe, D)

GES 121. What Makes a Habitable Planet?—Physical processes affecting habitability such as large impacts and the atmospheric greenhouse effect, comets, geochemistry, the rise of oxygen, climate controls, and impact cratering. Detecting and interpreting the spectra of extrasolar terrestrial planets. Student-led discussions of readings from the scientific literature. Team taught by planetary scientists from NASA Ames Research Center.
3 units, not given this year (Lissauer, J; Marley, M)

GES 122. Planetary Systems: Dynamics and Origins—(Students with a strong background in mathematics and the physical sciences should register for 222.) Motions of planets and smaller bodies, energy transport in planetary systems, composition, structure and dynamics of planetary atmospheres, cratering on planetary surfaces, properties of meteorites, asteroids and comets, extrasolar planets, and planetary formation. Prerequisite: some background in the physical sciences, especially astronomy, geophysics, or physics.
3-4 units, Aut (Lissauer, J; Marley, M)

GES 123. Invertebrate Paleobiology—Introduction to the fossil record with emphasis on marine invertebrates. Major debates in paleontological research. The history of animal life in the oceans. Topics include the nature of the fossil record, evolutionary radiations, mass extinctions, and the relationship between biological evolution and environmental change. Fossil taxa through time. Exercises in phylogenetics, paleoecology, biostratigraphy, and statistical methods. GER:DB-NatSci
4 units, alternate years, not given this year (Payne, J)

GES 130. Soil Physics and Hydrology—The waters of the Earth, and their occurrence, distribution, circulation, and reaction with the environment. Topics: precipitation, evapotranspiration, infiltration and vadose zone, groundwater, surface water and streamflow generation, lakes, water supply and use, and water balance and flood frequency estimates. Current and classic theory in soil physics and hydrology. Urban, rangeland, and forested environments. GER:DB-NatSci
3 units, Aut (Loague, K)

GES 131. Fluvial Systems and Landscape Evolution—Materials of the Earth and hydrologically driven landscape processes. Topics: hillslope hydrology, weathering of rocks and soils, erosion, flow failures, mass wasting, and conceptual models of landscape evolution. Current and classic theory in geomorphology. GER:DB-NatSci
3 units, Win (Loague, K)

GES 138. Urbanization, Global Change, and Sustainability—The relationship between urbanization and global change at local, regional, and global scales. Global environmental change as driver and outcome of human (economic, political, cultural, and social) and physical (urban structure, expansion, and land use) processes in urban areas. Urbanization as a demographic and biophysical phenomenon. Topics include the human and biophysical dimensions of global environmental change as relevant to the process of urbanization, environmental implications of urban processes and form, urban ecological services, and urban climate.
3 units, Spr (Seto, K)

GES 142. Remote Sensing of Land Use and Land Cover—(Same as EARTHSYS 142/242.) Emphasis is on terrestrial changes. Topics include pre-processing data, biophysical properties of vegetation observable by satellite, accuracy assessment of maps derived from remote sensing, and methodologies to detect changes such as urbanization, deforestation, vegetation health, and wildfires.
4 units, not given this year (Seto, K)

GES 144. Fundamentals of Geographic Information Science (GIS)—(Same as EARTHSYS 144.) Survey of geographic information including maps, satellite imagery, and census data, approaches to spatial data, and tools for integrating and examining spatially-explicit data. Emphasis is on fundamental concepts of geographic information science and associated technologies. Topics include geographic data structure, cartography, remotely sensed data, statistical analysis of geographic data, spatial analysis, map design, and geographic information system software. Computer lab assignments. GER:DB-NatSci
4 units, Spr (Seto, K)

GES 145. Energy Flow and Policy: The Pacific Rim—(Graduate students register for 245; same as EARTHSYS 145/245.) Factors shaping energy use and development throughout the Pacific Rim. Topics include fossil and alternative energy resources, supply and trade vulnerabilities, the geopolitics of energy use, and the environmental and social impacts of waste streams. Class develops a game simulation based on critical energy issues, student-initiated energy projections, and assessment of the principal stakeholders.
3 units, alternate years, not given this year (Howell, D)

GES 150. Senior Seminar: Issues in Earth Sciences—Focus is on written and oral communication in a topical context. Topics from current frontiers in earth science research and issues of concern to the public. Readings, oral presentations, written work, and peer review. May be repeated for credit. WIM.
3 units, Aut (Egger, A)

GES 151. Sedimentary Geology and Petrography: Depositional Systems—Topics: weathering, erosion and transportation, deposition, origins of sedimentary structures and textures, sediment composition, diagenesis, sedimentary facies, tectonics and sedimentation, and the characteristics of the major siliciclastic and carbonate depositional environments. Lab: methods of analysis of sediments in hand specimen and thin section. Field trips. Prerequisites: 1, 102, 103. GER:DB-NatSci
4 units, Win (Graham, S; Lowe, D)

GES 160. Statistical Methods for Earth and Environmental Sciences: General Introduction—Extracting information from data using statistical summaries and graphical visualization, statistical measures of association and correlation, distribution models, sampling, error estimation and confidence intervals, linear models and regression analysis, introduction to time-series and spatial data with geostatistics, applications including environmental monitoring, natural hazards, and experimental design. Either or both of 160 and 161 may be taken. GER:DB-NatSci
3 units, Spr (Switzer, P)

GES 161. Statistical Methods for the Earth and Environmental Sciences: Geostatistics—(Same as ENERGY 161.) Statistical analysis and graphical display of data, common distribution models, sampling, and regression. The variogram as a tool for modeling spatial correlation; variogram estimation and modeling; introduction to spatial mapping and prediction with kriging; integration of remote sensing and other ancillary information using co-kriging models; spatial uncertainty; introduction to geostatistical software applied to large environmental, climatological, and reservoir engineering databases; emphasis is on practical use of geostatistical tools.
3-4 units, Win (Boucher, A)

GES 164. Stable Isotopes—(Graduate students register for 264.) Light stable isotopes and their application to geological, ecological, and environmental problems. Isotopic systematics of hydrogen, carbon, nitrogen, oxygen, and sulfur; chemical and biogenic fractionation of light isotopes in the atmosphere, hydrosphere, and rocks and minerals. GER:DB-NatSci
3 units, not given this year (Chamberlain, P)

GES 164L. Stable Isotopes Laboratory—Practical laboratory for 164.
2-3 units, Win (Dunbar, R)

GES 166. Soil Chemistry—(Graduate students register for 266.) Practical and quantitative treatment of soil processes affecting chemical reactivity, transformation, retention, and bioavailability. Principles of primary areas of soil chemistry: inorganic and organic soil components, complex equilibria in soil solutions, and adsorption phenomena at the solid-water interface. Processes and remediation of acid, saline, and wetland soils. Recommended: soil science and introductory chemistry and microbiology. GER:DB-NatSci
4 units, Win (Fendorf, S)

GES 168. Geomicrobiology—(Graduate students register for 268.) How microorganisms shape the geochemistry of the Earth's crust including oceans, lakes, estuaries, subsurface environments, sediments, soils, mineral deposits, and rocks. Topics include mineral formation and dissolution; biogeochemical cycling of elements (carbon, nitrogen, sulfur, and metals); geochemical and mineralogical controls on microbial activity, diversity, and evolution; life in extreme environments; and the application of new techniques to geomicrobial systems. Recommended: introductory chemistry and microbiology such as CEE 274A.

3 units, Win (Francis, C)

GES 170. Environmental Geochemistry—Solid, aqueous, and gaseous phases comprising the environment, their natural compositional variations, and chemical interactions. Contrast between natural sources of hazardous elements and compounds and types and sources of anthropogenic contaminants and pollutants. Chemical and physical processes of weathering and soil formation. Chemical factors that affect the stability of solids and aqueous species under earth surface conditions. The release, mobility, and fate of contaminants in natural waters and the roles that water and dissolved substances play in the physical behavior of rocks and soils. The impact of contaminants and design of remediation strategies. Case studies. Prerequisite: 90 or consent of instructor. GER:DB-NatSci

4 units, Win (Brown, G)

GES 171. Geochemical Thermodynamics—Introduction to the application of chemical principles and concepts to geologic systems. The chemical behavior of fluids, minerals, and gases using simple equilibrium approaches to modeling the geochemical consequences of diagenetic, hydrothermal, metamorphic, and igneous processes. Topics: reversible thermodynamics, solution chemistry, mineral-solution equilibria, reaction kinetics, and the distribution and transport of elements by geologic processes. Prerequisite: 80. GER:DB-NatSci

3 units, Aut (Bird, D)

GES 175. Science of Soils—Physical, chemical, and biological processes within soil systems. Emphasis is on factors governing nutrient availability, plant growth and production, land-resource management, and pollution within soils. How to classify soils and assess nutrient cycling and contaminant fate. Recommended: introductory chemistry and biology. GER:DB-NatSci

4 units, Spr (Fendorf, S)

GES 179. Silicic Volcanism: Processes, Products, and Related Volcaniclastic Sequences—For students whose research involves products of silicic magmatism, mapping in volcanic terrains, or those interested in working with tephra or volcaniclastic units within their field areas. Topics include crustal magmatism and volcaniclastic sediments, including generation of large-scale silicic magma chambers, dynamics of eruption, emplacement and physical characteristics of pyroclastic flows and lavas, and interpreting volcaniclastic deposits.

1 unit, not given this year (Mahood, G)

GES 180. Igneous Processes—For juniors, seniors and beginning graduate students in Earth Sciences. Structure and physical properties of magmas; use of phase equilibria and mineral barometers and thermometers to determine conditions of magmatic processes; melting and magmatic lineages as a function of tectonic setting; processes that control magma composition including fractional crystallization, partial melting, and assimilation; petrogenetic use of trace elements and isotopes. Labs emphasize identification of volcanic and plutonic rocks in thin section and interpretation of rock textures. May be taken for 3 units without lab. Prerequisite 102, 103, or consent of instructor.

3-5 units, Spr (Stebbins, J)

GES 181. Metamorphic Processes—For juniors, seniors, and beginning graduate students in Earth Sciences. Thermodynamics and phase equilibria of multiple component systems; use of phase equilibria to determine pressure and temperature of metamorphic assemblages; geochronology of metamorphic rocks; heat flow in the lithosphere; links between tectonics and metamorphism; and the role of heat and mass transfer in the Earth's crust and mantle. Labs emphasize identification of metamorphic rocks and minerals for common pelitic and basic rocks and interpretation of rock textures. May be taken for 3 units without lab. Prerequisites: 102, 103, or consent of instructor. GER:DB-NatSci

3-5 units, Spr (Mattinson, C)

GES 183. California Desert Geology—Field seminar. For upper division undergraduates and graduate students in the earth sciences and archaeology. Six-day field trip over Spring Break to Mojave Desert, Death Valley, and Owens Valley. Basin-and-range faulting, alluvial fans, playas, sand dunes, metamorphic rocks, granites of the Sierra Nevada, obsidian lava flows and the deposits of major explosive eruptions, hot springs and ore deposits, and desert landscapes. Camping and moderate hiking.

1 unit, not given this year (Mahood, G)

GES 185. Volcanology—For juniors, seniors, and beginning graduate students in Earth Sciences and Archaeology. How volcanic landforms and deposits relate to the composition and physical properties of magmas and the modes of emplacement. Labs emphasize recognizing types of lavas and products of explosive eruptions. Volcanic hazards and the effects of eruptions on climate and the atmosphere; volcanic-hosted geothermal systems and mineral resources. Required four-day field trip over Memorial Day weekend to study silicic and mafic volcanism associated with the western margin of the Basin and Range province. Prerequisite: 1, 102 or equivalent. GER:DB-NatSci

3-4 units, Spr (Mahood, G)

GES 186. Geoarchaeology—(Graduate students register for 286.) For juniors, seniors, and beginning graduate students with interests in archaeology or geosciences. Geological concepts, techniques, and data in the study of artifacts and the interpretation of the archaeological record. Topics include: sediments and soils; sedimentary settings of site formation; postdepositional processes that disturb sites; paleoenvironmental reconstruction of past climates and landscapes using plant and animal remains and isotopic studies; raw materials (minerals, metals, stone, shells, clay, building materials) and methods used in sourcing; estimating age based on stratigraphic and radiometric techniques. Weekly lab; weekend field trip to local archaeological/geological site. GER:DB-NatSci

5 units, alternate years, not given this year (Mahood, G)

GES 190. Field Research—(Graduate students register for 299.) Two-three week field research projects. Written report required. May be repeated three times for credit.

2-4 units, Aut, Win, Spr, Sum (Staff)

GES 191. GES Field Trips—Field trips for teaching and research purposes. Trips average 5-10 days. May be repeated for credit. Prerequisite: consent of instructor.

1 unit, Aut, Win, Spr, Sum (Staff)

GES 192. Undergraduate Research in Geological and Environmental Sciences—Field-, lab-, or literature-based. Faculty supervision. Written reports. May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

GES 197. Senior Thesis—For seniors who wish to write a thesis based on research in 192 or as a summer research fellow. May not be repeated for credit; may not be taken if enrolled in 199.

3-5 units, Aut, Win, Spr, Sum (Staff)

GES 198. Special Problems in Geological and Environmental Sciences—Reading and instruction under faculty supervision. Written reports. May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

GES 199. Honors Program—Research on a topic of special interest. See "Undergraduate Honors Program" above. May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

GES 200. Professional Development in Geoscience Education—May be repeated for credit.
1 unit, Aut, Win (Payne, J)

GES 201. Science Course Design—(Same as CTL 201.) For students interested in an academic career and who anticipate designing science courses at the undergraduate or graduate level. Goal is to apply research on science learning to the design of effective course materials. Topics include syllabus design, course content and format decisions, assessment planning and grading, and strategies for teaching improvement.
2-3 units, Aut (Wright-Dunbar, R)

GES 205. Advanced Oceanography—For upper-division undergraduates and graduate students in the earth, biologic, and environmental sciences. Topical issues in marine science/oceanography. Topics vary each year following or anticipating research trends in oceanographic research. Focus is on links between the circulation and physics of the ocean with climate in the N. Pacific region, and marine ecologic responses. Participation by marine scientists from research groups and organizations including the Monterey Bay Aquarium Research Institute.
3 units, not given this year

GES 206. Antarctic Marine Geology—For upper-division undergraduates and graduate students. Intermediate and advanced topics in marine geology and geophysics, focusing on examples from the Antarctic continental margin and adjacent Southern Ocean. Topics: glaciers, icebergs, and sea ice as geologic agents (glacial and glacial marine sedimentology, Southern Ocean current systems and deep ocean sedimentation), Antarctic biostratigraphy and chronostratigraphy (continental margin evolution). Students interpret seismic lines and sediment core/well log data. Examples from a recent scientific drilling expedition to Prydz Bay, Antarctica. Up to two students may have an opportunity to study at sea in Antarctica during Winter Quarter.
3 units, alternate years, not given this year (Dunbar, R)

GES 208. Seminar in Sedimentary Geology—Current topics. May be repeated for credit.
1-3 units, offered occasionally (Staff)

GES 209. Microstructures—For upper-division undergraduates and graduate students. Structural and metamorphic fabrics, whose interpretation is essential to understand the thermo-mechanical behavior of the crust, produced by variations in temperature, pressure, and deformation. Topics include rheology of the crust, strain partitioning, the brittle ductile transition, development of foliations, lineations, relation to metamorphic mineral growth, preferred crystallographic orientations, shear zone deformation, and geochronologic methods of dating deformation. Lab involves study of deformed and metamorphosed rocks in thin section.
3-5 units, not given this year (Miller, E)

GES 211. Topics in Regional Geology and Tectonics—May be repeated for credit.
2-3 units, Aut (Miller, E)

GES 212. Topics in Tectonic Geomorphology—For upper-division undergraduates and graduate students. Topics vary and may include coupling among erosional, tectonic, and chemical weathering processes at the scale of orogens; historical review of tectonic geomorphology; hillslope and fluvial process response to active uplift; measures of landscape form and their relationship to tectonic uplift and bedrock lithology. May be repeated for credit.
2 units, Aut (Hilley, G)

GES 213. Topics in Sedimentary Geology—For upper division undergraduates and graduate students. Topics vary each year but the focus is on current developments and problems in sedimentary geology, sedimentology, and basin analysis. These include issues in deep-water sediments, their origin, facies, and architecture; sedimentary systems on the early Earth; and relationships among tectonics, basin development, and basin fill. May be repeated for credit.
2-3 units, offered occasionally (Staff)

GES 214. Topics in Paleobiology—For upper division undergraduates and graduate students. Topics vary each year; focus is on paleontological, sedimentological, and geochemical approaches to the history of life. Topics may include: mass extinction events; evolutionary radiations; the history of global biodiversity; links between evolutionary histories of primary producers and consumers; and the quality of the fossil record. Term paper. May be repeated for credit.
2 units, Aut (Payne, J; Finnegan, S)

GES 215A. Structural Geology and Rock Mechanics—(Same as CEE 297G.) Quantitative field and laboratory data integrated with solutions to initial and boundary-value problems of continuum mechanics introduce tectonic processes in Earth's crust that lead to the development of geological structures including folds, faults, fractures and fabrics. Topics include: techniques and tools for structural mapping; using differential geometry to characterize structures; dimensional analysis and scaling relations; kinematics of deformation and flow; traction and stress analysis. Data sets analyzed using MATLAB. Prerequisites: GES 1, MATH 53, MATLAB or equivalent.
3-5 units, Aut (Pollard, D)

GES 215B. Structural Geology and Rock Mechanics—(Same as CEE 297H.) Field equations for elastic solids and viscous fluids derived from conservation laws to develop mechanical models for tectonic processes and their structural products. Topics include: conservation of mass and momentum in a deformable continuum; linear elastic deformation and elastic properties of rock; brittle deformation including fracture and faulting; linear viscous flow including folding, model development, and methodology. Models constructed and solutions visualized using MATLAB. Prerequisite: GES 215A.
3-5 units, Win (Pollard, D)

GES 216. Rock Fracture Mechanics—Principles and tools of elasticity theory and fracture mechanics are applied to the origins and physical behaviors of faults, dikes, joints, veins, solution surfaces, and other natural structures in rock. Field observations, engineering rock fracture mechanics, and the elastic theory of cracks. The role of natural fractures in brittle rock deformation, and fluid flow in the earth's crust with applications to crustal deformation, structural geology, petroleum geology, engineering, and hydrogeology. Prerequisite: GES 215 or equivalent.
3-5 units, Aut (Pollard, D)

GES 217. Faults, Fractures, and Fluid Flow—Process-based approach to rock failure; the microstructures and overall architectures of the failure products including faults, joints, solution seams, and types of deformation bands. Fluid flow properties of these structures emphasizing sealing and transmitting of faults and their role in hydrocarbon flow, migration, and entrapment. Case studies of fracture characterization experiments in aquifers, oil and gas reservoirs, and waste repository sites. Guest speakers; weekend field trip. Prerequisite: first-year graduate student in Earth Sciences.
3 units, alternate years, not given this year (Aydin, A)

GES 218. Communicating Science—For undergraduates and graduate students interested in teaching science in local schools. Inquiry-based science teaching methods. How to communicate scientific knowledge and improve presentations. Six weeks of supervised teaching in a local school classroom. Prerequisite: course in introductory biology, geology, chemistry, or marine sciences.
3 units, alternate years, not given this year (Saltzman, J)

GES 220. Planetary and Early Biological Evolution Seminar—(For graduate students; see 120.)
2-3 units, not given this year (Lowe, D)

GES 222. Planetary Systems: Dynamics and Origins—(For students with a strong background in mathematics and the physical sciences; others should register for 122.) Motions of planets, moons, and small bodies; energy transport in planetary systems; meteorites and the constraints they provide on the formation of the solar system; asteroids and Kuiper belt objects; comets; planetary rings; planet formation; and extrasolar planets. In-class presentation of student papers.
3-4 units, Aut (Lissauer, J; Marley, M)

GES 223. Planetary Systems: Atmospheres, Surfaces, and Interiors—Focus is on physical processes, such as radiation transport, atmospheric dynamics, thermal convection, and volcanism, shaping the interiors, surfaces, and atmospheres of the major planets in the solar system. How these processes manifest themselves under various conditions in the solar system. Case study of the surface and atmosphere of Mars. Application of comparative planetary science to extrasolar planets and brown dwarfs. In-class presentation of student papers.

3 units, not given this year (Marley, M)

GES 228. The Application of Heavy Isotopes in Environmental and Biogeochemical Research—For students who plan to use these isotopic systems in their research. How Sr, Pb, Ca, U/Th, and Nd isotopes are used to address problems in low-temperature biogeochemistry. Topics include the use of Sr isotopes to trace the migration and dispersion of animals and Sr and Ca isotopes as a proxy for cation cycling in terrestrial ecosystems.

2 units, alternate years, not given this year (Chamberlain, P)

GES 230. Physical Hydrogeology—(Same as CEE 260A.) Theory of underground water occurrence and flow, analysis of field data and aquifer tests, geologic groundwater environments, solution of field problems, groundwater modeling. Introduction to groundwater contaminant transport and unsaturated flow. Lab. Prerequisite: elementary calculus.

4 units, Aut (Gorelick, S)

GES 231. Contaminant Hydrogeology—(Same as CEE 260C.) For earth scientists and engineers. Environmental and water resource problems involving contaminated groundwater. The processes affecting contaminant migration through porous media including interactions between dissolved substances and solid media. Conceptual and quantitative treatment of advective-dispersive transport with reacting solutes. Predictive models of contaminant behavior controlled by local equilibrium and kinetics. Modern methods of contaminant transport simulation and optimal aquifer remediation. Prerequisite: GES 230 or CEE 260A or equivalent.

4 units, Spr (Staff)

GES 237. Surface and Near-Surface Hydrologic Response—(Same as CEE 260B.) Quantitative review of process-based hydrology and geomorphology. Introduction to finite-difference and finite-element methods of numerical analysis. Topics: biometeorology, unsaturated and saturated subsurface fluid flow, overland and open channel flow, and physically-based simulation of coupled surface and near-surface hydrologic response. Links hydrogeology, soil physics, and surface water hydrology.

3 units, Aut (Loague, K)

GES 238. Soil Physics—Physical properties of the soil solid phase emphasizing the transport, retention, and transformation of water, heat, gases, and solutes in the unsaturated subsurface. Field experiments.

3 units, given next year (Loague, K)

GES 240. Geostatistics for Spatial Phenomena—(Same as ENERGY 240.) Probabilistic modeling of spatial and/or time dependent phenomena. Kriging and co-kriging for gridding and spatial interpolation. Integration of heterogeneous sources of information. Multiple-point geostatistics and training image-based stochastic imaging of reservoir/field heterogeneities. Introduction to GSLIB and SGEMS software. Case studies from the oil and mining industry and environmental sciences. Prerequisites: introductory calculus and linear algebra, STATS 116, GES 161, or equivalent.

3-4 units, Win (Journel, A)

GES 242. Topics in Advanced Geostatistics—(Same as ENERGY 242.) Conditional expectation theory and projections in Hilbert spaces; parametric versus non-parametric geostatistics; Boolean, Gaussian, fractal, indicator, and annealing approaches to stochastic imaging; multiple point statistics inference and reproduction; neural net geostatistics; Bayesian methods for data integration; techniques for upscaling hydrodynamic properties. May be repeated for credit. Prerequisites: 240, advanced calculus, C++/Fortran.

3-4 units, given next year (Boucher, A)

GES 245. Energy Flow and Policy: The Pacific Rim—(For graduate students; see 145; same as EARTHSYS 145/245.)

3 units, alternate years, not given this year (Howell, D)

GES 246. Reservoir Characterization and Flow Modeling with Outcrop Data—(Same as ENERGY 246.) Project addressing a reservoir management problem by studying an outcrop analog, constructing geostatistical reservoir models, and performing flow simulation. How to use outcrop observations in quantitative geological modeling and flow simulation. Relationships between disciplines. Weekend field trip.

3 units, Aut (Graham, S; Tchelepi, H; Boucher, A)

GES 249. Petroleum Geochemistry in Environmental and Earth Science—How molecular fossils in crude oils, oil spills, refinery products, and human artifacts identify their age, origin, and environment of formation. The origin and habitat of petroleum, technology for its analysis, and parameters for interpretation, including: origins of molecular fossils; function, biosynthesis, and precursors; tectonic history related to the evolution of life, mass extinctions, and molecular fossils; petroleum refinery processes and the kinds of molecular fossils that survive; environmental pollution from natural and anthropogenic sources including how to identify genetic relationships among crude oil or oil spill samples; applications of molecular fossils to archaeology; worldwide petroleum systems through geologic time.

3 units, Win (Moldowan, J)

GES 250. Sedimentation Mechanics—The mechanics of sediment transport and deposition and the origins of sedimentary structures and textures as applied to interpreting ancient rock sequences. Dimensional analysis, fluid flow, drag, boundary layers, open channel flow, particle settling, erosion, sediment transport, sediment gravity flows, soft sediment deformation, and fluid escape. Field trip required.

4 units, Aut (Lowe, D)

GES 251. Sedimentary Basins—Analysis of the depositional framework and tectonic evolution of sedimentary basins. Topics: tectonic and environmental controls on facies relations, synthesis of basin development through time in terms of depositional systems and tectonic settings. Weekend field trip required. Prerequisites: 110, 151.

3 units, Aut (Graham, S)

GES 252. Sedimentary Petrography—Siliciclastic sediments and sedimentary rocks. Research in modern sedimentary mineralogy and petrography and the relationship between the composition and texture of sediments and their provenance, tectonic settings, and diagenetic histories. Topics vary yearly. Prerequisite: 151 or equivalent.

4 units, alternate years, not given this year (Lowe, D)

GES 253. Petroleum Geology and Exploration—The origin and occurrence of hydrocarbons. Topics: thermal maturation history in hydrocarbon generation, significance of sedimentary and tectonic structural setting, principles of accumulation, and exploration techniques. Prerequisites: 110, 151. Recommended: GEOPHYS 184.

3 units, alternate years, not given this year (Graham, S)

GES 254. Carbonate Sedimentology—Processes of precipitation and sedimentation of carbonate minerals with emphasis on marine systems. Topics include: geographic and bathymetric distribution of carbonates in modern and ancient oceans; genesis and environmental significance of carbonate grains and sedimentary textures; carbonate rocks and sediments as sources of geochemical proxy data; carbonate diagenesis; changes in styles of carbonate deposition through Earth history; carbonate depositional patterns and the global carbon cycle. Lab exercises emphasize petrographic and geochemical analysis of carbonate rocks including map and outcrop scale, hand samples, polished slabs, and thin sections.

3-4 units, Spr (Payne, J)

GES 255. Basin Modeling and 3-D Visualization—For advanced undergraduates or graduate students. Students use stratigraphy, subsurface maps, and basic well log, lithologic, paleontologic, and geochemical data to construct 1-D, 2-D, and 3-D models of petroleum systems that predict the extent of source-rock thermal maturity, petroleum migration paths, and the volumes and compositions of accumulations through time (4-D). Recent software such as PetroMod designed to reconstruct basin geohistory. Recommended: 251 or 253.
3 units, Win (Peters, K)

GES 257. Clastic Sequence Stratigraphy—Sequence stratigraphy facilitates integration of all sources of geologic data, including seismic, log, core, and paleontological, into a time-stratigraphic model of sediment architecture. Tools applicable to regional and field scales. Emphasis is on practical applications and integration of seismic and well data to exploration and field reservoir problems. Examples from industry data; hands-on exercises.
3 units, Spr (McHargue, T)

GES 258. Introduction to Depositional Systems—The characteristics of the major sedimentary environments and their deposits in the geologic record, including alluvial fans, braided and meandering rivers, aeolian systems, deltas, open coasts, barred coasts, marine shelves, and deep-water systems. Emphasis is on subdivisions; morphology; the dynamics of modern systems; and the architectural organization and sedimentary structures, textures, and biological components of ancient deposits.
3 units, offered occasionally (Lowe, D)

GES 260. Laboratory Methods in Organic Geochemistry—Knowledge of components in geochemical mixtures to understand geological and environmental samples. The presence and relative abundance of these compounds provides information on the biological source, depositional environment, burial history, biodegradation, and toxicity of organic materials. Laboratory methods to detect and quantify components of these mixtures. Methods for separation and analysis of organic compounds in geologic samples: extraction, liquid chromatography, absorption by zeolites, gas chromatography and gas chromatography-mass spectrometry. Student samples considered as material for analysis. Recommended: 249.
2-3 units, Spr (Moldowan, J)

GES 261. Physics and Chemistry of Minerals and Mineral Surfaces—The concepts of symmetry and periodicity in crystals; the physical properties of crystals and their relationship to atomic-level structure; basic structure types; crystal chemistry and bonding in solids and their relative stability; the interaction of x-rays with solids and liquids (scattering and spectroscopy); structural variations in silicate glasses and liquids; UV-visible spectroscopy and the color of minerals; review of the mineralogy, crystal chemistry, and structures of selected rock-forming silicates and oxides; mineral surface and interface geochemistry.
4 units, alternate years, not given this year (Brown, G)

GES 262. Thermodynamics and Disorder in Minerals and Melts—The thermodynamic properties of crystalline, glassy, and molten silicates and oxides in light of microscopic information about short range structure and ordering. Measurements of bulk properties such as enthalpy, density, and their pressure and temperature derivatives, and structural determination by spectroscopies such as nuclear magnetic resonance and Mössbauer. Basic formulations for configurational entropy, heats of mixing in solid solutions, activities; and the energetics of exsolution, phase transitions, and nucleation. Quantitative models of silicate melt thermodynamics are related to atomic-scale views of structure. A general view of geothermometry and geobarometry. Prerequisites: introductory mineralogy and thermodynamics.
3 units, given next year (Stebbins, J)

GES 264. Stable Isotopes—(For graduate students; see 164.)
3 units, not given this year (Chamberlain, P)

GES 265. Microbially Mediated Redox Processes—Chemical and biologically mediated oxidation and reduction processes within soils, sediments, and surface/subsurface waters. Emphasis is on reactions and processes at the solid-water interface. Topics include electron transfer processes, dissimilatory metal reduction, redox reaction rates, alterations in mineralogy, and modifications in chemical behavior with changes in redox state.
3 units, not given this year (Fendorf, S; Francis, C)

GES 266. Soil Chemistry—(For graduate students; see 166.)
4 units, Win (Fendorf, S)

GES 267. Solution-Mineral Equilibria: Theory—Procedures for calculating and evaluating the thermodynamic properties of reversible and irreversible reactions among rock-forming minerals and aqueous solutions in geologic systems. Emphasis is on the generation and utility of phase diagrams depicting solution-mineral interaction relevant to phase relations associated with weathering diagenetic, hydrothermal, and metamorphic processes, and the prediction of temperature, pressure, and the chemical potential of thermodynamic components compatible with observed mineralogic phase relations in geologic outcrops. Individual research topics. Prerequisite: 171.
3 units, Win (Bird, D)

GES 268. Geomicrobiology—(For graduate students; see 168.)
3 units, Win (Francis, C)

GES 269. Environmental Microbial Genomics—The application of molecular and environmental genomic approaches to the study of biogeochemically-important microorganisms in the environment without the need for cultivation. Emphasis is on genomic analysis of microorganisms by direct extraction and cloning of DNA from natural microbial assemblages. Topics include microbial energy generation and nutrient cycling, genome structure, gene function, physiology, phylogenetic and functional diversity, evolution, and population dynamics of uncultured communities.
1-3 units, not given this year (Francis, C)

GES 270. Elkhorn Slough Microbiology—The microbial ecology and biogeochemistry of Elkhorn Slough, an agriculturally-impacted coastal estuary draining into Monterey Bay. The diversity of microbial lifestyles associated with estuarine physical/chemical gradients, and the influence of microbial activity on the geochemistry of the Slough, including the cycling of carbon, nitrogen, sulfur, and metals. Labs and field work. Location: Hopkins Marine Station.
3 units, Sum (Francis, C)

GES 275. Electron Probe Microanalytical Techniques—The practical and theoretical aspects of x-ray generation and detection, and the behavior of electron beams and x-rays in solids. The basic principles needed to quantitatively analyze chemically complex geological materials. Operation of the JEOL 733 electron microprobe and associated computer software for quantitatively analyzing materials. X-ray chemical mapping. Enrollment limited to 8.
2-3 units, Win (Jones, R)

GES 284. Field Seminar on Eastern Sierran Volcanism—For graduate students in the earth sciences and archaeology. Four-day trip over Memorial Day weekend to study silicic and mafic volcanism associated with the western margin of the Basin and Range province: basaltic lavas and cinder cones erupted along normal faults bounding Owens Valley, Long Valley caldera, postcaldera rhyolite lavas, hydrothermal alteration and hot springs, Holocene rhyolite lavas of the Inyo and Mono craters, volcanism of the Mono Basin with subaqueous basaltic eruptions, floating pumice blocks, and cryptodomes punching up lake sediments. If snow-level permits, silicic volcanism associated with the Bodie gold district. Prerequisite: 1, 102 or equivalent.
1 unit, not given this year (Mahood, G)

GES 285. Igneous Petrogenesis—Radiogenic isotopes, stable isotopes, and trace elements applied to igneous processes; interaction of magmas with mantle and crust; convergent-margin magmatism; magmatism in extensional terrains; origins of rhyolites; residence times of magmas and magma chamber processes; granites as imperfect mirrors of their source regions; trace element modeling of igneous processes; trace element discriminant diagrams in tectonic analysis; sources of ore forming metals. Topics emphasize student interest. Prerequisite: 180 or equivalent.
3 units, Spr (Mahood, G)

GES 286. Geoarchaeology—(For graduate students; see 186.)
5 units, alternate years, not given this year (Mahood, G)

GES 287. Tectonics, Topography, and Climate Change—For upper-division undergraduates and graduate students. The links between tectonics and climate change with emphasis on the Cenozoic era. Focus is on terrestrial climate records and how they relate to large-scale tectonics of mountain belts. Topics include stable isotope geochemistry, geochronology, chemical weathering, stratigraphy of terrestrial rocks, paleofauna and flora, climate proxies and records, and Cenozoic tectonics. Guest speakers, student presentations.
3 units, given next year (Chamberlain, P)

GES 290. Departmental Seminar in Geological and Environmental Sciences—Current research topics. Presentations by guest speakers from Stanford and elsewhere.
1 unit, Aut (Hilley, G; Payne, J)

GES 291. GES Field Trips—Field trips for teaching and research purposes. Trips average 5-10 days. Prerequisite: consent of instructor.
1 unit, Aut, Win, Spr, Sum (Staff)

GES 299. Field Research—(For graduate students; see 190.)
2-4 units, Aut, Win, Spr, Sum (Staff)

GES 300. Earth Sciences Seminar—(Same as EARTHSYS 300, EEES 300, GEOPHYS 300, IPER 300, ENERGY 300.) Required for incoming graduate students except coterms. Research questions, tools, and approaches of faculty members from all departments in the School of Earth Sciences. Goals are: to inform new graduate students about the school's range of scientific interests and expertise; and introduce them to each other across departments and research groups. Two faculty members present work at each meeting. May be repeated for credit.
1 unit, Aut (Matson, P; Graham, S)

GES 310. Climate Change, Climate Variability, and Landscape Development—The impact of long-term climate change on erosional processes and the evolution of Cenozoic landscapes. Climate data that highlight recurring climate variability on inter-annual to decadal timescales. The behavior of climate on multi-decadal to tectonic timescales over which significant changes in topography take place. The effects of climate change and variability on landscape development, sedimentary environments, and the deposits of these events.
1 unit, Aut (Hilley, G)

GES 314. Structural Geology and Geomechanics—Research seminar. May be repeated for credit.
1 unit, Aut, Win, Spr (Staff)

GES 315. Literature of Structural Geology—Classic studies and current journal articles. May be repeated for credit.
1 unit, Aut, Win, Spr (Pollard, D)

GES 322C. Seminar in Biogeochemistry—Current topics. May be repeated for credit.
1-2 units, not given this year (Matson, P)

GES 324. Seminar in Oceanography—Current topics. May be repeated for credit.
1-2 units, Aut, Win, Spr (Arrigo, K)

GES 325. The Evolution of Body Size—(Same as BIOSCI 325.) The influence of organism size on evolutionary and ecological patterns and processes. Focus is on integration of theoretical principles, observations of living organisms, and data from the fossil record. What are the physiological and ecological correlates of body size? Is there an optimum size? Do organisms tend to evolve to larger size? Does productivity control the size distribution of consumers? Does size affect the likelihood of extinction or speciation? How does size scale from the genome to the phenotype? How is metabolic rate involved in evolution of body size? What is the influence of geographic area on maximum body size?
2 units, not given this year (Hadly, E; Payne, J)

GES 328. Seminar in Paleobiology—For graduate students. Current research topics including paleobotany, vertebrate and invertebrate evolution, paleoecology, and major events in the history of life on Earth.
1-2 units, Spr (Payne, J)

GES 330. Advanced Topics in Hydrogeology—Questioning classic explanations of physical processes; coupled physical, chemical, and biological processes affecting heat and solute transport. May be repeated for credit.
1-2 units, Aut, Win (Gorelick, S)

GES 332A. Seminar in Hydrogeology—Current topics. May be repeated for credit. Autumn Quarter has open enrollment. For Winter Quarter, consent of instructor is required.
1 unit, Aut (Gorelick, S)

GES 332B. Seminar in Hydrogeology—Current topics. May be repeated for credit. Prerequisite: consent of instructor.
1 unit, Win (Gorelick, S)

GES 333. Water Policy Colloquium—(Same as CEE 333, IPER 333.) Student-organized interdisciplinary colloquium. Creation, implementation, and analysis of policy affecting the use and management of water resources. Weekly speakers from academia and local, state, national, and international agencies and organizations.
1 unit, Spr (Freyberg, D)

GES 342A,B,C. Geostatistics—Classic results and current research. Topics based on interest and timeliness. May be repeated for credit.
1-2 units, **A:** *Aut (Boucher, A),* **B:** *not given this year,* **C:** *Spr (Boucher, A)*

GES 343. Geographic Science Seminar: Why Space Matters—Current environmental research that incorporates geographic and spatial analysis using technological and analytical methods such as spatial econometrics, geostatistics, remote sensing, and GIS. May be repeated for credit.
1 unit, not given this year (Seto, K)

GES 355. Advanced Stratigraphy Seminar and Field Course—Student-led presentations; poster-sized display on assigned topic; field trip.
1-3 units, not given this year (Graham, S)

GES 365. Current Topics in Isotope Geochemistry—Using metamorphic rocks to understand the evolution of the lithosphere. Quantitative constraint of pressure and temperature, age, rate, and duration of metamorphic processes. Prerequisite: 102 or consent of instructor.
1 unit, not given this year (Staff)

GES 385. Practical Experience in the Geosciences—On-the-job training in the geosciences. May include summer internship; emphasizes training in applied aspects of the geosciences, and technical, organizational, and communication dimensions. Meets USCIS requirements for F-1 curricular practical training.
1 unit, Aut, Win, Spr, Sum (Staff)

GES 398. Current Topics in Ecosystem Modeling
1-2 units, not given this year (Matson, P)

GES 399. Advanced Projects—Graduate research projects that lead to reports, papers, or other products during the quarter taken. On registration, students designate faculty member and agreed-upon units.
1-10 units, Aut, Win, Spr, Sum (Staff)

GES 400. Graduate Research—Faculty supervision. On registration, students designate faculty member and agreed-upon units.
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOHOPK 182H/323H. Stanford at Sea—(Same as EARTHSYS 323.)
16 units, alternate years, not given this year

STATS 253/352. Spatial Statistics
3 units, Aut (Switzer, P)

GEOPHYSICS

Emeriti: Antony Fraser-Smith,** Robert Kovach, George A. Thompson
Chair: Rosemary J. Knight
Associate Chair: Greg Beroza
Professors: Greg Beroza, Jon F. Claerbout, Steven Gorelick,†† Jerry M. Harris, Simon Klemperer, Rosemary J. Knight, Marcia McNutt,*** Amos M. Nur, Joan Roughgarden,† Paul Segall, Norman H. Sleep, Howard Zebker,** Mark D. Zoback
Associate Professors: Kevin Arrigo, Biondo Biondi, Azadeh Tabazadeh†††
Assistant Professor: Jesse Lawrence
Professor (Research): Gerald M. Mavko
Courtesy Professors: Stephan A. Graham, David D. Pollard
Consulting Professors: James Berryman, William Ellsworth, Antoine Guitton, Walter Mooney, Louise Pellerin, David Scholl
Consulting Associate Professor: Stewart Levin
Visiting Professors: Esben Auken, Sierd A.P.L. Cloetingh
Senior Research Scientists: Robert Clapp, Jack Dvorkin, Tapan Mukerji
Research Associates: Gry Mine Berg, Nigel Crook, Paul Hagin, Youli Quan, David Robinson, Tiziana Vanorio, Charley Weiland

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* Recalled to active duty
† Joint appointment with Biological Sciences
** Joint appointment with Electrical Engineering
†† Joint appointment with Geological and Environmental Sciences
*** Joint appointment with Monterey Bay Aquarium Research Institute
††† Joint appointment with Civil and Environmental Engineering

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Web Site: http://pangea.stanford.edu/GP/

Courses given in Geophysics have the subject code GEOPHYS. For a complete list of subject codes, see Appendix.

Geophysics is the branch of Earth science concerned with exploring and analyzing active processes of Earth through physical measurement. The undergraduate and graduate programs are designed to provide a background of fundamentals in science, and courses to coordinate these fundamentals with the principles of geophysics. The program leading to the Bachelor of Science (B.S.) in Geophysics permits many electives and a high degree of flexibility for each student. Graduate programs provide specialized training for professional work in resource exploration, research, and education and lead to the degrees of Master of Science and Doctor of Philosophy.

The Department of Geophysics is housed in the Ruth Wattis Mitchell Earth Sciences Building. It has numerous research facilities, among which are a state-of-the-art broadband seismic recording station, high pressure and temperature rock properties and rock deformation laboratories, various instruments for field measurements including seismic recorders, nine dual frequency GPS receivers, and field equipment for measuring in-situ stress at great depth. Current research activities include biogeochemical cycling; crustal deformation; earthquake archaeology; earthquake seismology and earthquake mechanics; reflection, refraction, and tomographic seismology; rock mechanics, rock physics; seismic studies of the continental lithosphere; remote sensing; environmental geophysics; and synthetic aperture radar studies.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

Objectives—To provide knowledge about the entire spectrum of geophysics from resource exploration to environmental geophysics to earthquake seismology and plate tectonics, built upon a solid background in the essentials of math, physics, and geology. Students are prepared for either an immediate professional career in the resources and environmental sciences industries or future graduate study.

The following courses are required for the B.S. degree in Geophysics. A written report on original research or an honor's thesis is also required through participation in two or three quarters of GEOPHYS 185, Research Seminar Series, typically during the senior year. The departmental program proposal form can be downloaded at http://geo.stanford.edu/GP/undergraduate/major.html. Seniors in Geophysics who expect to do graduate work should take the Graduate Record Examination (GRE) early in their final undergraduate year.

CURRICULUM

FUNDAMENTAL GEOPHYSICS

GEOPHYS 102/EARTHSYS 110. Geosphere
or GES 1. Fundamentals of Geology
GEOPHYS 150. General Geophysics
or GEOPHYS 190. Near-Surface Geophysics
GEOPHYS 201. Frontiers of Geophysical Research

ADDITIONAL ELECTIVES

1. Three approved upper-level (100 or higher) Geophysics lecture courses, typically chosen from the following:

GEOPHYS 104. The Water Course
GEOPHYS 130. Biological Oceanography
GEOPHYS 136. Aerosols, Clouds, and Climate Change
GEOPHYS 140. Introduction to Remote Sensing
GEOPHYS 141. Remote Sensing of the Oceans
GEOPHYS 150. General Geophysics and Physics of the Earth
GEOPHYS 160. Waves
GEOPHYS 182. Reflection Seismology
GEOPHYS 183. Reflection Seismology Interpretation
GEOPHYS 190. Near-Surface Geophysics
GEOPHYS 220. Tectonics
GEOPHYS 262. Rock Physics

2. 6 units of GEOPHYS 185. Research Seminar Series (includes WIM requirement)
3. Three additional approved upper-level (100 or higher) Earth Sciences lecture courses, typically chosen from the above GEOPHYS electives or from the following:

GES 102. Earth Materials
GES 110. Structural Geology and Tectonics
GES 111A. Fundamentals of Structural Geology
GES 160. Statistical Methods for Earth and Environmental Sciences
ENERGY 120. Fundamentals of Petroleum Engineering

PREREQUISITE COURSES

MATH 19,20,21. Calculus, or equivalent,
and MATH 53. Ordinary Differential Equations
PHYSICS 41 *and* 110. Mechanics and Intermediate Mechanics
EE 141. Engineering Electromagnetics
or PHYSICS 120. Intermediate Electricity and Magnetism
CHEM 31A. Chemical Principles

RECOMMENDED ELECTIVE

CS 106A. Programming Methodology

MINOR

The Geophysics minor provides students with a general knowledge of geophysics in addition to a background in the related fields of physics, mathematics, and geology. The departmental program proposal form can be downloaded from http://geo.stanford.edu/GP/undergraduate/major.html.

CURRICULUM

GEOPHYS 102. Geosphere *or* GES 1. Fundamentals of Geology
GEOPHYS 201. Frontiers of Geophysical Research
GEOPHYS 150. General Geophysics
or GEOPHYS 190. Near-Surface Geophysics
Two additional approved upper-level (100 or higher) Geophysics lectures courses, typically chosen from GEOPHYS 104, 130, 136, 140, 141, 150, 160, 182, 183, 190, 220, 262.
MATH 19,20,21 or 41. Calculus
PHYSICS 41. Mechanics

HONORS PROGRAM

The department offers a program leading to the B.S. degree in Geophysics with honors. The guidelines are:

1. Select a research project, either theoretical, field, or experimental, that has the approval of an adviser.
2. Submit a proposal to the department, which decides on its suitability as an honors project. Necessary forms are in the department office.
3. Course credit for the project is assigned by the adviser within the framework of GEOPHYS 205.
4. The decision whether a given independent study project does or does not merit an award of honors shall be made jointly by the department and the student's adviser. This decision shall be based on the quality of both the honors work and the student's other work in earth sciences.
5. The work done on the honors program cannot be used as a substitute for regularly required courses.

COTERMINAL B.S./M.S. PROGRAM

The department offers a coterminal program. Interested individuals should check with a member of the department faculty for details. For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

University requirements for the M.S. and Ph.D. are described in the "Graduate Degrees" section of this bulletin. Lecture course units applied to graduate degree program requirements must be taken for a letter grade if the course is offered for letter grade.

Transfer credit—An incoming student with a relevant Master of Science degree may apply for a departmental waiver of up to 18 units of the 45 units required for the Ph.D. degree (see "Doctor of Philosophy" section below). Students without an M.S. degree may apply for waivers for individual courses taken in post-baccalaureate study at other institutions. Credit for courses generally requires that students identify an equivalent Stanford course and obtain the signature of the Stanford faculty responsible for such a course stating its equivalence.

Waiving of any course requirements or substitution of electives other than those listed below requires the written consent of the student's faculty adviser and the Geophysics graduate coordinator.

MASTER OF SCIENCE

Objectives—To enhance the student's training for professional work in geophysics through the completion of fundamental courses, both in the major fields and in related sciences, and to begin independent work and specialization.

Requirements for the Degree—The candidate must complete 45 units from the following groups of courses:

1. Complete 15 units of Geophysics lecture courses with at least 9 units numbered 200 or higher.
2. Complete six units numbered 100 or higher and three units of 200-level, non-Geophysics lecture courses in earth sciences.
3. Complete one to four electives selected from courses numbered 100 or higher from mathematics, chemistry, engineering, physics, relevant biology, computer science, ecology, hydrology, or earth science. At least one course must be numbered 200 or higher.
4. At least 9, but not more than 18, of the 45 units must be independent work on a research problem resulting in a written report accepted and archived by the candidate's faculty adviser. Normally, this research is undertaken as part of the candidate's participation in multiple quarters of research seminar (GEOPHYS 385 series). A summer internship is encouraged as a venue for research, but no academic credit is given.
5. Submit a program proposal for approval by a faculty adviser in the first quarter of enrollment.
6. Each candidate must present and defend the results of his or her research at a public oral presentation attended by at least two faculty members.
7. Students are required to attend department seminars.

DOCTOR OF PHILOSOPHY

Objectives—The Ph.D. degree is conferred upon evidence of high attainment in Geophysics, and ability to conduct an independent investigation and present the results of such research.

Requirements for the Degree—A minimum of 135 units of graduate study at Stanford must be satisfactorily completed. An acceptable program normally consists of at least 45 lecture units in the areas listed following. Up to 18 lecture units in categories 2, 4, and 6 may be satisfied by courses taken elsewhere if the previous course duplicates an existing Stanford course and the Stanford faculty member responsible for the course concurs. Required courses must be taken for a letter grade, if offered. Students are required to attend the department seminars.

1. ENGR 202W.
2. GEOPHYS 201.
3. 12 units of Geophysics lecture courses numbered 100 or higher.
4. 12 units of Geophysics lecture courses numbered 200 or higher, taken from at least four faculty members with different research specializations.
5. One 3-unit lecture course numbered 100 or higher in mathematics, science, or engineering covering mathematical methods, continuum or fluid mechanics, or Fourier/spectral analysis.
6. 9 units of 200-level or higher courses in math, science, engineering, or other quantitative science.
7. 6 units of non-Geophysics lecture courses numbered 100 or higher in Earth or planetary sciences, ecology, hydrology, chemistry, or relevant biology.
8. One 3-unit non-Geophysics lecture course numbered 200 or higher in Earth or planetary science, ecology, hydrology, chemistry, or relevant biology.
9. Sufficient units of independent work on a research problem to meet the 135-unit University requirement. 12 units must be met by participation in the GEOPHYS 385 series, or equivalent series in other departments with approval of the adviser and graduate coordinator. Students are encouraged to participate in the GEOPHYS 385 series from more than one faculty member or group and relevant equivalent series in other departments.
10. Two quarters of quarter-time teaching assistant experience. For more information, see the *Geophysics Administrative Guide*, section 1.4.1.

The student's record must indicate outstanding scholarship, and deficiencies in previous training must be removed. Experience as a teaching assistant (quarter-time for at least two academic quarters) is required for the Ph.D. degree. The student must pass the departmental oral examination by presenting and defending a written research paper or proposal by the end of the sixth academic quarter (third academic quarter for students with an M.S. degree); prepare under faculty supervision a dissertation that is a contribution to knowledge and the result of independent work expressed in satisfactory form; and pass the University oral examination. The Ph.D. dissertation must be submitted in its final form within five calendar years from the date of admission to candidacy.

Upon formal acceptance into a research group, the student and faculty adviser form a supervising committee consisting of at least three members who are responsible for overseeing satisfactory progress toward the Ph.D. degree. At least two committee members must be Geophysics faculty members. The committee conducts the department oral examination, and meets thereafter annually with the student to review degree progress. The Geophysics faculty monitors progress of all students who have not yet passed their department oral examination by carrying out an annual performance appraisal at a closed faculty meeting.

COURSES

GEOPHYS 25. Hands-on Introduction to Astrobiology—Are human beings alone; are microbes common in the universe? Historical development and modern status of topics such as: the vastness of space and time; star evolution; planetary climate; effects of geological processes and asteroid impacts on life; other habitable places in the solar system with updates on Mars; the Earth as a biological organism; maintenance of society for a geologically long time; and the search for intelligent extraterrestrials. Outdoor lab exercises designed to work in K-12 science classes. Non-science majors welcome. GER:DB-NatSci

3 units, Aut (Sleep, N)

GEOPHYS 100. Directed Reading

1-2 units, Aut, Win, Spr, Sum (Staff)

GEOPHYS 101A. Research Preparation—Structured mentoring of students enrolled in Geophysics Summer Research Program. Development of research proposals and preliminary readings.

1 unit, Spr (Klemperer, S; Egger, A)

GEOPHYS 101B. Research Presentation—Student participants from the Geophysics Summer Research Program prepare oral and poster presentations; formal presentations to the department and community.

1 unit, not given this year (Klemperer, S)

GEOPHYS 104. The Water Course—(Same as EARTHSYS 104.) The pathway that water takes from rainfall to the tap using student home towns as an example. How the geological environment controls the quantity and quality of water; taste tests of water from around the world. Current U.S. and world water supply issues. GER:DB-NatSci

3 units, Spr (Knight, R)

GEOPHYS 112. Exploring Geosciences with MATLAB—How to use MATLAB as a tool for research and technical computing, including 2-D and 3-D visualization features, numerical capabilities, and toolboxes. Practical skills in areas such as data analysis, regressions, optimization, spectral analysis, differential equations, image analysis, computational statistics, and Monte Carlo simulations. Emphasis is on scientific and engineering applications.

1-3 units, Aut (Mukerji, T)

GEOPHYS 113. Earthquakes and Volcanoes—(Same as EARTHSYS 113.) Earthquake location, magnitude and intensity scales, seismic waves, styles of eruptions and volcanic hazards, tsunami waves, types and global distribution of volcanoes, volcano forecasting. Plate tectonics as a framework for understanding earthquake and volcanic processes. Forecasting; earthquake resistant design; building codes; and probabilistic hazard assessment. For non-majors and potential earth scientists. GER:DB-EngrAppSci

3 units, not given this year (Beroza, G; Segall, P)

GEOPHYS 117. Biology and Global Change—(Same as BIOSCI 117, EARTHSYS 111.) The biological causes and consequences of anthropogenic and natural changes in the atmosphere, oceans, and terrestrial and freshwater ecosystems. Topics: glacial cycles and marine circulation, greenhouse gases and climate change, tropical deforestation and species extinctions, and human population growth and resource use. Prerequisite: Biological Sciences or Human Biology core or graduate standing. GER:DB-NatSci

4 units, Win (Vitousek, P; Arrigo, K)

GEOPHYS 123. What Does the Universe Tell Me—Interdisciplinary series. Topics include: oil and war; Yergin's *The Prize;* earthquakes and archaeology; petroleum and national security; global warming and Al Gore's *An Inconvenient Truth;* earth systems and music; Gustav Mahler's 3rd Symphony.

1 unit, Aut (Nur, A) offered once only

GEOPHYS 131/231. Marine Biogeochemistry—(Graduate students register for 231.) Processes that control the mean concentration and distribution of biologically utilized elements and compounds in the ocean. Processes at the air-sea interface, production of organic matter in the upper ocean, remineralization of organic matter in the water column, and processing of organic matter in the sediments. Cycles of carbon, oxygen, and nutrients; the role of the ocean carbon cycle in interannual to decadal variability, paleoclimatology, and the anthropogenic carbon budget.

3-4 units, Spr (Arrigo, K)

GEOPHYS 136/236. Aerosols, Clouds, and Climate Change—(Graduate students register for 236; same as CEE 161T/261T.) Natural and manmade aerosol particles in the Earth's atmosphere. Coupling interactions between aerosol and cloud particles and how such interactions influence the climate and atmospheric composition. Term project. Prerequisites: MATH 51 and CHEM 31, or equivalents.

3 units, Win (Tabazadeh, A)

GEOPHYS 137/237. Fundamentals of Ecological Modeling—(Graduate students register for 237.) The dynamics of complex systems through quantitative models that synthesize knowledge and forecast system behavior. Principles of ecological modeling including model conceptualization, construction, analysis, use, and abuse. Modeling exercises that culminate in the design, implementation, and evaluation of a process-based simulation model.

3 units, not given this year (Arrigo, K)

GEOPHYS 141/241. Remote Sensing of the Oceans—(Graduate students register for 241; same as EARTHSYS 141/241.) How to observe and interpret physical and biological changes in the oceans using satellite technologies. Topics: principles of satellite remote sensing, classes of satellite remote sensors, converting radiometric data into biological and physical quantities, sensor calibration and validation, interpreting large-scale oceanographic features. GER:DB-NatSci

3 units, Win (Arrigo, K)

GEOPHYS 150. General Geophysics and Physics of the Earth—Elementary study of gravitational, magnetic, seismic, and thermal properties of the Earth. Earth's crust, mantle, core. Plate tectonics and mantle convection. Probing Earth structure with seismic waves. Measurements, interpretation, and applications to Earth structure and exploration. Prerequisites: calculus, first-year college physics. GER:DB-NatSci

3 units, Win (Klemperer, S; Sleep, N)

GEOPHYS 160. Waves—Topics: derivations of wave equations and their solutions in 1-D, 2-D, and 3-D; amplitude, polarization, phase and group velocities, attenuation, and dispersion; reflection and transmission at single and multiple interfaces; ray theory. Applications from acoustics, elastodynamics, and electromagnetics. Prerequisites: differential/integral calculus and complex functions. GER:DB-NatSci

3 units, not given this year (Beroza, G; Harris, J)

GEOPHYS 161/261. Atmosphere and Global Environmental Change—(Graduate students register for 261; same as CEE 161S/261S.) Topics include atmospheric chemistry and physics, solar dimming, the greenhouse model, cooling and warming components of climate, and the recovery of stratospheric ozone in a changing atmosphere. Prerequisites: MATH 51 and CHEM 31, or equivalents.

3 units, Aut (Tabazadeh, A)

GEOPHYS 162. Laboratory Methods in Geophysics—Principles and measurements of geophysical properties such as velocity, attenuation, porosity, permeability, electrical resistivity, and magnetic susceptibility. Foundation for conducting experiments and assessing accuracy and variability in reported experimental data. Laboratory experiments and demonstrations. No previous laboratory experience required.

2-3 units, Win (Vanorio, T)

GEOPHYS 180. Geophysical Inverse Problems—Concepts of inverse theory, with application to geophysics. Inverses with discrete and continuous models, generalized matrix inverses, resolving kernels, regularization, use of prior information, singular value decomposition, nonlinear inverse problems, back-projection techniques, and linear programming. Application to seismic tomography, earthquake location, migration, and fault-slip estimation. Prerequisite: MATH 103. GER:DB-Math

3 units, alternate years, not given this year (Beroza, G; Segall, P)

GEOPHYS 182. Reflection Seismology—The principles of seismic reflection profiling, focusing on methods of seismic data acquisition and seismic data processing for hydrocarbon exploration. GER:DB-NatSci

3 units, not given this year (Klemperer, S)

GEOPHYS 183. Reflection Seismology Interpretation—The structural and stratigraphic interpretation of seismic reflection data, emphasizing hydrocarbon traps in two and three dimensions on industry data, including workstation-based interpretation. Lectures only, 1 unit. Prerequisite: 182, or consent of instructor.

1-4 units, Spr (Klemperer, S; Graham, S)

GEOPHYS 184. Seismic Reflection Processing—Workshop in computer processing of seismic reflection data. Students individually process a commercial seismic reflection profile from field tapes to migrated stack, using interactive software on a workstation. Prerequisite: consent of instructor.

3 units, alternate years, not given this year

GEOPHYS 185. Research Seminar Series—(Graduate students register for 385 series.) Limited to Geophysics undergraduates and coterminal master's candidates. Undergraduates participate directly in an ongoing research project: experimental and computational work, joining in reading and study groups, giving seminar papers, and doing original research for the undergraduate thesis. Prerequisite: consent of instructor.

GEOPHYS 185A. Reflection Seismology—(Graduate students register for 385A.) Research in reflection seismology and petroleum prospecting. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr, Sum (Biondi, B; Clapp, R)

GEOPHYS 185B. Environmental Geophysics—(Graduate students register for 385B.) Research on the use of geophysical methods for near-surface environmental problems. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr, Sum (Knight, R)

GEOPHYS 185C. Topics in Biological Oceanography—(Graduate students register for 385C.) Research on biological processes of the world's oceans. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr, Sum (Arrigo, K)

GEOPHYS 185E. Tectonics—(Graduate students register for 385E.) Research on the origin, major structures, and tectonic processes of the Earth's crust. Emphasis is on use of deep seismic reflection and refraction data. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr, Sum (Klemperer, S; Sleep, N; Thompson, G)

GEOPHYS 185K. Crustal Mechanics—(Graduate students register for 385K.) Research in areas of petrophysics, seismology, in situ stress, and subjects related to characterization of the physical properties of rock in situ. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr (Zoback, M)

GEOPHYS 185L. Earthquake Seismology, Deformation, and Stress—(Graduate students register for 385L.) Research on seismic source processes, crustal stress, and deformation associated with faulting and volcanism. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr (Segall, P; Beroza, G; Zoback, M)

GEOPHYS 185S. Wave Physics—(Graduate students register for 385S.) Theory, numerical simulation, and experiments on seismic and electromagnetic waves in complex porous media. Applications from Earth imaging and in situ characterization of Earth properties, including subsurface monitoring. Presentations by faculty, research staff, students, and visitors. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr (Harris, J)

GEOPHYS 185T. Atmospheric Chemistry—(Graduate students register for 385T.) Research seminar. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr, Sum (Tabazadeh, A)

GEOPHYS 185V. Poroelasticity—(Graduate students register for 385V.) Research on the mechanical properties of porous rocks: dynamic problems of seismic velocity, dispersion, and attentuation; and quasi-static problems of faulting, fluid transport, crustal deformation, and loss of porosity. Participants define, investigate, and present an original problem of their own. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr (Mavko, G)

GEOPHYS 185Z. Radio Remote Sensing—(Graduate students register for 385Z.) Research applications, especially crustal deformation measurements. Recent instrumentation and system advancements. May be repeated for credit. WIM at 3-unit level.

1-3 units, Aut, Win, Spr (Zebker, H)

GEOPHYS 190. Near-Surface Geophysics—Applications of geophysical methods for imaging and characterizing the top 100 meters of the Earth. Focus is on the use of electrical and seismic methods for environmental and engineering applications. Introduction to the link between electrical and elastic properties of rocks, soils, and sediments, and their physical, chemical, and biological properties. Surface and borehole methods used for data acquisition. GER:DB-EngrAppSci

3 units, not given this year (Knight, R)

GEOPHYS 200. Fluids and Flow in the Earth: Computational Methods—Interdisciplinary problems involving the state and movement of fluids in crustal systems, and computational methods to model these processes. Examples of processes include: nonlinear, time-dependent flow in porous rocks; coupling in porous rocks between fluid flow, stress, deformation, and heat and chemical transport; percolation of partial melt; diagenetic processes; pressure solution and the formation of stylolites; and transient pore pressure in fault zones. MATLAB, Lattice-Boltzmann, and COMSOL Multiphysics. Term project. No experience with COMSOL Multiphysics required.

3 units, Win (Mukerji, T)

GEOPHYS 201. Frontiers of Geophysical Research at Stanford: Faculty Lectures—Required of new students entering the department; second-year and other graduate students may attend for credit or as auditors. Department faculty and senior research staff introduce the frontiers of research problems and methods being employed or developed in the department and unique to department faculty and students. Current research is, why it is important, methodologies and technologies, and potential impact of the results.

1 unit, Aut (Knight, R)

GEOPHYS 202. Reservoir Geomechanics—Basic principles of rock mechanics and the state of stress and pore pressure in sedimentary basins related to exploitation of hydrocarbon and geothermal reservoirs. Mechanisms of hydrocarbon migration, exploitation of fractured reservoirs, reservoir compaction and subsidence, hydraulic fracturing, utilization of directional and horizontal drilling to optimize well stability.

3 units, Win (Zoback, M)

GEOPHYS 205. Honors Program—Experimental, observational, or theoretical honors project and thesis in geophysics under supervision of a faculty member. Students who elect to do an honors thesis should begin planning it no later than Winter Quarter of the junior year. Prerequisites: department approval.

1-3 units, Aut, Win, Spr, Sum (Staff)

GEOPHYS 210. Basic Earth Imaging—Echo seismogram recording geometry, head waves, moveout, velocity estimation, making images of complex shaped reflectors, migration by Fourier and integral methods. Anti-aliasing. Dip moveout. Computer labs. See http://sep.stanford.edu/sep/prof/.

3-4 units, Aut (Claerbout, J; Clapp, R)

GEOPHYS 211. Environmental Soundings Image Estimation—Imaging principles exemplified by means of imaging geophysical data of various uncomplicated types (bathymetry, altimetry, velocity, reflectivity). Adjoints, back projection, conjugate-gradient inversion, preconditioning, multidimensional autoregression and spectral factorization, the helical coordinate, and object-based programming. Common recurring issues such as limited aperture, missing data, signal/noise segregation, and nonstationary spectra. See http://sep.stanford.edu/sep/prof/.

3 units, Win (Claerbout, J)

GEOPHYS 220. Tectonics—The architecture of the Earth's crust; regional assembling of structural or deformational features and their relationship, origin and evolution. The plate-tectonic cycle: rifting, passive margins, sea-floor spreading, subduction zones, and collisions. Case studies.
3 units, Aut (Klemperer, S)

GEOPHYS 230. Advanced Topics in Well Logging—(Same as ENERGY 230.) State of the art tools and analyses; the technology, rock physical basis, and applications of each measurement. Hands-on computer-based analyses illustrate instructional material. Guest speakers on formation evaluation topics. Prerequisites: 130 or equivalent; basic well logging; and standard practice and application of electric well logs.
3 units, Spr (Lindblom, R)

GEOPHYS 241A. Practice of Geostatistics and Seismic Data Integration—Students build a synthetic 3D fluvial channel reservoir model with layer depths, channel geometry, and facies-specific petrophysic and seismic properties, stressing the physical significance of geophysical data. Reference data set is sparsely sampled, providing the sample data typically available for an actual reservoir assessment. Geostatistical reservoir modeling uses well and seismic data, with results checked against the reference database. Software provided (GSLIB and SRB tools). Prerequisite: ENERGY 240. Recommended: experience with Unix, MATLAB/C++/Fortran programming.
3-4 units, Spr (Mukerji, T; Caers, J)

GEOPHYS 245. Probability Theory—(Same as ENERGY 245.) Probabilistic formulations and solutions to inverse problems. Monte Carlo methods for solving inverse problems. Metropolis algorithm. Deterministic solutions using maximum likelihood, gradient methods. Dealing with prior probability and data uncertainty. Gaussian and non-Gaussian model formulations. Application to Earth Science problems. Prerequisite: introduction to probability theory course.
3 units, Win (Tarantola, A)

GEOPHYS 255. Report on Energy Industry Training—On-the-job-training for master's and doctoral degree students under the guidance of on-site supervisors. Required report detailing work activities, problems, assignment, and key results. Prerequisite: written consent of adviser.
1-3 units, Aut, Win, Spr, Sum (Staff)

GEOPHYS 260. Rock Physics for Reservoir Characterization—How to integrate well log and laboratory data to determine and theoretically generalize rock physics transforms between sediment wave properties (acoustic and elastic impendence), bulk properties (porosity, lithology, texture, permeability), and pore fluid conditions (pore fluid and pore pressure). These transforms are used in seismic interpretation for reservoir properties, and seismic forward modeling in what-if scenarios.
3 units, Win (Dvorkin, J)

GEOPHYS 262. Rock Physics—Properties of and processes in rocks as related to geophysical exploration, crustal studies, and tectonic processes. Emphasis is on wave velocities and attenuation, hydraulic permeability, and electrical resistivity in rocks. Application to in situ problems, using lab data and theoretical results.
3 units, Aut (Mavko, G)

GEOPHYS 263. Atmospheric Heterogeneous Processes—(Same as CEE 261U.) Atmospheric physicochemical processes occurring in heterogeneous mediums. Topics include oxidation and catalytic chemistry in the aqueous phase, adsorption isotherms and chemistry on surfaces, and thermodynamics of colloid formation and precipitation processes in particles. Term project.
3 units, Spr (Tabazadeh, A)

GEOPHYS 265. Imaging Radar and Applications—(Same as EE 355.) Topics include radar system elements, the radar equation and signal to noise ratio, signal and image processing, range/Doppler algorithms, interferometric measurements. Applications to crustal deformation, topographic mapping, velocities of ice sheets and glaciers, polarimetry and terrain analysis. Computational labs give hands-on-experience with real data.
3 units, alternate years, not given this year (Zebker, H)

GEOPHYS 270. Electromagnetic Properties of Geological Materials—Laboratory observations and theoretical modeling of the electromagnetic properties and nuclear magnetic resonance response of geological material. Relationships between these properties and water-saturated material properties such as composition, water content, surface area, and permeability.
2 units, Win (Knight, R)

GEOPHYS 280. 3-D Seismic Imaging—The principles of imaging complex structures in the Earth subsurface using 3-D reflection seismology. Emphasis is on processing methodologies and algorithms, with examples of applications to field data. Topics: acquisition geometrics of land and marine 3-D seismic surveys, time vs. depth imaging, migration by Kirchhoff methods and by wave-equation methods, migration velocity analysis, velocity model building, imaging irregularly sampled and aliased data. Computational labs involve some programming. Lab for 3 units.
2-3 units, Spr (Biondi, B)

GEOPHYS 287. Earthquake Seismology—Theorems in elastodynamics, Green's functions, attenuation, wave propagation in layered media, ray theory, seismic moment tensors, finite-source effects, kinematics and dynamics of earthquakes, and engineering aspects of seismology.
3 units, alternate years, not given this year

GEOPHYS 288A. Crustal Deformation—Earthquake and volcanic deformation, emphasizing analytical models that can be compared to data from GPS, InSAR, and strain meters. Deformation, stress, and conservation laws. Dislocation models of strike slip and dip slip faults, in 2 and 3 dimensions. Crack models, including boundary element methods. Dislocations in layered and elastically heterogeneous earth models. Models of volcano deformation, including sills, dikes, and magma chambers.
3-5 units, Win (Segall, P)

GEOPHYS 288B. Crustal Deformation—Earthquake and volcanic deformation, emphasizing analytical models that can be compared to data from GPS, InSAR, and strain meters. Viscoelasticity, post-seismic rebound, and viscoelastic magma chambers. Effects of surface topography and earth curvature on surface deformation. Gravity changes induced by deformation and elastogravitational coupling. Poro-elasticity, coupled fluid flow and deformation. Earthquake nucleation and rate-state friction. Models of earthquake cycle at plate boundaries.
3-5 units, Spr (Segall, P)

GEOPHYS 289. Global Positioning System in Earth Sciences—The basics of GPS, emphasizing monitoring crustal deformation with a precision of millimeters over baselines tens to thousands of kilometers long. Applications: mapping with GIS systems, airborne gravity and magnetic surveys, marine seismic and geophysical studies, mapping atmospheric temperature and water content, measuring contemporary plate motions, and deformation associated with active faulting and volcanism.
3-5 units, not given this year (Segall, P)

GEOPHYS 290. Tectonophysics—The physics of faulting and plate tectonics. Topics: plate driving forces, lithospheric rheology, crustal faulting, and the state of stress in the lithosphere. Exercises: lithospheric temperature and strength profiles, calculation of seismic strain from summation of earthquake moment tensors, slip on faults in 3D, and stress triggering and inversion of stress from earthquake focal mechanisms.

3 units, alternate years, not given this year (Zoback, M)

GEOPHYS 300. Earth Sciences Seminar—(Same as EARTHSYS 300, EEES 300, GES 300, IPER 300, ENERGY 300.) Required for incoming graduate students except coterms. Research questions, tools, and approaches of faculty members from all departments in the School of Earth Sciences. Goals are: to inform new graduate students about the school's range of scientific interests and expertise; and introduce them to each other across departments and research groups. Two faculty members present work at each meeting. May be repeated for credit.

1 unit, Aut (Matson, P; Graham, S)

GEOPHYS 385. Research Seminar Series—See 185 series for offerings and descriptions. Opportunity for advanced graduate students to frame and pursue research or thesis research in the context of an ongoing research project in the department, and present thesis research progress reports before a critical audience. Prerequisite: consent of instructor.

GEOPHYS 399. Teaching Experience in Geophysics—On-the-job training in the teaching of geophysics. An opportunity to develop problem sets and lab exercises, grade papers, and give occasional lectures under the supervision of the regular instructor of a geophysics course. Regular conferences with instructor and with students in the class provide the student teacher with feedback about effectiveness in teaching.

2-4 units, Aut, Win, Spr, Sum (Staff)

GEOPHYS 400. Research in Geophysics

1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

AA 272C. Global Positioning Systems

3 units, Win (Enge, P)

CEE 297G. Structural Geology and Rock Mechanics—(Same as GES 215A.)

3-5 units, Aut (Pollard, D)

CEE 297H. Structural Geology and Rock Mechanics—(Same as GES 215B.)

3-5 units, Win (Pollard, D)

EE 106. Planetary Exploration

3 units, Spr (Fraser-Smith, A)

EE 140. The Earth From Space: Introduction to Remote Sensing

3 units, Win (Zebker, H)

EE 355. Imaging Radar and Applications

3 units, alternate years, not given this year (Zebker, H)

GES 3. Current Research Topics in Earth and Environmental Sciences

1 unit, Aut (Egger, A), Win (Egger, A)

GES 144. Fundamentals of Geographic Information Science (GIS)—(Same as EARTHSYS 144.)

4 units, Spr (Seto, K)

GES 222. Planetary Systems: Dynamics and Origins

3-4 units, Aut (Lissauer, J; Marley, M)

GES 223. Planetary Systems: Atmospheres, Surfaces, and Interiors

3 units, not given this year

INTERDISCIPLINARY GRADUATE PROGRAM IN ENVIRONMENT AND RESOURCES (IPER)

Director: Gretchen C. Daily

Associate Director: Helen J. Doyle

Faculty: Kevin Arrigo (Geophysics), Kenneth J. Arrow (Economics, Emeritus), Gregory Asner (Department of Global Ecology, Carnegie Institution), William Barnett (Graduate School of Business, Woods Institute for the Environment), Barbara Block (Biological Sciences), Alexandria Boehm (Civil and Environmental Engineering), Carol Boggs (Biological Sciences), Jef Caers (Energy Resources Engineering), Margaret Caldwell (Law School), Page Chamberlain (Geological and Environmental Sciences), Gretchen Daily (Biological Sciences, Woods Institute for the Environment), Jennifer Davis (Civil and Environmental Engineering, Woods Institute for the Environment), Robert B. Dunbar (Geological and Environmental Sciences, Woods Institute for the Environment, Freeman Spogli Institute for International Studies), William H. Durham (Anthropology), Anne Ehrlich (Biological Sciences), Paul Ehrlich (Biological Sciences), Gary Ernst (Geological and Environmental Sciences, emeritus), Walter Falcon (Freeman Spogli Institute for International Studies, Economics, emeritus), Scott Fendorf (Geological and Environmental Sciences), Christopher B. Field (Biological Sciences, Department of Global Ecology, Carnegie Institution), David Freyberg (Civil and Environmental Engineering), Oliver Fringer (Civil and Environmental Engineering), Steven Gorelick (Geological and Environmental Sciences, Geophysics), Lawrence Goulder (Economics, Freeman Spogli Institute for International Studies), Elizabeth Hadly (Biological Sciences), Ursula Heise (English), Thomas Heller (Law School, Freeman Spogli Institute for International Studies, Woods Institute for the Environment), Henning Hillmann (Sociology), Sara Hoagland (School of Education), Dominique Irvine (Anthropology), Mark Jacobson (Civil and Environmental Engineering), Terry Karl (Political Science), David Kennedy (History), Donald Kennedy (Biological Sciences, Freeman Spogli Institute for International Studies, Emeritus), Herve Kieffel (Management Science and Engineering), Rosemary Knight (Geophysics, Woods Institute for the Environment), Jeffrey Koseff (Civil and Environmental Engineering, Woods Institute for the Environment), Anthony Kovscek (Energy Resources Engineering), Raymond Levitt (Civil and Environmental Enginering), Richard Luthy (Civil and Environmental Engineering, Woods Institute for the Environment), Pamela Matson (Dean, School of Earth Sciences, Freeman Spogli Institute for International Studies, Woods Institute for the Environment), Douglas McAdam (Sociology), Fiorenza Micheli (Biological Sciences), Grant Miller (School of Medicine, Center for Health Policy), Stephen Monismith (Civil and Environmental Engineering), Harold Mooney (Biological Sciences), Rosamond Naylor (Freeman Spogli Institute for International Studies), Franklin M. Orr, Jr. (Global Climate and Energy Project, Energy Resources Engineering), Leonard Ortolano (Civil and Environmental Engineering), Stephen Palumbi (Biological Sciences, Woods Institute for the Environment), Erica Plambeck (Graduate School of Business, Woods Institute for the Environment), Terry L. Root (Woods Institute for the Environment), Debra Satz (Philosophy), Stephen H. Schneider (Biological Sciences, Woods Institute for the Environment), Gary Schoolnik (School of Medicine, Woods Institute for the Environment), Richard Scott (Sociology), Karen Seto (Geological and Environmental Sciences, Freeman Spogli Institute for International Studies, Woods Institute for the Environment), Richard Shavelson (School of Education, Woods Institute for the Environment), James Sweeney (Management Science and Engineering), Barton Thompson (Law School, Woods

Institute for the Environment), Shripad Tuljapurkar (Biological Sciences), David Victor (Law School, Freeman Spogli Institute for International Studies, Woods Institute for the Environment), Peter Vitousek (Biological Sciences, Woods Institute for the Environment), John Weyant (Management Science and Engineering, Freeman Spogli Institute for International Studies), Richard White (History), Mark Zoback (Geophysics)

Senior Lecturer: Julie Kennedy

Lecturer: Michael Mastrandrea

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Courses given in IPER have the subject code IPER. For a complete list of subject codes, see Appendix.

Over the last 30 years, environmental and resource investigations have focused on problems with acute local impacts, such as urban air pollution, pesticide use, or groundwater depletion. These problems have been addressed principally at the national and local level through research and policies that address specific media such as air or water; threats such as toxic chemicals; or resources such as forests or wetlands. More global challenges such as climate change and biodiversity loss pose fundamental threats to the health of the planet and human societies. Solutions to these problems must be multifaceted, addressing the interactions among threats and resources, and engaging diverse actors, including academia, national governments, international institutions, business, and civil society. The research and understanding necessary to devise such solutions thus must be interdisciplinary, integrating the analytical tools of diverse fields to yield new insights and promising responses.

The Interdisciplinary Graduate Program in Environment and Resources (IPER) responds to these challenges by leveraging Stanford's faculty strengths in disciplines ranging from ecology and engineering to law and economics, all of which are increasingly directed toward interdisciplinary, solution-oriented research and teaching that encompasses collaborative efforts that cross departmental boundaries.

Interdisciplinary work requires that individuals and groups become familiar with the concepts, methods, data, and analyses of several disciplines in order to focus research questions more sharply. It requires the integration of multidisciplinary knowledge in the formulation of research questions and hypotheses, and in the execution and analyses of results. Students in the IPER program learn through interactions with a cohort of students and a dedicated faculty who influence each other's ways of thinking and questioning.

FOUNDATION AND FLEXIBILITY

IPER students construct an integrative graduate curriculum through shared foundational study and flexibility in a research course. Students in the program are expected to make significant progress in each of three intellectual areas:

1. The linkages between physical and biological systems, and understanding the potential environmental consequences associated with the dynamics or evolution of these joint systems.
2. The interplay between human activities and the Earth system, and how human influence on the environment, such as through methods of production or patterns of consumption, is affected by social and economic institutions, legal rules, and cultural values, and how resources and environment in turn affect human actions and decision making.
3. Skills for gauging the potential impacts of alternative public policy options for dealing with environmental problems, for evaluating such policy alternatives according to various normative criteria, and for integrating scientific research into policy formulation.

The program's flexibility enables students to focus on their areas of greatest interest. For example, a student with a strong interest in the relationship between commercial fishing and coral reef habitat might concentrate on biology, international relations, and economics; a student aiming to understand the environmental impacts from agricultural production decisions might focus on the interplay among economics, biogeochemistry, and hydrology; and a student interested in the design and evaluation of policies to curb emissions of greenhouse gases might learn about scientific, technological, and economic issues, while gaining skills in policy analysis, evaluation, and implementation.

RESEARCH HIGHLIGHTS

Research is the cornerstone of IPER. Faculty and graduate students are engaged in interdisciplinary research projects such as studying the effects and constraints of agricultural intensification and urbanization in the Yaqui Valley of Sonora, Mexico, and spatial analysis of land use changes in Vietnam. Students in IPER have the opportunity to work on existing projects or develop their own research directions and topics. Student research addresses issues such as the science and policy of global climate change, environmental quality, regional security, the mapping and valuation of ecosystem services, energy development, agricultural intensification and variability, characterization and effects of land use change, conservation finance, and natural resource management. Examples of research projects include:

1. Investigating ecosystem services in the Hawaiian countryside, through study of the sustainable management of native hardwood on private lands by creating financial incentives to make biodiversity conservation economically attractive to landowners.
2. Evaluating electric power sector development in China and India, and the potential for international policy mechanisms to steer these countries toward less CO_2-intensive growth paths.

For additional student research projects, see http://iper.stanford.edu/research.For more information about integrative environmental research at Stanford, see the Woods Institute for the Environment web site at http://environment.stanford.edu.

GRADUATE PROGRAMS

The University's basic requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

JOINT DEGREE PROGRAM

Students enrolled in a Stanford professional degree program in the Graduate School of Business or the School of Law are eligible to apply for admission to the joint Master of Science in Environment and Resources degree program. Completion of the program results in the award of joint M.B.A. and M.S. in Environment and Resources degrees, or joint J.D. and M.S. in Environment and Resources degrees. The joint M.B.A./M.S. degree requires a total of 129 units (84 for the M.B.A. and 45 for the M.S.) to be completed over approximately eight academic quarters. The joint J.D./M.S. degree allows up to 30 semester or 45 quarter units to count towards both degrees, potentially allowing the joint degree to be completed in three academic years depending upon when a student enters the joint degree program and upon the courses chosen. Students in the joint degree program must take two core courses: IPER 310, Environmental Forum Seminar, and IPER 335, Environmental Science for Managers and Policy Makers. Students also complete at least eight other graded courses at the 100 level or higher, of which at least two must be at the 200 level, while maintaining a 'B' average. Law students are also required to take the Environmental Law workshop. Directed research and independent study may count for a maximum of 4 units for joint M.S. students. A maximum of 12 units from the student's professional school, including environmental law workshop units for Law students, may be applied toward the IPER M.S. A list of approved professional school courses can be found on the IPER web site: http://iper.stanford.edu. MBA students must focus their final projects in the approved GSB classes on an environmental or natural resource topic to be counted toward the MS. Students design their elective courses around one or more of the program's focal areas chosen to complement but not duplicate their primary professional degree program at Stanford. The focal areas are: culture and institutions; economics and policy analysis; engineering and technology; and natural sciences. These focal areas are not declared on Axess; they do not appear on the transcript or diploma. While science or mathematics background is not required for acceptance, quantitative skills are necessary for many courses; students may be required to take additional course work in quantitative methods.

The student's program of study is subject to the approval of the student's advising team, consisting of at least one faculty member from the applicable professional school and one faculty member from the student's IPER focal area. The joint degree is conferred when the requirements for both the IPER M.S. and the professional degree programs have been met. For application information, see http://iper.stanford.edu/apply/app_processMS.html.

DUAL DEGREE

Only students in the School of Medicine may apply to pursue a dual degree, which requires that they meet requirements for the M.D. and complete an additional 45 units for the M.S. in Environment and Resources. No course units may be counted towards both degrees. Completion of the M.S. is anticipated to require three quarters in addition to the quarters required for the M.D.

Students in the dual degree program must take two core courses: IPER 310, Environmental Forum Seminar; and IPER 335, Environmental Science for Managers and Policy Makers. Students also complete at least eight other graded courses at the 100 level or higher, of which at least two must be at the 200 level, while maintaining a 'B' average. Directed research and independent study may count for a maximum of 8 of these units for dual M.S. students. Students design their elective courses around one or more of the program's focal areas chosen to complement but not duplicate their primary professional degree program at Stanford. The focal areas are: culture and institutions; economics and policy analysis; engineering and technology; and natural sciences. These focal areas are not declared on Axess; they do not appear on the transcript or diploma. While science or mathematics background is not required for acceptance, quantitative skills are necessary for many courses; students may be required to take additional course work in quantitative methods.

The student's program of study is subject to the approval of the student's advising team, consisting of at least one faculty member from the applicable professional school and one faculty member from the student's chosen focal area within IPER. The degrees are conferred separately when the respective requirements have been completed. For application information, see http://iper.stanford.edu/apply/app_processMS.html.

MASTER OF SCIENCE

In exceptional circumstances, IPER offers a Master of Science degree for students in IPER's Ph.D. program who opt to complete their training with a M.S. degree and not pursue the Ph.D. degree. Admission directly to the stand-alone M.S. program is not allowed.

M.S. course work totals at least 45 units at or above the 100-level, of which 18 units should be at or above the 200-level. Students must complete: IPER 310, Environmental Forum Seminar, and IPER 335, Environmental Science for Managers and Policy Makers; or IPER 310, Environmental Forum Seminar, IPER 320, Designing Environmental Research, and IPER 330, Research Approaches for Environmental Problem Solving.

Students plan a sequence of courses with a focus in an area of study such as: culture and institutions; economics and policy analysis; engineering and technology; or natural sciences.

A program proposal, signed by the student's program adviser and approved by the chair of the student's M.S. committee, must be filed within the first four weeks of the first quarter of M.S. degree enrollment. Students may take no more than 6 units credit/no credit and must maintain at least a 'B' average in all courses taken for the M.S. degree. The M.S. degree does not have an M.S. with thesis option. Students may write a M.S. thesis, but it is not formally recognized by the University.

DOCTOR OF PHILOSOPHY

1. The student works with a faculty advising team to design a course of study that allows the student to develop and exhibit: a) familiarity with analytical tools and research approaches for interdisciplinary problem solving, and a mastery of those tools and approaches central to the student's thesis work; b) interdisciplinary breadth in each of four focal areas: culture and institutions; economics and policy analysis; engineering and technology; and natural sciences; and c) depth in at least two distinct fields of inquiry. The advising team has primary responsibility for ensuring the adequacy of the course of study. The IPER faculty advising team is comprised minimally of two lead advisers, each representing a field of inquiry chosen by the student. At a minimum, the student meets with these advisers quarterly during the first year, culminating in Spring Quarter with a big picture advising meeting, and at least annually thereafter. Depth in the fields of inquiry is monitored by a student's two lead faculty advisers who must certify that a) the two fields of inquiry are sufficiently distinct such that work integrating the two is interdisciplinary; and b) the student's course work and independent study has provided the substantial depth of understanding normally expected at the Ph.D. level.

   Breadth requirements vary by concentration area and are normally satisfied through a sequence of courses, independent study, and/or demonstration of proficiency through prior course work and/or experience. Breadth fulfillment is certified by a student's two lead faculty advisers and the IPER faculty director. See below for a list of courses that satisfy each of the breadth areas. Additional information about breadth requirements, including any updates to the list of courses that satisfy the requirements, can be found at http://iper/study/requirements.html or obtained from the IPER office.

   The three core courses to be taken by all Ph.D. students are IPER 310, Environmental Forum Seminar (two quarters), IPER 320, Designing Environmental Research, and IPER 330, Research Approaches for Environmental Problem Solving. All core courses must earn a letter grade of 'B' or higher. Incoming students in the School of Earth Sciences are required to take IPER 300, Earth Sciences Seminar. IPER Ph.D. students are expected to take all courses, apart from undergraduate prerequisites, for a letter grade unless their advisers recommend otherwise.
2. To be admitted to candidacy for the Ph.D. degree, a student must have successfully completed at least 25 graded units (not including research credits) of graduate courses (200 level and above) maintaining a 'B' average. In addition, the student must pass an oral qualifying exam that demonstrates command of two areas of specialization as well as interdisciplinary breadth. The student may not have any incompletes on the transcript.
3. By the end of the sixth quarter of study, students present a Ph.D. candidacy plan to their primary advisers, with a copy to the associate and assistant directors. This plan should include:
   a) the names of 4-5 proposed oral qualifying exam committee members
   b) a list of courses or experiences used to fulfill the IPER breadth and depth requirements
   c) courses TA'd or which the student intends to TA to fulfill the teaching requirement
   d) an unofficial transcript to ensure completion of the IPER core curriculum
   e) a proposed date for the oral qualifying exam. The plan is reviewed and subject to approval by the IPER faculty director

By the end of the sixth quarter of study, students organize the Meeting of the Minds as they develop their candidacy plan and dissertation proposal. For this meeting, the student should prepare a 10-15 minute oral presentation of the candidacy plan and thesis proposal. Additional courses or training opportunities the student may need to complete their dissertation research can also be identified.

The oral qualifying exam should be completed by the end of the eighth quarter. By the end of the quarter prior to the quarter during which the oral qualifying exam is to be taken, a student must formally designate a committee, and the primary advisers must certify that the student is eligible to take the exam. The oral qualifying exam committee of 4-5 members should include the student's two lead faculty advisers and other faculty with expertise in at least two of the student's fields of inquiry; it may also include a member-at-large. The majority of the oral qualifying exam committee should be members of the Academic Council. The chair of the committee must be a member of the Academic Council and should not be one of the student's lead advisers. Normally, membership of the oral qualifying exam committee should not change after formal designation. Thereafter, the IPER Executive Committee must approve any proposed changes.

The oral qualifying exam consists of two parts: a 20-40 minute presentation of a dissertation proposal and a question and answer period during which the student should be prepared to address questions about the dissertation proposal and broader questions arising from IPER breadth and depth course work. The total procedure should span two to two-and-a-half hours. A written dissertation proposal should be distributed to a student's oral qualifying exam committee 10 days before the actual examination. The proposal should be 15-30 pages in length, double-spaced, excluding appendices and references. It should include a title page, an abstract, an introduction outlining and motivating the research questions, a background literature review establishing the intellectual context of the proposed work, a description of the methodology or approaches to be taken in the work, a discussion of results and other progress made to date, a timeline for future research, and a references section. The proposal should discuss explicitly the interdisciplinary nature of the research and why it is appropriate for a degree in environment and resources.

4. Teaching experience is an essential element of training in the Ph.D. program. Each student is required to complete one quarter of teaching, which can be fulfilled by serving as a teaching assistant for IPER 320 or IPER 330 or by serving as a TA for any other course, in any department or program, with a discussion section or with an opportunity to lecture in at least two class sessions.
5. To complete the Ph.D., the student must pass a University oral examination in defense of the dissertation.
6. Degree progress is monitored through a formal annual review in which the student and advisers submit progress reports to the IPER Executive Committee; see http://pangea.stanford.edu/IPER/internal/about_annual_reviews.html.

Additional information may be found in the *Graduate Student Handbook* at http://www.stanford.edu/dept/DoR/GSH/.

The following courses may be taken to satisfy the breadth area requirements:

CULTURE AND INSTITUTIONS BREADTH COURSES

At least two courses are required; alternative courses may be proposed through IPER's exception process.

IPER 235. Global Environmental Ethics
IPER 265. Central America: Environment, Development and Security
ANTHSCI 153. The Population Question
ANTHSCI 162. Indigenous Peoples and Environmental Problems
ANTHSCI 164. Ecological Anthropology
ANTHSCI 252. Political Ecology
ECON 228. Institutions and Organizations in Historical Perspective
HISTORY 281A. Environmental History of the Americas
LAW 280. Toxic Harms
LAW 281. Natural Resources Law and Policy
LAW 437. Water Law and Policy
LAW 592. International Conflict
LAW 594. International Institutions
LAW 603. Environmental Law and Policy
LAW 604. Environmental Workshop
LAW 605. International Environmental Law and Policy
LAW 667. Marine Resources
POLISCI 351A. Foundations of Political Economy
POLISCI 362. New Economics of Organizations
POLISCI 424. Introduction to Political Psychology
POLISCI 435. Topics in the Philosophy of Social Science
POLISCI 436. Rational Choice
PUBLPOL 102. Organizations and Public Policy
PUBLPOL 166. Organizational Theory and Design
PUBLPOL 194. Technology Policy
SOC 116. Globalization and Organizations
SOC 260. Formal Organizations
SOC 264. Firms, Markets, and States
SOC 360. Foundations of Organizational Sociology
SOC 362. Organization and Environment
SOC 364. Organizations as Governance Structures
SOC 367. Institutional Analysis of Organizations
SOC 377. Comparing Institutional Forms: Public, Private, and Non-profit
STS 110. Ethics and Public Policy

ECONOMICS AND POLICY ANALYSIS BREADTH COURSES

Students taking IPER 243 are expected to have mastered the topics covered in any of the following course combinations or by equivalent courses previously taken elsewhere. Prior enrollment in one of these course combinations is encouraged.

ECON 50 and 51. Economic Analysis I and II
ECON 50. Economic Analysis I
  and 155. Environmental Economics and Policy
ECON 150. Economic Policy Analysis
ECON 202N and 203N. Core Economics for Non-Economics Ph.D. Students
MS&E 241. Economic Analysis

Alternatively, students may satisfy the minimum breadth requirement by taking courses culminating in ECON 241 or 243.

ENGINEERING AND TECHNOLOGY BREADTH COURSES

At least two courses are required; alternative courses may be proposed through IPER's exception process.

CEE 101B. Mechanics of Fluids
CEE 166B. Floods and Droughts, Dams and Aqueducts
CEE 172. Air Quality Management
CEE 176A. Energy Efficient Buildings
CEE 176B. Electric Power: Renewables and Efficiency
CEE 177. Aquatic Chemistry and Biology
CEE 270. Movement and Fate of Organic Contaminants in Surface Waters and Groundwater
CEE 274E. Pathogens in the Environment
GES 230. Physical Hydrogeology
MS&E 250A. Engineering Risk Analysis

NATURAL SCIENCES BREADTH COURSES

At least two courses are required; alternative courses may be proposed through IPER's exception process.

IPER 250. Ecological Principles for Environmental Problem Solving
BIOSCI 101. Ecology
BIOSCI 121. Biogeography
BIOSCI 136. Evolutionary Paleobiology
BIOSCI 139. Biology of Birds
BIOSCI 143. Evolution
BIOSCI 144. Conservation Biology
BIOSCI 280. Fundamentals of Sustainable Agriculture
BIOHOPK 263H. Oceanic Biology
BIOHOPK 265H. Air and Water
BIOHOPK 266H. Molecular Ecology
BIOHOPK 272H. Marine Ecology
CEE 164. Introduction to Physical Oceanography
CEE 274A,B. Environmental Microbiology I, II
ENERGY 260. Groundwater Pollution and Oil Slicks
GEOPHYS 104. The Water Course
GEOPHYS 130. Biological Oceanography
GES 140. Remote Sensing of Land Use and Land Cover
GES 170. Environmental Geochemistry
GES 175. Science of Soils
GES 205. Advanced Oceanography
GES 230. Physical Hydrogeology
GES 240. Geostatistics for Spatial Phenomena
GES 259. Marine Chemistry
GES 268. Geomicrobiology

COURSES

Additional courses may be listed in the quarterly *Time Schedule*.

IPER 200. Going Green: Research, Writing, and Reporting to the Public—Preference to graduate students. Focus is on environmental, economic, and cultural consequences of day-to-day behavioral choices such as computers on at all times versus only when used, or biodegradable versus metal forks at cafés. Sources include scientific and technical literature from disciplines such as energy, biology, and economics. How to write summaries that integrate relevant information for a lay audience. Prerequisite: consent of instructor.
3-4 units, Aut (Root, T; Moekle, K)

IPER 210. Communication and Leadership Skills—(Same as BIOSCI 388.) Focus is on delivering information to policy makers and the lay public. How to speak to the media, Congress, and the general public; how to write op-eds and articles; how to package ideas including titles, abstracts, and CVs; how to survive peer review, the promotion process, and give a job talk; and how to be a responsible science advocate.
2 units, Spr (Root, T)

IPER 220A,B,C. Special Topics Seminar—For IPER Ph.D. students; other graduate students with consent of instructor. Challenges of interdisciplinary research; collaborations across disciplines. Topical or methodological focus depending on faculty and student interests. May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

IPER 235. Global Environmental Ethics—Theories of environmental ethics and their evolution. Environmental treaties as a framework to analyze case studies of contemporary ethical issues raised by environmental problems that transcend national boundaries.
4-5 units, not given this year

IPER 243. Energy and Environmental Policy Analysis—(Same as MS&E 243.) Concepts, methods, and applications. Energy/environmental policy issues such as automobile fuel economy regulation, global climate change, research and development policy, and environmental benefit assessment. Group project. Prerequisite: 241 or ECON 50, 51.
3 units, Spr (Sweeney, J)

IPER 270. Graduate Practicum in Environment and Resources—Opportunity for IPER students to pursue areas of specialization in an institutional setting such as a laboratory, clinic, research institute, governmental agency, non-governmental organization, or multilateral organization. Meets US CIS requirements for off-campus employment with endorsement from designated school official.
1-9 units, Aut, Win, Spr, Sum (Daily, G)

IPER 286. Interpersonal Influence and Leadership—(Same as MS&E 286, GSBGEN 374, LAW 628.) How one's actions affect and influence others and the ability to work with them. Foundational skills such as the ability to work through difficult issues, give and receive feedback, and work in groups. How to work with different people. The art of learning from experience. Prerequisiste: consent of instructor.
3-4 units, Win (Robin, C)

IPER 300. Earth Sciences Seminar—(Same as EARTHSYS 300, EEES 300, GES 300, GEOPHYS 300, ENERGY 300.) Required for incoming graduate students except coterms. Research questions, tools, and approaches of faculty members from all departments in the School of Earth Sciences. Goals are: to inform new graduate students about the school's range of scientific interests and expertise; and introduce them to each other across departments and research groups. Two faculty members present work at each meeting. May be repeated for credit.
1 unit, Aut (Matson, P; Graham, S)

IPER 310. Environmental Forum Seminar—Required IPER core course for first year Ph.D. and joint and dual M.S. students. Conceptual framework, analytical approaches, validity of conclusions from an interdisciplinary perspective, and alternative approaches. Autumn Quarter: participants attend the Woods Institute's Environmental Forum series or other seminar on campus selected by faculty and students. Winter Quarter: guest Stanford faculty discuss environment and sustainability research. May be repeated for credit. Prerequisite for non-IPER graduate students: application.
1-2 units, Aut (Schneider, S; Root, T), Win (Staff)

IPER 320. Designing Environmental Research—Required IPER core course restricted to first year IPER Ph.D. students. Alternative designs for environmental research projects. Primary data collection techniques versus mixed method approaches. Interpretation of data, including basic statistical methods. Analysis of environmental literature, and development of individual research design, data collection, and analysis strategies.
3 units, Win (Davis, J)

IPER 330. Research Approaches for Environmental Problem Solving—Required IPER core course restricted to first year IPER Ph.D. students. How to identify good research questions and implement interdisciplinary research in environment and resources. Student presentations of work in progress; peer critique of written work. Guest speakers including from the Center for Teaching and Learning. Corequisite: 398 with the faculty member chosen to explore a possible dissertation topic.
3 units, Spr (Ortolano, L)

IPER 333. Water Policy Colloquium—(Same as CEE 333, GES 333.) Student-organized interdisciplinary colloquium. Creation, implementation, and analysis of policy affecting the use and management of water resources. Weekly speakers from academia and local, state, national, and international agencies and organizations.
1 unit, Spr (Freyberg, D)

IPER 335. Environmental Science for Managers and Policy Makers—(Same as LAW 608, OIT 338.) Core course for joint J.D., M.B.A., or M.D. with M.S. in Environment and Resources; open to first-year Law and GSB students; recommended for those who plan to apply to the joint degree program. Fundamentals of earth and environmental science, spreadsheet modeling, optimization, and Monte Carlo simulation. Applications in resource management and environmental policy.
4 units, Win (Plambeck, E; Caldwell, M; Palumbi, S; Daily, G; Kennedy, D; Field, C; Masters, G)

IPER 339. Environmental Entrepreneurship—(Same as GSBGEN 339.) Preference to graduate students; advanced undergraduates require consent of instructor. Environmental challenges as entrepreneurial opportunities. Application of business principles of finance, marketing, operations, and economics to provision of environmental goods and services. Innovation in conservation, energy, and materials. Guest speakers include environmental entrepreneurs, venture capitalists, corporate executives, and nonprofit leaders. Students develop business plans.
4 units, Aut (Plambeck, E)

IPER 398. Directed Individual Study in Environment and Resources—Under supervision of an IPER faculty member on a subject of mutual interest.
1-9 units, Aut, Win, Spr, Sum (Staff)

IPER 399. Directed Research in Environment and Resources—For advanced graduate students.
1-9 units, Aut, Win, Spr, Sum (Staff)

IPER 410. Ph.D. Qualifying Tutorial—For Ph.D. students only.
1 unit, Aut, Win, Spr, Sum (Staff)

IPER 460. Proposal Writing Tutorial—Practical training in grant writing methods. Students draft research proposals relevant to individual interests with supervision from IPER faculty.
1-2 units, Aut, Win, Spr (Staff)

IPER 480. Dissertation Writing Tutorial in Environment and Resources—For students who have completed the oral qualifying examination.
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ANTHSCI 162/262. Indigenous Peoples and Environmental Problems
3-5 units, not given this year

BIOHOPK 163H. Oceanic Biology
4 units, not given this year

BIOSCI 101. Ecology
3 units, Aut (Vitousek, P; Dirzo, R)

BIOSCI 139. Biology of Birds
3 units, Spr (Root, T)

BIOSCI 143/243. Evolution
3 units, Aut (Watt, W)

CEE 101B. Mechanics of Fluids
4 units, Spr (Koseff, J)

CEE 164 262D. Introduction to Physical Oceanography—(Same as EARTHSYS 164.)
4 units, Spr (Hench, J)

CEE 166B/ 266B. Floods and Droughts, Dams, and Aqueducts
3 units, Win (Freyberg, D)

CEE 172. Air Quality Management
3 units, Win (Hildemann, L), Sum (Kopperud, R)

CEE 176A. Energy Efficient Buildings
3-4 units, Win (Masters, G)

CEE 176B. Electric Power: Renewables and Efficiency
3-4 units, Spr (Masters, G)

CEE 177. Aquatic Chemistry and Biology
4 units, Aut (Yeung, C)

CEE 270. Movement and Fate of Organic Contaminants in Waters
3 units, Aut (Luthy, R), Sum (Robertson, A)

CEE 274A. Environmental Microbiology I—(Same as CHEMENG 174/274.)
3 units, Aut (Spormann, A), Sum (Sepulveda-Torres, L)

CEE 274B. Metabolic Biochemistry of Microorganisms—(Same as CHEMENG 456.)
3 units, Win (Spormann, A), alternate years, not given next year

EARTHSYS 180/280. Fundamentals of Sustainable Agriculture—(Same as BIOSCI 180/280.)
3 units, alternate years, not given this year

ECON 50. Economic Analysis I
5 units, Aut (Abramitzky, R), Spr (Tendall, M), Sum (Aturupane, C)

ECON 51. Economic Analysis II
5 units, Aut (Tendall, M), Win (Einav, L), Sum (Nicholson, S)

ECON 155. Environmental Economics and Policy—(Same as EARTHSYS 112.)
5 units, Aut (Staff)

ECON 228. Institutions and Organizations in Historical Perspective
2-5 units, Aut (Greif, A)

ECON 243. Economics of Environment
2-5 units, Spr (Staff), not given next year

ENERGY 240. Geostatistics for Spatial Phenomena—(Same as GES 240.)
3-4 units, Win (Journel, A)

GES 170. Environmental Geochemistry
4 units, Win (Brown, G)

GES 175. Science of Soils
4 units, Spr (Fendorf, S)

GES 230. Physical Hydrogeology—(Same as CEE 260A.)
4 units, Aut (Gorelick, S)

HUMBIO 112. Conservation Biology—(Same as BIOSCI 144.)
3-4 units, Win (Boggs, C; Launer, A)

HUMBIO 118. Ecological Anthropology—(Same as ANTHSCI 164/264.)
3-5 units, not given this year

MS&E 241. Economic Analysis
3-4 units, Win (Weber, T)

MS&E 250A. Engineering Risk Analysis
2-3 units, Win (Paté-Cornell, E)

POLISCI 351A. Foundations of Political Economy—(Same as POLECON 680.)
4 units, Aut (Hatfield, J)

POLISCI 362. New Economics of Organization
5 units, Spr (Weingast, B)

PUBLPOL 102. Organizations and Public Policy
5 units, Aut (Hannan, M)

PUBLPOL 104. Economic Policy Analysis—(Same as ECON 150.)
5 units, Spr (Staff)

PUBLPOL 194. Technology Policy
5 units, Win (Windham, P)

SOC 160/260. Formal Organizations
5 units, Win (Zhou, X)

SOC 262/362. Organization and Environment—(Same as OB 672.)
4 units, Aut (Carroll, G)

SOC 367. Institutional Analysis of Organizations
3-5 units, Aut (Scott, W)

STS 110. Ethics and Public Policy—(Same as MS&E 197, PUBLPOL 103B.)
5 units, Win (McGinn, R)

SCHOOL OF EDUCATION

Emeriti: (Professors) J. Myron Atkin, John Baugh, Edwin M. Bridges, Robert C. Calfee, Larry Cuban, Elliot W. Eisner, Nathaniel L. Gage, James Greeno, Michael W. Kirst, Henry M. Levin, Richard Lyman (President emeritus), James G. March, William F. Massy, Nel Noddings, Ingram Olkin, Denis C. Phillips, Thomas Rohlen, Lee S. Shulman, George D. Spindler, Carl E. Thoresen, David B. Tyack, Decker F. Walker, Hans Weiler
Dean: Deborah J. Stipek
Associate Dean for Faculty Affairs: Edward Haertel
Associate Dean for Student Affairs: David F. Labaree
Senior Associate Dean for Administration: Victoria Oldberg
Associate Dean for External Relations: Rebecca T. Smith
Professors: Arnetha Ball, Hilda Borko, Anthony Bryk, Eamonn Callan, Martin Carnoy, William Damon, Linda Darling-Hammond, Claude Goldenberg, Pamela Grossman, Patricia J. Gumport, Edward Haertel, Kenji Hakuta, Connie Juel, John D. Krumboltz, David F. Labaree, Raymond P. McDermott, Milbrey McLaughlin, Amado M. Padilla, Roy Pea, Walter Powell, Francisco O. Ramirez, Daniel Schwartz, Richard J. Shavelson, Deborah J. Stipek, Myra H. Strober, Guadalupe Valdés, John Willinsky, Sam Wineburg
Associate Professors: Anthony L. Antonio, Brigid J. Barron, Prudence Carter, Teresa C. LaFromboise, Susanna Loeb, Daniel McFarland, Debra Meyerson, Sean Reardon, David Rogosa
Assistant Professors: Jennifer Adams, Bryan Brown, Ira Lit, Aki Murata, Na'ilah Suad Nasir, Christine Min Wotipka
Professors (Teaching): Shelley Goldman, Rachel Lotan
Courtesy Professors: Stephen Barley, Carol Dweck, Paula England, Eric Hanushek, John Kennedy, William Koski, John Rickford
Courtesy Assistant Professor: Robert Reich
Lecturers: Denise Pope, Ann Porteus
Consulting Professor: Michael Kamil
Consulting Associate Professors: Suki Hoagland, Thomas Keating

School Offices: Cubberley 101
Mail Code: 94305-3096
Phone: (650) 723-2109
Email: info@suse.stanford.edu
Web Site: http://ed.stanford.edu

Courses given in the School of Education have the subject code EDUC. For a complete list of subject codes, see Appendix.

The School of Education prepares scholars, teachers, teacher educators, policy analysts, evaluators, researchers, administrators, and other educational specialists. Two graduate degrees with specialization in education are granted by the University: Master of Arts and Doctor of Philosophy. While no undergraduate majors are offered, the school offers a number of courses for undergraduates, an undergraduate honors program, and a variety of tutoring programs.

The School of Education is organized into three program area committees: Curriculum Studies and Teacher Education (C&TE); Psychological Studies in Education (PSE); and Social Sciences, Policy, and Educational Practice (SSPEP).

In addition, several cross-area programs are sponsored by faculty from more than one area. These programs include the doctoral Learning Sciences and Technology Design Program (LSTD); two master's level programs: the Stanford Teacher Education Program (STEP) and the Learning, Design, and Technology Program (LDT); and the undergraduate honors program.

These program area committees function as administrative units that act on admissions, plan course offerings, assign advisers, and determine program requirements. Various concentrations exist within most of these areas. Faculty members are affiliated primarily with one area but may participate in several programs. While there is a great deal of overlap and interdisciplinary emphasis across areas and programs, students are affiliated with one area committee or program and must meet its degree requirements.

Detailed information about admission and degree requirements, faculty members, and specializations related to these area committees and programs can be found in the publication *School of Education Guide to Graduate Studies* and at http://ed.stanford.edu.

The School of Education offers an eight-week summer session for admitted students only. The school offers no correspondence or extension courses, and in accordance with University policy, no part-time enrollment is allowed. Work in an approved internship or as a research assistant is accommodated within the full-time program of study.

UNDERGRADUATE PROGRAMS

The School of Education focuses on graduate education and research training and does not offer an undergraduate major. However, undergraduate education is of concern to the School, and courses and programs are available to those interested in the field of education. The following courses are appropriate for undergraduates:

101. Undergraduate Teaching Practicum
102. Culture, Class and Educational Opportunity
103A. Tutoring: Seeing a Child Through Literacy
103B. Race, Ethnicity, and Linguistic Diversity in Classrooms: Sociocultural Theory and Practices
103C. Educational Policy, Diversity, and English Learners
106. Interactive Media in Education
107. The Politics of International Cooperation in Education
110. Sociology of Education: The Social Organization of Schools
112X. Urban Education
124. Collaborative Design and Research of Technology: Integrated Curriculum
130. Introduction to Counseling
131. Mediation for Dispute Resolution
134. Career and Personal Counseling
136. World, Societal, and Educational Change: Comparative Perspectives
149. Theory and Issues in the Study of Bilingualism
165. History of Higher Education in the United States
178X. Latino Families, Languages, and Schools
179. Urban Youth and their Institutions: Research and Practice
181. Multicultural Issues in Higher Education
193A. Listen Up! Core Peer Counseling Skills
197. Education and the Status of Women: Comparative Perspective
199A,B,C. Undergraduate Honors Seminar
201. History of Education in the United States
201A. History of African American Education
201B. Education for Liberation
202. Introduction to Comparative and International Education
204. Introduction to Philosophy of Education
208B. Curriculum Construction
214. Popper, Kuhn, and Lakatos
218. Topics in Cognition and Learning: Play
220B. Introduction to the Politics of Education
220D. History of School Reform: Origins, Policies, Outcomes, and Explanations
221A. Policy Analysis in Education
243. Writing Across Languages and Cultures: Research on Writing and Writing Instruction
247. Moral Education
251B. Statistical Analysis in Educational Research: Analysis of Variance
270A. Learning to Lead in Public Service Organizations
290. Leadership: Research, Policy, and Practice
298. Online Learning Communities
304. The Philosophical and Educational Thought of John Dewey
323A. Introduction to Education Policy Analysis
326. Legal Dilemmas and Administrative Decision Making in Schools
342. Child Development and New Technologies
354X. School-Based Decision Making
369. Human Cognitive Abilities

374A. Research Workshop: Knowledge Networks
377. Comparing Institutional Forms: Public, Private, and Nonprofit
382. Student Development and the Study of College Impact
384. Advanced Topics in Higher Education

HONORS PROGRAM

An honors program is available to undergraduates to supplement their regular majors outside the school. This program permits interested undergraduates at Stanford to build on the training received in their major field of study by pursuing additional courses and a research or practicum project in a related area of education.

Students apply for entry during the junior year. Applications are available at http://www.stanford.edu/dept/SUSE/honors. The current director of the program is Professor John Krumboltz. At least one course must be taken from each of the following areas:

1. *Educational policy and history in the U.S.*—EDUC 201, History of Education in the United States; EDUC 202, Introduction to the Study of International Comparative Education; EDUC 165, History of Higher Education in the U.S.
2. *Contemporary problem areas*—courses include: EDUC 149, Theory and Issues in the Study of Bilingualism; EDUC 179, Urban Youth and their Institutions: Research and Practice; EDUC 197, Education and the Status of Women: Comparative Perspectives.
3. *Foundational disciplines*—courses include: EDUC 110, Sociology of Education: Social Organizations of Schools; EDUC 204, Introduction to Philosophy of Education; EDUC 220, Social Sciences and Educational Analysis.

A directed reading course as well as directed research courses with a faculty member in Education are also required. Students in the program should enroll in 199A,B,C, Undergraduate Honors Seminar, during their senior year.

Near the end of Spring Quarter, successful candidates for honors orally present brief reports of their work and findings at a mini-conference. All honors students in Education are expected to attend this conference.

COTERMINAL BACHELOR'S AND MASTER'S PROGRAM

The School of Education admits a small number of students from undergraduate departments within the University into a coterminal bachelor's and M.A. program. For information about the coterminal option through the Stanford Teacher Education Program (STEP), see the details under STEP below. Students in this program receive the bachelor's degree in their undergraduate major and the master's degree in Education. Approval of the student's undergraduate department and admission to the School of Education M.A. program are required. Undergraduates may apply when they have completed at least 120 units, and must submit their application no later than the quarter prior to the expected completion of their undergraduate degree. The number of units required for the M.A. degree depends on the program requirements within the School of Education; the minimum is 45 units.

Applicants may obtain coterminal degree application materials from the School of Education's Admissions Office in Cubberley, Room 140. For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

The School of Education offers several advanced degree programs described below. Requirements vary somewhat across programs. Both University and School of Education requirements must be met for each degree. The University requirements are detailed in the "Graduate Degrees" section of this bulletin. Students are urged to read this section carefully, noting residency, tuition, and registration requirements. A student who wishes to enroll for graduate work in the School of Education must be qualified and admitted to graduate standing by one of the school's area committees and approval of the Associate Dean of Student Affairs.

Complete information about admissions procedures and requirements is available at http://gradadmissions.stanford.edu, or by writing Stanford University Graduate Admissions, 630 Serra Street, Suite 120, Stanford, CA 94305-6032, or at http://ed.stanford.edu/suse. All applicants, except coterminal applicants, must submit scores from the Graduate Record Examination General Test (verbal, quantitative, and analytical or analytical writing areas); TOEFL scores are also required from those whose first language is not English. Applicants to the Stanford Teacher Education Program are also required to submit specific test scores or acceptable equivalents as required by the California Commission on Teacher Credentialing; see the section on STEP below. Test information is available at http://ed.stanford.edu/suse/admissions/admissions-application-requirements.html#test-scores.

MASTER OF ARTS

The M.A. degree is conferred by the University upon recommendation of the faculty of the School of Education. The minimum unit requirement is 45 quarter units earned at Stanford as a graduate student. Students must maintain a grade point average (GPA) of 3.0 or better in courses applicable to the degree, and a minimum of 27 units must be taken in the School of Education. Students typically enroll in 15 to 18 units per quarter. They must enroll in at least 11 units of work each quarter unless their program makes special provision for a lower quarterly minimum. Master's students should obtain detailed program requirements from the master's coordinator, located in academic services in the School of Education. Most programs require a final project, scholarly paper, or monograph. Additional detailed information regarding program content, entrance, and degree requirements is available at http://ed.stanford.edu. Upon admission, each student is assigned a faculty adviser from the appropriate area committee to begin early planning of a coherent program.

Master of Arts degrees are offered for the following specializations:

Curriculum and Teacher Education.* Students may specialize in English, Literacy, Mathematics, Science, or History.
International Comparative Education
International Educational Administration and Policy Analysis
Joint Degree Program with Graduate School of Business (MBA/MA)
Joint Degree Program with Law School (JD/MA)
Learning, Design, and Technology
Policy, Organization, and Leadership Studies
Social Sciences in Education. Students may specialize in anthropology, economics, educational linguistics, history, philosophy or sociology of education, or interdisciplinary studies.

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* This program in CTE is not a credentialing program; see STEP below.

In addition, an M.A. degree with a teaching credential is offered in the Stanford Teacher Education Program.

STANFORD TEACHER EDUCATION PROGRAM (STEP)

STEP is a twelve-month, full-time program leading to a Master of Arts and a preliminary California teaching credential. STEP offers two Master of Arts programs to prepare college graduates for careers as teachers in single- or multiple-subject classrooms. STEP-Secondary prepares humanities and sciences students to become teachers of English, languages (French, German, Japanese, Spanish), mathematics, science (biology, chemistry, earth science, physics), and history/social science. STEP-Elementary prepares students to be teachers in California multiple-subject classrooms. STEP seeks to prepare and support teachers to work with diverse learners to achieve high intellectual, academic, and social standards by creating equitable and successful schools and classrooms.

The 12-month STEP year begins in June (Secondary) or July (Elementary) with a Summer Quarter of intensive academic preparation and placement in a local summer school. During the academic year, students continue their course work and begin a year-long field placement under the guidance of expert teachers in local schools. The master's degree and teaching credential require a minimum of 45 quarter units, taken during four quarters of continuous residency.

Stanford undergraduates who enroll in STEP through the coterminal program must have their B.A. conferred prior to commencing the four quarters of the STEP program. Students complete their undergraduate degree prior to beginning in the STEP year which concludes in a master's degree and a recommendation for a California teaching credential.

Applicants to the secondary program are required to pass the California Basic Educational Skills Test (CBEST) and must demonstrate subject matter competence in one of two ways: (1) by passing the California Subject Examination for Teachers (CSET) in their content area; or (2) by completing a California state-approved subject matter preparation program. Applicants to the elementary program are required to pass the California Basic Educational Skills Test (CBEST), the California Multiple Subject Examination for Teachers (CSET), and the Reading Instruction Competence Assessment Test (RICA) after admission to the program.

Further information regarding admission requirements, course work, and credential requirements is available at http://ed.stanford.edu and in the *School of Education Guide to Graduate Studies*.

DOCTORAL DEGREES

The School of Education offers the Doctor of Philosophy (Ph.D.) degree in all program area committees. The degree is conferred by the University upon recommendation by the faculty of the School of Education and the University Committee on Graduate Studies. The Ph.D. requires a minimum of 135 units of course work and research completed at Stanford beyond the baccalaureate degree. Students may transfer up to 45 units of graduate course work. Students must consult with the doctoral programs officer if they intend to transfer prior course work. Students must maintain a grade point average (GPA) of 3.0 (B) or better in courses applicable to the degree.

Students should note that admission to the doctoral program does not constitute admission to candidacy for the degree. Students must qualify and apply for candidacy by the end of their second year of study and should obtain information about procedures and requirements during their first year from the School's doctoral programs office in Cubberley 135.

The Ph.D. degree is designed for students who are preparing for research work in public school systems, branches of government, or specialized institutions; teaching roles in education in colleges or universities, and research connected with such teaching; or other careers in educational scholarship and research.

Ph.D. students must complete a minor in another discipline taught outside the school, or hold an acceptable master's degree outside the field of education, or complete an approved individually designed distributed minor that combines relevant advanced work taken in several disciplines outside the school.

Upon admission, the admitting area committee assigns an initial adviser from its faculty who works with the student to establish an appropriate and individualized course of study, a relevant minor, and project research plans. Other faculty members may also be consulted in this process. Details about administrative and academic requirements for each area committee and the School of Education, along with the expected timelines to complete program milestones, are given in the publication *School of Education Doctoral Degree Handbook*, available for download at http://ed.stanford.edu/suse/programs-degrees/; click on the publication link.

The following doctoral specializations, with their sponsoring area and concentration, are offered:

Administration and Policy Analysis (SSPEP)
Anthropology of Education (SSPEP)
Child and Adolescent Development (PSE)
Economics of Education (SSPEP)
Educational Linguistics (SSPEP)
Educational Psychology (PSE)
English Education/Literacy Studies (C&TE)
General Curriculum Studies (C&TE)
Higher Education (SSPEP)
History of Education (SSPEP)
International Comparative Education (SSPEP)
Learning Sciences and Technology Design (CTE, PSE, SSPEP)
Mathematics Education (C&TE)
Organization Studies (SSPEP)
Philosophy of Education (SSPEP)
Science Education (C&TE)
Interdisciplinary Studies (SSPEP)
History/Social Science Education (C&TE)
Sociology of Education (SSPEP)
Teacher Education (C&TE)

PH.D. MINOR FOR STUDENTS OUTSIDE EDUCATION

Candidates for the Ph.D. degree in other departments or schools of the University may elect to minor in Education. Requirements include a minimum of 20 quarter units of graduate course work in Education and a clear field of concentration. Students choosing to minor in education should meet with the Associate Dean for Student Affairs to determine a suitable course of study early in their program.

COURSES

OTHER DIVISIONS OF THE UNIVERSITY

Teachers, administrators, and researchers are expected to have substantial knowledge of a variety of academic fields outside the areas encompassed by professional education. Graduate students in the School of Education are, therefore, urged to consider the courses offered in other divisions of the University in planning their programs.

The numbering of courses in the School of Education identifies the approximate course level and its intended audience:

Below 100 level—For undergraduates
100 level—Primarily for undergraduates (graduate students may enroll)
200 and 300 level—For M.A. and first- and second-year doctoral students, and qualified undergraduates
400 level—Research seminars or similar courses primarily for third-year doctoral students and beyond

Course descriptions are in numerical order and indexed by program areas.

An 'X' suffix denotes a new experimental course. With faculty approval, after being taught twice, it can be offered as a regular course in the School of Education.

An 'S' suffix denotes a special course, given only once and usually taught by visiting faculty.

An 'E' suffix denotes a course that is part of the STEP-Elementary curriculum.

EDUCATION COURSES

EDUC 93Q. Young Children's Mathematical Thinking and Learning—Stanford Introductory Seminar. Preference to sophmores. Students re-examine how they learned to think mathematically. How young children's reasoning supports their methods in problem solving; whether and how school experiences support their learning. Field trips to classrooms; research projects working with children.

3 units, Win (Murata, A)

EDUC 98X. Service Learning Practicum—For Alternative Spring Break program leaders. The skills and philosophical framework to develop and lead an ASB experience.

1 unit, Aut (McConnell, J)

EDUC 101. Undergraduate Teaching Practicum—Students engage in real world teaching by observing and assisting teachers in the classroom, and being involved in structured interactions such as tutoring. Weekly meetings concerning field experiences, readings, and developing skills and knowledge. This course provides the opportunity to consider whether a teaching career is a good match.

3-5 units, Aut (Wolf, J)

EDUC 102. Culture, Class, and Educational Opportunity—Upward Bound and EPASSA counselors work with students from educationally disadvantaged backgrounds. Topics: language education, culture and family, class management, school finance, and community-school relations. Mandatory school visits and classroom observations. Enrollment limited to 15. (SSPEP)

2 units, not given this year

EDUC 103A. Tutoring: Seeing a Child through Literacy—(Same as SOC 103A.) For undergraduates to engage in the real world of teaching; required of all STEP elementary credential candidates. Focus is on teaching struggling young readers. The role of instruction in literacy development; supervised tutoring of a child; seeing the worlds of school, print, and learning through the eyes of a child. Ravenswood Reads tutors encouraged to enroll.

4 units, Aut (Juel, C; England, P)

EDUC 103B. Race, Ethnicity, and Linguistic Diversity in Classrooms: Sociocultural Theory and Practices—(Graduate students register for 337.) Undergraduates engage in the real world of teaching. Focus is on classrooms with students from diverse racial, ethnic and linguistic backgrounds. Studies, writing, and media representation of urban and diverse school settings; implications for transforming teaching and learning. Issues related to developing teachers with attitudes, dispositions, and skills necessary to teach diverse students.

3-5 units, Win (Ball, A)

EDUC 103C. Educational Policy, Diversity, and English Learners—Undergraduates engage in the real world of teaching. Historical and legal foundations, and materials, methods, and strategies for English and primary language development. Students tutor an English learner.

3-4 units, Spr (Staff)

EDUC 104X. Conduct of Research with and in Communities—For undergraduates interested in service learning and research in community settings. The historical and theoretical underpinnings of community-based participatory research (CBPR), action research, community-embedded research, participant observation, and qualitative research.

3-4 units, Aut, Spr (Emery, D)

EDUC 106. Interactive Media in Education—Workshop. (CTE)

3-5 units, Win (Staff)

EDUC 107. The Politics of International Cooperation in Education—(Ph.D. students register for 307B; see 307B.) For undergraduates and master's students. (SSPEP/ICE, APA)

3-4 units, not given this year

EDUC 110. Sociology of Education: The Social Organization of Schools—(Graduate students register for 310; same as SOC 132/332.) Topics and case studies that elaborate on the embeddedness of classrooms and schools in social environments, spanning school processes such as stratification, authority, moral and technical specialization, curricular differentiation, classroom instruction, voluntary associations, social crowds, and peer influence. (SSPEP) GER:DB-SocSci

4 units, not given this year

EDUC 111. The Young Adult Novel: A Literature For and About Adolescents—For undergraduates considering teaching or working with adolescents, and for those planning to apply to the coterminal program in the Stanford Teacher Education program (STEP). Students work together to define the genre of young adult novels. What they reveal about adolescence in America. How to read and teach young adult literature.

5 units, not given this year

EDUC 112X. Urban Education—(Graduate students register for 212X.) Combination of social science and historical perspectives trace the major developments, contexts, tensions, challenges, and policy issues of urban education.

3-4 units, Win (Carter, P)

EDUC 113X. Gender and Sexuality in Schools—Issues at the intersection of queer theory and educational practice. Experiences, rights, and responsibilities of lesbian, gay, bisexual, transgender, intersex, queer, and questioning students and teachers as members of marginalized or majority cultures.

3 units, Spr (Haertel, E)

EDUC 115Q. Identities, Race, and Culture in Urban Schools—Stanford Introductory Seminar. Preference to sophomores. How urban youth come to a sense of themselves as students, members of cultural and racial groups, and young people in urban America. The nature and interaction of racial and academic identities: how identity takes shape; how it has been conceptualized. The relation between identities and learning. Urban schools as contexts for identity development. Theoretical perspectives include psychology, sociolinguistics, sociology, anthropology, and education. Students shadow a high-school student in a public school and write a case study.

3 units, Spr (Nasir, N)

EDUC 116X. Service Learning as an Approach to Teaching—History, theory, and practice. Topics include: responsive community partnerships, cultural awareness, role of reflection, and best practices in service learning.

3 units, Spr (Cotterman, K)

EDUC 117X. Research and Policy on Postsecondary Access—(Graduate students register for 417X; see 417X.)

3 units, Spr (Antonio, A)

EDUC 119X. Writing About Education—Workshop. How to communicate research and thinking in a clear and memorable way. The elements of good writing, word choice, and editing. Choosing the right publication for work; pros and cons of writing for a non-specialist audience; ethics, law, and libel; and how to get published. Students write about their work and share their writing.

1-3 units, Spr (Staff)

EDUC 121X. Leadership and Civic Responsibility—How leaders from public and private occupations exemplify civic responsibility. Theories and attributes of leadership behavior that promote the public welfare, civic responsibility, and social justice. Relationships among leadership, civic responsibility, and education. Guest speakers.

2 units, not given this year

EDUC 122X. From Local to Global: Collaborations for International Environmental Education—(Same as EARTHSYS 123.) A collaboration with three universities in Africa. Discourse and debate using Internet and mobile technology interactions. Topics include the global environment, climate change, sustainable development, and food security.

2 units, Win (Goldman, S; Hoagland, S)

EDUC 123X. Contexts that Promote Youth Development: Understandings of Effective Interventions—How psychology, medicine, public health, sociology, education, and public policy define and promote youth development. How to build the resilience and competencies of youth through safe, supportive environments for building social, emotional, and intellectual skills. How to design settings that best promote youth development.

2-4 units, Aut (Emery, D; Penuel, W)

EDUC 124. Collaborative Design and Research of Technology: Integrated Curriculum—For education students interested in math and science curriculum development. Studio-based, hands-on approach to the research and development of technology tools and curriculum materials. Focus is on the role that technologies can play in teaching and learning in the content areas.

3-4 units, not given this year

EDUC 130. Introduction to Counseling—The theories and techniques of counseling, emphasizing clients' individual and cultural differences, and construction of one's own theory of the counseling process and outcome. Two psychotherapeutic theories, cognitive-behavioral and existential-humanistic, supplemented with a third theory of student's choice. Experiential, problem-based focus on how to develop self-awareness and conceptual understandings of the counseling process in culturally diverse contexts. (PSE)

3 units, Win (Krumboltz, J)

EDUC 131. Mediation for Dispute Resolution—(Same as PSYCH 152.) Mediation as more effective and less expensive than other forms of settling disputes such as violence, lawsuits, or arbitration. How mediation can be structured to maximize the chances for success. Simulated mediation sessions.

3 units, Aut (Krumboltz, J)

EDUC 134. Career and Personal Counseling—(Graduate students register for 234; same as PSYCH 192.) Methods of integrating career and personal counseling with clients and counselors from differing backgrounds. Practice with assessment instruments. Case studies of bicultural role conflict. Informal experience in counseling. (PSE)

3 units, Spr (Krumboltz, J)

EDUC 136. World, Societal, and Educational Change: Comparative Perspectives—(Graduate students register for 306D; same as SOC 231.) Theoretical perspectives and empirical studies on the structural and cultural sources of educational expansion and differentiation, and on the cultural and structural consequences of educational institutionalization. Research topics: education and nation building; education, mobility, and equality; education, international organizations, and world culture.

4-5 units, Win (Drori, G)

EDUC 137X. Social Justice in Education—(Graduate students register for 237X; formerly 320X.) Recent work in political theory to address questions about social justice in educational policy and practice: equality in education, language rights, race and multiculturalism, educational choice. GER:EC-EthicReas

3 units, Win (Callan, E)

EDUC 143. Boys' Psychosocial Development—(Same as HUMBIO 144.) From early childhood through adolescence. Emphasis is on how boys' lives and experiences are embedded within their interpersonal relationships and social and cultural contexts. Interdisciplinary approach including perspectives from fields such as psychology, sociology, anthropology, family studies, and education. Prerequisite: Human Biology core or equivalent, or consent of instructor. GER:EC-Gender

4 units, Spr (Chu, J)

EDUC 144X. STEP Elementary Child Development—How schools form a context for children's social and cognitive development. Focus is on early and middle childhood. Transactional processes between children and learning opportunities in classroom contexts. Topics include: alternative theoretical perspectives on the nature of child development; early experience and fit with traditional school contexts; assessment practices and implications for developing identities as learners; psychological conceptions of motivational processes and alternative perspectives; the role of peer relationships in schools; and new designs for learning environments. Readings address social science and methodological issues.

4 units, not given this year

EDUC 146X. Perspectives on the Education of Linguistic Minorities—(Same as APPLLING 207.) Social, political, linguistic, and pedagogical issues associated with educating students who do not speak the language or language variety of the majority society. Focus is on the U.S.; attention to minorities elsewhere. American attitudes toward linguistic and racial minorities. Educational problems of linguistically different children and non-English- or limited-English-speaking children. Approaches to solving problems.

3-5 units, Spr (Valdés, G)

EDUC 147X. Human-Computer Interaction in Education—Required for students in the Learning Design and Technology Master's Program. Concepts underlying the design of human-computer interaction including usability and affordances, direct manipulation, systematic design methods, user conceptual models and interface metaphors, design languages and genres, human cognitive and physical ergonomics, information and interactivity structures, design tools, and environments. Studio/discussion component applies these principles to the design of interactive technology for teaching and learning.

3 units, not given this year

EDUC 148X. Critical Perspectives on Teaching and Tutoring English Language Learners—Theoretical foundation for volunteer tutors of English language learners in urban environments working with children in school-based programs or adults in community-based settings.

3 units, not given this year

EDUC 149. Theory and Issues in the Study of Bilingualism—(Graduate students register for 249; same as SPANLIT 207.) Sociolinguistic perspective. Emphasis is on typologies of bilingualism, the acquisition of bilingual ability, description and measurement, and the nature of societal bilingualism. Prepares students to work with bilingual students and their families and to carry out research in bilingual settings. (SSPEP)

3-5 units, Aut (Valdés, G)

EDUC 150. Introduction to Data Analysis and Interpretation—Primarily for master's students with little or no experience. Focus is on reading literature and interpreting descriptive and inferential statistics, especially those commonly found in education. Topics: basic research design, instrument reliability and validity, description statistics, correlation, t-tests, one-way analysis of variance, and simple and multiple regression.

4 units, Aut, Win (Porteus, A)

EDUC 151. Introduction to Qualitative Research Methods—Primarily for master's students. Issues, ideas, and methods.

3-4 units, Aut (Pope, D), Win (Wolf, J)

EDUC 158. Children's Citizenship: Justice Across Generations—(Same as POLISCI 131.) The development of children into citizens, focusing on major social institutions responsible for their civic education: schools, families, communities, and civil society. How does each institution develop citizenship? What is the relationship between civic education and the reproduction of social equality or inequality? Do children's rights differ from those of adults? Readings: political theorists on justice, feminist theorists on family and children, court cases on tensions between the state and community interest in education, and social critics on the practice of civic education. GER:DB-SocSci, EC-EthicReas

5 units, not given this year

EDUC 160. Introduction to Statistical Methods in Education—(Master's students register for 150.) For doctoral students with little or no prior statistics. Organization of data, descriptive statistics, elementary methods of inference, hypothesis testing, and confidence intervals. Computer package used. Students cannot also receive credit for PSYCH 60 or for STATS 60/160. (all areas)

4 units, Aut (Hakuta, K)

EDUC 165. History of Higher Education in the U.S.—(Graduate students register for 265; see 265; same as HISTORY 158C.)

3-4 units, Aut (Staff)

EDUC 166. The Centrality of Literacies in Teaching and Learning—Focus is on principles in understanding, assessing, and supporting the reading and writing processes, and the acquisition of content area literacies in secondary schools. Literacy demands within particular disciplines and how to use oral language, reading, and writing to teach content area materials more effectively to all students. (STEP)

3 units, Sum (Ball, A)

EDUC 167. Educating for Equity and Democracy—Introduction to the theories and practices of equity and democracy in education. How to think about teaching and schooling in new ways; the individual moral and political reasons for becoming a teacher. (STEP)

3 units, Sum (McDermott, R)

EDUC 177. Education of Immigrant Students: Psychological Perspectives—(Graduate students register for 277.) Historical and contemporary approaches to educating immigrant students. Case study approach focuses on urban centers to demonstrate how stressed urban educational agencies serve immigrants and native-born U.S. students when confronted with overcrowded classrooms, controversy over curriculum, current school reform movements, and government policies regarding equal educational opportunity. (SSPEP)

4 units, Win (Padilla, A)

EDUC 178X. Latino Families, Languages, and Schools—The challenges facing schools to establish school-family partnerships with newly arrived Latino immigrant parents. How language acts as a barrier to home-school communication and parent participation. Current models of parent-school collaboration and the ideology of parental involvement in schooling. (SSPEP)
3-5 units, not given this year

EDUC 179. Urban Youth and Their Institutions: Research and Practice—(Graduate students register for 279.) The determinants and consequences of urban life for youth, emphasizing disciplinary and methodological approaches, and the gap between the perspectives of state and local organizations and those of youth and their communities. The diversity of urban youth experiences with respect to ethnicity, gender, and immigration histories. Case studies illustrate civic-level and grassroots institutions, their structures, networks, and philosophies; historical and contemporary realities of urban youth for policy makers, educators, and researchers. Limited enrollment. Prerequisite: consent of instructor. (SSPEP/APA)
4-5 units, Aut (McLaughlin, M)

EDUC 179B. Youth Empowerment and Civic Engagement—(Graduate students register for 279B.) Focus is on youth development policies and practices: what makes them effective, and how they operate in broader institutional contexts. Research-based information; conceptual underpinnings; best learning from experience; and the perspective of expert youth workers, policymakers, and youth about what works.
2-4 units, not given this year

EDUC 180. Directed Reading in Education—For undergraduates and master's degree students. (All Areas)
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 181. Multicultural Issues in Higher Education—(Graduate students register for 381; see 381.)
4 units, Win (Antonio, A)

EDUC 185. Master's Thesis—(all areas)
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 190. Directed Research in Education—For undergraduates and master's students. May be repeated for credit. (all areas)
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 191X. Introduction to Survey Research—(Graduate students register for 291X.) Planning tasks, including problem formulation, study design, questionnaire and interview design, pretesting, sampling, interviewer training, and field management. Epistemological and ethical perspectives. Issues of design, refinement, and ethics in research that crosses boundaries of nationality, class, gender, language, and ethnicity.
3-4 units, Aut (Adams, J)

EDUC 193A. Listen Up! Core Peer Counseling Skills—Topics: verbal and non-verbal skills, open and closed questions, paraphrasing, working with feelings, summarization, and integration. Individual training, group exercises, role play practice with optional video feedback. Sections on relevance to crisis counseling and student life. Guest speakers from University and community agencies. Students develop and apply skills in University settings.
2 units, Aut, Win, Spr (Mendoza-Newman, M)

EDUC 193B. Peer Counseling in the Chicano/Latino Community—Topics: verbal and non-verbal attending and communication skills, open and closed questions, working with feelings, summarization, and integration. Salient counseling issues including Spanish-English code switching in communication, the role of ethnic identity in self-understanding, the relationship of culture to personal development, and Chicana/o student experience in University settings. Individual training, group exercises, role play, and videotape practice.
1 unit, Aut (Martinez, A)

EDUC 193C. Peer Counseling in the African American Community—Topics: the concept of culture, Black cultural attributes and their effect on reactions to counseling, verbal and non-verbal attending, open and closed questions, working with feelings, summarization, and integration. Reading assignments, guest speakers, role play, and videotaped practice. Students develop and apply skills in the Black community on campus or in other settings that the student chooses.
1 unit, Aut (Edwards, S)

EDUC 193F. Psychological Well-Being on Campus: Asian American Perspectives—Topics: the Asian family structure, and concepts of identity, ethnicity, culture, and racism in terms of their impact on individual development and the counseling process. Emphasis is on empathic understanding of Asians in America. Group exercises.
1 unit, Spr (Brown, N)

EDUC 193N. Peer Counseling in the Native American Community—Verbal and non-verbal communication, strategic use of questions, methods of dealing with strong feelings, and conflict resolution. How elements of counseling apply to Native Americans including client, counselor, and situational variables in counseling, non-verbal communication, the role of ethnic identity in self-understanding, the relationship of culture to personal development, the impact of family on personal development, gender roles, and the experience of Native American students in university settings. Individual skill development, group exercises, and role practice.
1 unit, Win (Simms, W)

EDUC 193P. Peer Counseling at the Bridge—Mental health issues such as relationships, substance abuse, sexual assault, depression, eating disorders, academic stressors, suicide, and grief and bereavement. Guest speakers.
1 unit, Aut, Win, Spr (Mendoza-Newman, M)

EDUC 193S. Peer Counseling on Comprehensive Sexual Health—Information on sexually transmitted infections and diseases, and birth control methods. Topics related to sexual health such as communication, societal attitudes and pressures, pregnancy, abortion, and the range of sexual expression. Role-play and peer-education outreach projects. Required for those wishing to counsel at the Sexual Health Peer Resource Center (SHPRC).
1 unit, Aut, Win, Spr (Martinez, A)

EDUC 197. Education and the Status of Women: Comparative Perspective—Theories and perspectives from the social sciences relevant to the role of education in changing, modifying, or reproducing structures of gender differentiation and hierarchy. Cross-national research on the status of women and its uses to evaluate knowledge claims. (SSPEP) GER:EC-Gender
4-5 units, not given this year

EDUC 198X. Tutoring with Adolescents: Ravenswood Writes—(Same as PWR 198X.) Strategies and approaches for teaching writing to students from diverse backgrounds and languages, and cultural and learning styles. Course prepares students to become tutors for Ravenswood Writes. Prerequisites: application and committee approval.
3 units, Spr (Ball, A; Tinker, J)

EDUC 199A,B,C. Undergraduate Honors Seminar—Required of juniors and seniors in the honors program in the School of Education. Student involvement and apprenticeships in educational research. Participants share ongoing work on their honors thesis. Prerequisite: consent of instructor.
1 unit, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Krumboltz, J)*

EDUC 201. History of Education in the United States—(Same as HISTORY 158B.) How education came to its current forms and functions, from the colonial experience to the present. Focus is on the 19th-century invention of the common school system, 20th-century emergence of progressive education reform, and the developments since WW II. The role of gender and race, the development of the high school and university, and school organization, curriculum, and teaching. (SSPEP)
3-4 units, Spr (Staff)

EDUC 201A. History of African American Education—Pivotal points in African American educational history including literacy attempts during slavery, the establishment of historically Black colleges and universities, the debate between liberal and vocational education, Black student rebellions on campuses during the 20s, and the establishment of Black studies and cultural centers. (SSPEP)
3-4 units, not given this year

EDUC 201B. Education for Liberation—How ethnic, gender, and religious groups have employed education to advance group self-determination and autonomy throughout history. How reformers attempted to impose educational prescriptions on these groups.
3-4 units, not given this year

EDUC 202. Introduction to Comparative and International Education—Contemporary theoretical debates about educational change and development, and the international dimension of issues in education. Emphasis is on the development of students' abilities to make cross-national and historical comparisons of educational phenomena. (SSPEP/ICE)
4-5 units, Aut (Adams, J)

EDUC 202I. Education Policy Workshop in International and Comparative Education—For students in International and Comparative Education. Practical introduction to issues in educational policy making, educational planning, implementation, and the role of foreign expertise/consultants in developing country contexts. (SSPEP/ICE)
3-4 units, not given this year

EDUC 204. Introduction to Philosophy of Education—How to think philosophically about educational problems. Recent influential scholarship in philosophy of education. No previous study in philosophy required. (SSPEP)
3 units, Aut (Callan, E)

EDUC 205X. The Impact of Social and Behavioral Science Research on Educational Issues—Ways in which research intersects with educational policy and practice. Emphasis is on behavioral, social, and cognitive traditions. Topics include early childhood education, early reading, science education, bilingual education, school desegregation, class size reduction, classroom organization, violence and juvenile crime, and affirmative action in higher education. Policy debates and how research informs or fails to inform deliberations and decisions in these areas.
3 units, not given this year

EDUC 206A. Applied Research Methods in International and Comparative Education I: Introduction—Required for M.A. students in ICE and IEAPA; others by consent of instructor. Orientation to the M.A. program and research project; exploration of resources for study and research. (SSPEP/ICE)
1 unit, Aut (Wotipka, C)

EDUC 206B. Applied Research Methods in International and Comparative Education II: Master's Monograph Proposal—Required for M.A. students in ICE and IEAPA; others by consent of instructor. Development of research skills through theoretical and methodological issues in comparative and international education. Preparation of a research proposal for the M.A. monograph. (SSPEP/ICE)
1-3 units, Win (Wotipka, C)

EDUC 206C. Applied Research Methods in International and Comparative Education III: Master's Monograph Workshop—Conclusion of the M.A. program in ICE and IEAPA; required of M.A. students. Reviews of students' research in preparation for their master's monograph. (SSPEP/ICE)
3 units, Sum (Wotipka, C)

EDUC 208B. Curriculum Construction—The theories and methods of curriculum development and improvement. Topics: curriculum ideologies, perspectives on design, strategies for diverse learners, and the politics of curriculum construction and implementation. Students develop curriculum plans for use in real settings. (CTE)
3-4 units, Win (Pope, D)

EDUC 208C. Curriculum: In Theory and Policy—Focus is on key works on the organization and structuring of learning in formal and informal educational settings in light of contemporary issues in curriculum theory, relation of theory and practice, and strategies of curriculum policy development and implementation.
4 units, Spr (Willinsky, J)

EDUC 211. Master's Seminar in Social Sciences in Education—Limited to master's students in SSE. Hands-on forum. The process of developing and shaping a research program, integrating it with academic and field experiences, and building relationships beyond the program. Students conceptualize their projects and focus on researchable topics: effective revising and editing, job searches, working with your adviser, what next? or a celebration of achievements so far. (SSPEP)
1-3 units, Aut, Win, Spr (Wotipka, C)

EDUC 212X. Urban Education—(For graduate students; see 112X.)
3-4 units, Win (Carter, P)

EDUC 214. Popper, Kuhn, and Lakatos—(Same as PHIL 156.) These 20th-century philosophers of science raise fundamental issues dealing with the nature of scientific progress: the rationality of change of scientific belief, science versus non-science, role of induction in science, truth or verisimilitude as regulative ideals. Their impact in the social sciences and applied areas such as educational research. (SSPEP)
3 units, not given this year

EDUC 215X. International Human Rights and Education—Theory and practice. Focus is on how education may be seen as a human rights issue and a tool to educate citizens about their human rights. The history of human rights and the spread of the international human rights regime in terms of organizations and treaties. Issues include street and working children, language rights, and women's right to education.
4-5 units, not given this year

EDUC 216. Second Language and Second Dialect Acquisition—(Same as APPLLING 204, SPANLIT 204.) Spanish-language teaching and learning in tutored environments. In Spanish.
3-5 units, not given this year

EDUC 217. Philosophical and Methodological Issues in Educational Research—The role causation in educational phenomena, and how to determine causal factors. Is educational research based on a positivistic paradigm? Randomized controlled experimental designs. Criteria for judging the rigor of qualitative modes of inquiry. Do Popperian or Deweyan approaches hold the key to resolving contentious issues? Does a postpositivist perspective hold promise?
3 units, not given this year

EDUC 218. Topics in Cognition and Learning: Play—How people recruit perceptual mechanisms (such as for navigating, learning about spatial relations such as driving a car, or inferring the behavior of novel devices) to understand symbolic and conceptual domains. Do hands-on activities with physical objects promote the development of mathematical thinking? May be repeated for credit.
3 units, Aut (Schwartz, D)

EDUC 219E. Visual Arts in Elementary Education—For undergraduates in STEP Elementary Program and others interested in the arts or elementary teaching. Hands-on exploration of visual arts media and works of art.
3-4 units, Spr (Staff)

EDUC 220A. Introduction to the Economics of Education—The relationship between education and economic analysis. Topics: labor markets for teachers, the economics of child care, the effects of education on earnings and employment, the effects of education on economic growth and distribution of income, and the financing of education. Students who lack training in microeconomics, register for 220Y for 1 additional unit of credit. (SSPEP/APA)
4 units, not given this year

EDUC 220B. Introduction to the Politics of Education—(Same as GSBGEN 349.) The relationships between political analysis and policy formulation in education; focus is on alternative models of the political process, the nature of interest groups, political strategies, community power, the external environment of organizations, and the implementations of policy. Applications to policy analysis, implementation, and politics of reform. (APA)
4 units, Win (Staff)

EDUC 220C. Education and Society—(Same as SOC 130/230.) The effects of schools and schooling on individuals, the stratification system, and society. Education as socializing individuals and as legitimizing social institutions. The social and individual factors affecting the expansion of schooling, individual educational attainment, and the organizational structure of schooling.
4-5 units, Aut (Ramirez, F)

EDUC 220D. History of School Reform: Origins, Policies, Outcomes, and Explanations—Required for students in the POLS M.A. program; others welcome. Focus is on 20th-century U.S. Intended and unintended patterns in school change; the paradox of reform that schools are often reforming but never seem to change much; rhetorics of reform and factors that inhibit change. Case studies emphasize the American high school. (SSPEP/APA)
3-5 units, Aut (Labaree, D)

EDUC 220Y. Introduction to the Economics of Education: Economics Section—For those taking 220A who have not had microeconomics before or who need a refresher. Corequisite: 220A. (SSPEP/APA)
1-2 units, not given this year

EDUC 221A. Policy Analysis in Education—Major concepts associated with the development, enactment, and execution of educational policy. Issues of policy implementation, agenda setting and problem formulation, politics, and intergovernmental relations. Case studies. Goal is to identify factors that affect how analysts and policy makers learn about and influence education. Limited enrollment. Prerequisite: consent of instructor. (SSPEP/APA)
4-5 units, Win (McLaughlin, M)

EDUC 222. Resource Allocation in Education—Problems of optimization and design, and evaluation of decision experience. Marginal analysis, educational production functions, cost effectiveness and cost-benefit analysis, constrained maximization, program evaluation. Introduction to linear models for large-scale data analysis. Implications to model assumptions. (SSPEP)
4-5 units, Spr (Carnoy, M)

EDUC 223. Good Schools: Research, Policy, and Practice—Recent studies of schools that exceed expectations in producing desired results. Research methodologies, findings of studies, and efforts to implement results. Components of good schools analyzed: effective teaching, principal leadership, organizational processes, parent involvement, cultures in schools, the role of the superintendent. Required project studies a school and determines goodness. (SSPEP/APA, CTE)
3-4 units, not given this year

EDUC 226X. Empirical Analysis of Education Governance—Emphasis is on strategies for empirical evaluation. Topics include: school board, superintendent, and principal decision making; the state role in education policy and budgeting; the impact of teacher unionization; and the growing influence of private foundations and parent associations. Students participate in an original data collection effort for an ongoing research project.
3 units, not given this year

EDUC 228E. Becoming Literate in School I—First in a three course sequence. Introduction to reading and language arts theory and methodology for candidates in the elementary Multiple Subjects Credentialing program. Instructional methods, formats, and materials.
2 units, Sum (Juel, C)

EDUC 228F. Becoming Literate in School II—Second in a three-course required sequence of reading and language arts theory and methodology for candidates in the elementary Multiple Subjects Credentialing program. Theories for guiding instruction and curricular choices.
3 units, Aut (Juel, C)

EDUC 228G. Becoming Literate in School III—Third in a three-course required sequence of reading and language arts theory and methodology for candidates in the elementary Multiple Subjects Credentialing program. Theories for guiding instruction and curricular choices.
4 units, Win (Staff)

EDUC 228H. Literacy, History, and Social Science—How elementary school teachers can teach history and social science within a literacy framework. Topics include: historical thinking, reading, and writing; current research; applying nonfiction reading and writing strategies to historical texts; using primary sources with elementary students; adapting instruction to meet student needs; state standards; evaluating curriculum; assessing student knowledge; developing history and social science units; and embedding history and social science into the general literacy curriculum.
1 unit, Spr (Staff)

EDUC 229A,B,C,D. Learning Design and Technology Seminar—Four quarter seminar core of the LDT master's program. Designs for learning with technology. Issues and processes relating to internships and careers. Major learning, design, and technology project. Students navigate design sequences in learning environments rooted in practical problems. Theoretical and practical perspectives, hands-on development, and collaborative efforts. (all areas)
A: *1 unit, Aut (Staff)*
B: *1 unit, Win (Staff)*
C: *1 unit, Spr (Staff)*
D: *4-5 units, Sum (Staff)*

EDUC 232A. The Study of Teaching—Theory and practice of teaching, past and present, K-12 and higher education. (CTE)
4 units, not given this year

EDUC 232B. Introduction to Curriculum—What should American schools teach? How should school programs be organized? How can schools determine whether their goals have been achieved? What kind of school organization helps teachers improve their teaching? Historical and contemporary perspective on the curriculum of American schools. Interactions among curriculum, the organizational structure of schools, the conception of the teacher's role, and teaching and student learning assessment. Text, video analysis of teaching, and small group discussions. (CTE)
4 units, not given this year

EDUC 233A. Adolescent Development and Mentoring in the Urban Context—Students engage in an ongoing mentoring relationship with an adolescent from a youth-serving organization. The impact of culture on mentoring. Intervention with children and adolescents, forming positive connections, demonstrating empathy, learning culturally specific caring norms, participating in activities promoting positive youth development. Students are expected to maintain this relationship for at least one additional quarter.
3 units, Aut (LaFromboise, T)

EDUC 233B. Adolescent Development and Mentoring in the Urban Context—Continution of 233A. Topics include: developmental psychology and service learning; collaborating with the community; psychological research on altruism and prosocial behavior; volunteers' motivations; attributions about poverty, and the problem of prejudice.
3 units, Win (LaFromboise, T)

EDUC 234. Career and Personal Counseling—(Undergraduates register for 134; see134; same as PSYCH 192.) (PSE)
3 units, Spr (Krumboltz, J)

EDUC 236B. Indigenous Latin America: Diversity and Governance—Debates on indigenous people's inclusion in modern Latin American democratic societies. Constitutions, national legislation, citizenry, role of education, and cultural diversity.

3-5 units, not given this year

EDUC 236X. Indigenous Peoples, Multiculturalism, and Education: Is Social Inclusion Possible in Latin America?—Existing indigenous social organization based on tradition and ancient cosmology; dynamics of change; and claims for participation and inclusion in democratic societies in Latin America and their implications for the formal education system.

3-5 units, not given this year

EDUC 237X. Social Justice in Education—(Undergraduates register for 137X; see 137X; formerly 320X.)

3 units, Win (Callan, E)

EDUC 238. Spanish Dialectology—(Same as SPANLIT 205.) Focus is on the major varieties of Spanish as they are spoken in Spain and in the Americas. Introduction to dialect geography and to the study of social and regional variation from a sociolinguistic perspective.

3-5 units, not given this year

EDUC 240. Adolescent Development and Learning—How do adolescents develop their identities, manage their inner and outer worlds, and learn? Presuppositions: that fruitful instruction takes into account the developmental characteristics of learners and the task demands of specific curricula; and that teachers can promote learning and motivation by mediating among the characteristics of students, the curriculum, and the wider social context of the classroom. Prerequisite: STEP student or consent of instructor. (STEP)

3 units, Aut (Borko, H; Darling-Hammond, L; Nasir, N)

EDUC 242. Language Use in the Chicano Community—(Same as APPLING 206, SPANLIT 206.) Significance and consequences of language diversity in U.S. culture and society. Experiences of non-English background individuals through focus on Spanish-English bilingual communities.

3-5 units, Spr (Valdés, G)

EDUC 243. Writing Across Languages and Cultures: Research in Writing and Writing Instruction—Theoretical perspectives that have dominated the literature on writing research. Reports, articles, and chapters on writing research, theory, and instruction; current and historical perspectives in writing research and research findings relating to teaching and learning in this area.

3-4 units, not given this year

EDUC 244. Classroom Management—Student and teacher roles in developing a classroom community. Strategies for classroom management within a theoretical framework.

1 unit, Aut (Lawrence, P)

EDUC 244E. Elementary Classroom Culture and Management—How to best manage a classroom. Student and teacher roles in developing a classroom community. Strategies for classroom management within a theoretical framework.

1 unit, Sum (Costanzo, R)

EDUC 244F. Elementary Classroom Culture and Management—Skills for developing a positive classroom learning environment. Theoretical issues and opportunities to acquire strategies and make links with practice teaching class.

1 unit, Aut (Costanzo, R)

EDUC 245. Understanding Racial and Ethnic Identity Development—African American, Native American, Mexican American, and Asian American racial and ethnic identity development; the influence of social, political and psychological forces in shaping the experience of people of color in the U.S. The importance of race in relation to social identity variables including gender, class, and occupational, generational, and regional identifications. Bi- and multiracial identity status, and types of white racial consciousness.

3-5 units, Aut (LaFromboise, T)

EDUC 246A,B,C,D. Secondary Teaching Seminar—Preparation and practice in issues and strategies for teaching in classrooms with diverse students. Topics: instruction, curricular planning, classroom interaction processes, portfolio development, teacher professionalism, patterns of school organization, teaching contexts, and government educational policy. Classroom observation and student teaching with accompanying seminars during each quarter of STEP year. 16 units required for completion of the program. Prerequisite: STEP student.

A: *2 units, Sum (Lotan, R)*
B: *1-3 units, Aut (Lotan, R)*
C: *7-9 units, Win (Lotan, R)*
D: *2-7 units, Spr (Lotan, R)*

EDUC 246E,F,G,H. Elementary Teaching Seminar—Integrating theory and practice in teacher development. Topics include: equity, democracy, and social justice in the context of teaching and learning; teacher reflection, inquiry, and research; parent/teacher relationships; youth development and community engagement; professional growth and development; teacher leadership and school change processes; preparation for the job search, the STEP Elementary Portfolio, and the STEP Elementary Conference. Prerequisite: STEP student.

E: *2 units, Sum (Lit, I)*
F: *2-3 units, Aut (Lit, I)*
G: *7 units, Win (Lit, I)*
H: *5 units, Spr (Lit, I)*

EDUC 247. Moral Education—Contemporary scholarship and educational practice related to the development of moral beliefs and conduct in young people. The psychology of moral development; major philosophical, sociological, and anthropological approaches. Topics include: natural capacities for moral awareness in the infant; peer and adult influences on moral growth during childhood and adolescence; extraordinary commitment during adulthood; cultural variation in moral judgment; feminist perspectives on morality; the education movement in today's schools; and contending theories concerning the goals of moral education. (PSE)

3 units, Win (Damon, W)

EDUC 248X. Issues of Curriculum and Pedagogy in Multicultural Classrooms—Debates concerning race, class, gender and sexuality, and ethnicity as they impact curriculum and practice in heterogeneous classrooms. How teachers and students can become agents of educational change. Sources include videos, scholarship, popular press, and voices of practitioners, students, and families.

3-4 units, not given this year

EDUC 249. Theory and Issues in the Study of Bilingualism—(Undergraduates register for 149; see 149; same as SPANLIT 207.) (SSPEP)

3-5 units, Aut (Valdés, G)

EDUC 250A. Inquiry and Measurement in Education—Part of doctoral research core. The logic of scientific inquiry in education, including identification of research questions, selection of qualitative or quantitative research methods, design of research studies, measurement, and collection, analysis and interpertation of evidence.

3 units, Aut (Antonio, A; Haertel, E)

EDUC 250B. Statistical Analysis in Education: Regression—Primarily for doctoral students; part of doctoral research core; prerequisite for advanced statistical methods courses in School of Education. Basic regression, a widely used data-analytic procedure, including multiple and curvilinear regression, regression diagnostics, analysis of residuals and model selection, logistic regression. Proficiency with statistical computer packages.

4 units, Win (Reardon, S)

EDUC 250C. Qualitative Analysis in Education—Primarily for doctoral students; part of doctoral research core. Methods for collecting and interpreting qualitative data including case study, ethnograpy, discourse analysis, observation, and interview.

3 units, Spr (Barron, B; Goldman, S)

EDUC 251B. Statistical Analysis in Educational Research: Analysis of Variance—Primarily for doctoral students. ANOVA models as widely used data analytic procedures, especially in experimental, quasi-experimental, and criterion-group designs. Topics: single-factor ANOVA; factorial between and within subjects and mixed design ANOVA (fixed, random, and mixed models); analysis of covariance; and multiple comparison procedures. Prerequisite: 250A or equivalent. (all areas)

4 units, not given this year

EDUC 251C. Statistical Analysis in Educational Research: Applied Multivariate Analysis—Primarily for doctoral students in education, social, and behavioral sciences. Multivariate analysis of variance, discriminant analysis, factor analysis, correlation analysis. Advanced regression methods. Data compression: principal components analysis, clustering. Computer packages for data analysis. Prerequisite: 250B, 257, STATS 200, or equivalent. (all areas)

1-4 units, not given this year

EDUC 252. Introduction to Test Theory—Concepts of reliability and validity; derivation and use of test scales and norms; mathematical models and procedures for test validation, scoring, and interpretation. Prerequisite: STATS 190 or equivalent. (PSE)

3-4 units, Spr (Haertel, E)

EDUC 253X. Teaching the Unteachable: Teaching and Representing the Holocaust—(Same as HISTORY 237B.) Theodore Adorno asked whether it was possible to write poetry after Auschwitz; whatever the answer, each year witnesses exponential growth in state-sponsored mandates to teach the Holocaust. How and to what end does catastrophe become curriculum? How to assess what students learn from these efforts. The Nazis' efforts to teach for hate, and contemporary parallels. Historical and educational sources, especially films and memoirs.

3-5 units, Win (Wineburg, S)

EDUC 256. Psychological and Educational Resilience Among Children and Youth—Emphasis is on family, school, and community assets as they relate to protective factors that create conditions of resilience. How protective factors can be used to create healthy communities that enhance the life qualities of at-risk children and youth.

3-4 units, Spr (Padilla, A)

EDUC 257A. Statistical Methods for Behavioral and Social Sciences—Analysis of data from experimental studies through factorial designs, randomized blocks, repeated measures; regression methods through multiple regression, model building, analysis of covariance; categorical data analysis through log-linear models, logistic regression. Integrated with the use of statistical computing packages. Prerequisite: analysis of variance and regression at the level of STATS 161.

3 units, not given this year

EDUC 257B. Statistical Methods for Behavioral and Social Sciences—For students with experience in empirical research. Analysis of data from experimental studies through factorial designs, randomized blocks, repeated measures; regression methods through multiple regression, model building, analysis of covariance; categorical data analysis through log-linear models, logistic regression. Integrated with the use of statistical computing packages. Prerequisite: analysis of variance and regression at the level of STATS 161.

3 units, not given this year

EDUC 257C. Causal Inference in Quantitative Educational and Social Science Research—(Same as SOC 257.) Quantitative methods to make causal inferences in the absence of randomized experiment including the use of natural and quasi-experiments, instrumental variables, regression discontinuity, matching estimators, longitudinal methods, fixed effects estimators, and selection modeling. Assumptions implicit in these approaches, and appropriateness in research situations. Students develop research proposals relying on these methods. Prerequisites: exposure to quantitative research methods; multivariate regression.

3-5 units, Spr (Reardon, S)

EDUC 258. Literacy Development and Instruction—Literacy acquisition as a developmental and educational process. Problems that may be encountered as children learn to read. How to disentangle home, community, and school instruction from development.

3 units, Win (Juel, C)

EDUC 259X. Application of Hierarchical Linear Models in Behavioral and Social Research—(Same as OB 682.) Persistent methodological problems in the social sciences: the measurement of change and the assessment of multi-level effects or the unit of analysis problem. Their common cause: the inadequacy of traditional statistical techniques for the modeling of hierarchy.

4 units, Aut (Bryk, A)

EDUC 260X. Understanding Statistical Models and their Social Science Applications—(Same as HRP 239, STATS 209.) Information that statistical modeling can provide in experimental and non-experimental settings emphasizing misconceptions in social science applications such as causal modeling. Text is *Statistical Models: Theory and Practice*, by David Freedman. See http://www-stat.stanford.edu/~rag/stat209. Prerequisite: intermediate-level statistical methods including multiple regression, logistic regression, and log-linear models.

3 units, Win (Rogosa, D)

EDUC 262A,B,C. Curriculum and Instruction in English—Approaches to teaching English in the secondary school, including goals for instruction, teaching techniques, and methods of evaluation. (STEP)

A: *2 units, Sum (Williamson, P)*
B: *3 units, Aut (Grossman, P)*
C: *3 units, Win (Williamson, P)*

EDUC 263A,B,C. Curriculum and Instruction in Mathematics—The purposes and programs of mathematics in the secondary curriculum; teaching materials, methods. Prerequisite: STEP student or consent of instructor. (STEP)

A: *2 units, Sum (Woodbury, E)*
B: *3 units, Aut (Staff)*
C: *3 units, Win (Staff)*

EDUC 263E,F,G. Quantitative Reasoning in Mathematics—Three-course sequence in mathematics for STEP elementary teacher candidates. Content, pedagogy, and context. Mathematics subject matter; the orchestration of teaching and learning of elementary mathematics including curriculum, classroom and lesson design, and cases studies. Sociocultural and linguistic diversity, equity, differentiation of instruction, the impact of state and national standards, and home/community connections.

E: *2 units, Sum (Murata, A)*
F: *3 units, Aut (Murata, A)*
G: *4 units, Win (Murata, A)*

EDUC 264A,B,C. Curriculum and Instruction in World Languages—Approaches to teaching foreign languages in the secondary school, including goals for instruction, teaching techniques, and methods of evaluation. Prerequisite: STEP student. (STEP)

A: *2 units, Sum (Staff)*
B: *3 units, Aut (Staff)*
C: *3 units, Win (Staff)*

EDUC 264E. Methods and Materials in Bilingual Classrooms—Restricted to STEP elementary teacher candidates in the BCLAD program. Theories, research, and methods related to instruction of Spanish-English bilingual children, grades K-8. Approaches to dual language instruction, and pedagogical and curricular strategies for the instruction of reading, language arts, science, history, social science, and math in Spanish. Assessment issues and practices with bilingual students. In Spanish.

1-3 units, Aut (Staff)

EDUC 265. History of Higher Education in the U.S.—(Undergraduates register for 165; same as HISTORY 158C.) Major periods of evolution, particularly since the mid-19th century. Premise: insights into contempo-

rary higher education can be obtained through its antecedents, particularly regarding issues of governance, mission, access, curriculum, and the changing organization of colleges and universities. (SSPEP-APA)
3-4 units, Aut (Staff)

EDUC 266X. Workshop in Practical Quantitative Research on Educational Policy and Inequality—Conceptual and technical skills for analyzing data concerning educational policy and inequality. How to design analytic strategies using available data sources. Interpreting and presenting results. Prerequisite: 250A.
3 units, not given this year

EDUC 267A,B,C. Curriculum and Instruction in Science—Possible objectives of secondary science teaching and related methods: selection and organization of content and instructional materials; lab and demonstration techniques; evaluation, tests; curricular changes; ties with other subject areas. Prerequisite: STEP student or consent of instructor. (STEP)
A: *2 units, Sum (Brown, B; Lythcott, J)*
B: *3 units, Aut (Brown, B)*
C: *3 units, Win (Lythcott, J)*

EDUC 267E. Development of Scientific Reasoning and Knowledge—For STEP elementary teacher candidates. Theories and methods of teaching and learning science. How to develop curricula and criteria for critiquing curricula. Students design a science curriculum plan for a real setting. State and national science frameworks and content standards. Alternative teaching approaches; how to select approaches that are compatible with learner experience and lesson objectives. Focus is on the linguistic and cultural diversity of California public school students.
3 units, Spr (Lythcott, J)

EDUC 268A,B,C. Curriculum and Instruction in History and Social Science—The methodology of history instruction: teaching for historical thinking and reasoning; linking the goals of teaching history with literacy; curriculum trends; and opportunities to develop teaching and resource units. Prerequisite: STEP student.
A: *2 units, Sum (Wineburg, S)*
B: *3 units, Aut (Wineburg, S)*
C: *3 units, Win (Staff)*

EDUC 268E. Elementary History and Social Science—Teaching and learning history and social science in the elementary grades. What is included in the discipline and why it is important to teach. The development of historical thinking among children. How students learn and understand content in these disciplines.
3-4 units, not given this year

EDUC 269. Analysis of Teaching—Student learning and the epistemology of school subjects as related to the planning and implementation of teaching, analysis of curriculum, and evaluation of performance and understanding. Readings and activities are coordinated with student teaching activities of participants. Prerequisite: STEP student or consent of instructor.
3 units, not given this year

EDUC 270A. Learning to Lead in Public Service Organizations—For Haas Center student service organization leaders.
3-5 units, Spr (Staff)

EDUC 271S. School-Based Strategies for Reform and Redesign—Seminar. Major redesign and reform strategies that schools are using to improve their performance. Preparation of a report for local school leaders analyzing school improvement resources and strategies.
3-5 units, not given this year

EDUC 273. Gender and Higher Education—Focus is on the U.S. The effects of interactions between gender and the structures of higher education; policies seeking changes in those structures. Topics: undergraduate and graduate education, faculty field of specialization, rewards and career patterns, sexual harassment, and the development of feminist scholarship and pedagogy.
4 units, not given this year

EDUC 276. Educational Assessment—Reliability, validity, bias, fairness, and properties of test scores. Uses of tests to monitor, manage, and reform instruction. Testing and competition, meritocracy, achievement gaps, and explanations for group differences.
3 units, Win (Haertel, E)

EDUC 277. Education of Immigrant Students: Psychological Perspectives—(Undergraduates register for 177; see 177.) (SSPEP)
4 units, Win (Padilla, A)

EDUC 278. Introduction to Issues in Evaluation—Open to master's and doctoral students with priority to students from education. Focus is on the basic literature and major theoretical and practical issues in evaluation. Introduction to basic concepts and intellectual debates in the field: knowledge construction, purpose of evaluation, values in evaluation, knowledge utilization, professional standards of evaluation practice. Enrollment limited to 18. (SSPEP)
3 units, Spr (Porteus, A)

EDUC 279. Urban Youth and Their Institutions: Research and Practice—(Undergraduates register for 179; see 179.) (SSPEP/APA)
4-5 units, Aut (McLaughlin, M)

EDUC 279B. Youth Empowerment and Civic Engagement—(Undergraduates register for 179B; see 179B.)
2-4 units, not given this year

EDUC 284. Teaching and Learning in Heterogeneous Classrooms—Teaching in academically and linguistically heterogeneous classrooms requires a repertoire of pedagogical strategies. Focus is on how to provide access to intellectually challenging curriculum and equal-status interaction for students in diverse classrooms. Emphasis is on group work and its cognitive, social, and linguistic benefits for students. How to prepare for group work, equalize participation, and design learning tasks that support conceptual understanding, mastery of content and language growth. How to assess group products and individual contributions. (STEP)
3 units, Win (Lotan, R)

EDUC 285X. Supporting Students with Special Needs—For STEP teacher candidates. Needs of exceptional learners, identification of learning differences and disabilities, and adaptations in the regular inclusion classroom. Legal requirements of special education, testing procedures, development of individualized education plans, and support systems and services. Students follow a special needs learner to understand diagnosis, student needs, and types of services.
1-3 units, Spr (Fur, E)

EDUC 288. Organizational Behavior and Analysis—(Same as SOC 366.) Principles of organizational behavior and analysis; theories of group and individual behavior; organizational culture; and applications to school organization and design. Case studies.
4 units, Aut (Drori, G)

EDUC 290. Leadership: Research, Policy, and Practice—Conceptions of leadership that include the classroom, school, district office, and state capitol. The role of complexity; organizational leaders outside of schools past and present, and how that complexity permitted leadership to arise. Case studies. (SSPEP/APA)
4 units, Aut (Staff)

EDUC 291. Learning Sciences and Technology Design Research Seminar and Colloquium—Students and faculty present and critique new and original research relevant to the Learning Sciences and Technology Design doctoral program. Goal is to develop a community of scholars who become familiar with each other's work. Practice of the arts of presentation and scholarly dialogue while introducing seminal issues and fundamental works in the field.
1-3 units, Aut (Staff), Win (Schwartz, D), Spr (Goldman, S)

EDUC 291X. Introduction to Survey Research—(Undergraduates register for 191X; see 191X.)
3-4 units, Aut (Adams, J)

EDUC 293X. American Philosophy of Education—A century of classical writers in American philosophy, focusing on work on education, democracy, learning, and culture. Texts by Emerson, Peirce, James, Dewey, and Mead.

3-4 units, not given this year

EDUC 294X. Theories of Human Development—Concepts and theoretical viewpoints of developmental science. Goal is to evaluate multidisciplinary applications of empirical developmental research including its impact on educational reform, interventions, and social policy issues.

3 units, not given this year

EDUC 295. Learning and Cognition in Activity—(Same as PSYCH 261A.) Methods and results of research on learning, understanding, reasoning, problem solving, and remembering, as aspects of participation in social organized activity. Principles of coordination that support cognitive achievements and learning in activity settings in work and school environments.

3 units, not given this year

EDUC 298. Online Communities of Learning—Historical foundations, theoretical perspectives, underlying learning theories, case studies, and enabling technologies of online learning communities across and within K-12 schools, among teachers, in professional collaborations in the sciences, and across informal communities of interest in society.

3 units, not given this year

EDUC 300. Issues and Methods in the Teaching of Heritage Languages—(Same as APPLLING 203, SPANLIT 300.) Teaching Spanish to students raised in Spanish-speaking homes. Issues include language variation in the Spanish-speaking world, English/Spanish bilingualism in the U.S., and second dialect acquisition. Techniques for developing the academic Spanish language skills of heritage students.

3-5 units, not given this year

EDUC 301B. Theoretical Debates in the History of Education—(Same as HISTORY 366.) How and to what purpose should students be educated in America? What is an appropriate curriculum? Do all students deserve or need the same curriculum?

3-4 units, not given this year

EDUC 303X. Designing Learning Spaces—Project-based. How space shapes personal interactions and affords learning opportunities in formal and informal settings. How to integrate learning principles into the design of spaces and develop a rubric to assess the impact on learning.

3-4 units, Spr (Emery, D; Gilbert, D)

EDUC 304. The Philosophical and Educational Thought of John Dewey—(Same as PHIL 242.) Dewey's pragmatic philosophy and educational thought; his debt to Darwin, Hegel, Peirce, and James; his educational writings including *Democracy and Education*; and his call for a revolution in philosophy in *Reconstruction in Philosophy.* (SSPEP)

4 units, not given this year

EDUC 305X. Progressive Education, the Free Child, and the Critics—Radically different models of child rearing and their implications for educational practice. Topics include: Rousseau's *Emile*, Puritan education, Summerhill School and the philosophy of open education, contemporary orthodox and evangelical schools, and democratic schools. Mock debates. How these models inform educational alternatives locally; classroom observation.

4 units, not given this year

EDUC 306A. Education and Economic Development—Case material considers development problems in the U.S. and abroad. Discussion sections on economic aspects of educational development. (SSPEP/ICE)

5 units, Aut (Carnoy, M)

EDUC 306B. Politics, Policy Making, and Schooling Around the World—Education policy, politics, and development. Topics include: politics, interests, institutions, policy, and civil society; how schools and school systems operate as political systems; how policy making occurs in educational systems; and theories of development.

3-4 units, Spr (Adams, J)

EDUC 306C. Political Economy of the Mind—Theories of political economy related to theories of the learning mind, emphasizing theories of genius. Readings from Pascal, Defoe, Smith, Balzac, Emerson, Marx, Veblen, Joyce, and Morrison. (SSPEP)

3-4 units, not given this year

EDUC 306D. World, Societal, and Educational Change: Comparative Perspectives—(Undergraduates register for 136; see 136; same as SOC 231.)

4-5 units, Win (Drori, G)

EDUC 306Y. Economic Support Seminar for Education and Economic Development—Core economic concepts that address issues in education in developing and developed countries. Supply and demand, elasticity, discount rates, rate of return analysis, utility functions, and production functions. Corequisite: 306A.

1 unit, Aut (Carnoy, M)

EDUC 307B. The Politics of International Cooperation in Education—(Undergraduates and master's students register for 107; see 107.) (SSPEP/ICE, APA)

3-4 units, not given this year

EDUC 307X. Organizing for Diversity: Opportunities and Obstacles in Groups and Organizations—Obstacles in organizations and groups that prevent people from participating, working effectively, and developing relationships in the context of diversity. How to create conditions in which diversity enhances learning and effectiveness? Experiential exercises; students experiment with conceptual and analytic skills inside and outside of the classroom.

3-4 units, not given this year

EDUC 309X. Educational Issues in Contemporary China—Reforms such as the decentralization of school finance, emergence of private schools, expansion of higher education, and reframing of educational policy to focus on issues of quality. Have these reforms exacerbated educational inequality?

3-4 units, Spr (Adams, J)

EDUC 310. Sociology of Education: The Social Organization of Schools—(Undergraduates register for 110; see 110; same as SOC 132/332.) (SSPEP)

4 units, not given this year

EDUC 314. Workshop in Economics of Education—Research by students and faculty engaged in problems in the economics of education. Prerequisites: advanced graduate training in economics theory and methodology; current ongoing research. May be repeated for credit. (SSPEP)

1-2 units, not given this year

EDUC 315X. Issues in Science Education for Science Graduate Students—Recurring themes in debates about science education: why should science be taught in schools; what science should be taught and how and to whom; do schools present an accurate picture of science, and should they; how much do science teachers need to know; how do they know what students are learning; what is the role of scientists?

1-3 units, not given this year

EDUC 316. Network Analysis—(Same as SOC 369.) The educational applications of social network analysis. Introduction to social network theory, methods, and research applications in sociology. Network concepts of interactionist (balance, cohesion, centrality) and structuralist (structural equivalence, roles, duality) traditions are defined and applied to topics in small groups, social movements, organizations, communities. Applications to data on schools and classrooms. (SSPEP)

4-5 units, Aut (McFarland, D)

EDUC 317. Workshop: Social Psychology and Social Structure—(Same as SOC 321.) Current theories and research agendas, recent publications, and presentations of ongoing research by faculty and students. May be repeated for credit. Prerequisite: consent of instructor.

1-5 units, Aut, Win, Spr (Cook, K; McFarland, D; Ridgeway, C)

EDUC 321A. Emerging Conceptions of Qualitative and Ethnographic Research—Issues of knowing via forms through which human beings have historically represented the world and how they care about it, including narrative, visual images, and poetry. How to see and represent the educational worlds. Sources include videotaped classrooms in action, film excerpts that reveal human relations, and literary forms that describe classroom situations. Materials and procedures used by researchers, film makers, and fiction writers.

4-5 units, not given this year

EDUC 321X. Leading Social Change: Educational and Social Entrepreneurship—(Same as OB 385.) Mechanisms of change and theories of action. Case studies; guest lecturers.

4 units, not given this year

EDUC 322. Discourse of Liberation and Equity in Schools and Society—Issues and strategies for studying oral and written discourse as a means for understanding classrooms, students, and teachers, and teaching and learning in educational contexts. The forms and functions of oral and written language in the classroom, emphasizing teacher-student and peer interaction, and student-produced texts. Individual projects utilize discourse analytic techniques. Prerequisite: graduate status or consent of instructor. (SSPEP)

3-5 units, Win (Ball, A)

EDUC 323A. Introduction to Education Policy Analysis—The formulation and improvement of federal and state education and children policies. Key current policy issues and trends in politics. Topics: the federal role in education and child care. (SSPEP)

3 units, Spr (Staff)

EDUC 324. Business Opportunities in Education—(Same as GSBGEN 545.) For students in the joint degree program in Business and Education; open to others. Changing market mechanisms and emerging technologies creating opportunities in for-profit education and training organizations. Interaction of firms with public sectors. Roles of public administrators, educators, investors, and technology providers in defining opportunities, challenges, and constraints for education and training firms. Approaches to strategy formation, product development, and operations. Guest experts. (SSPEP/APA)

2 units, Win (Staff)

EDUC 325A,B, C. Proseminar 1,2,3—Required of and limited to first-year Education doctoral students. Core questions in education: what is taught, to whom, and why? How do people learn?

325A: *3 units, Aut (McFarland, D; Willinsky, J)*
325B: *3units, Win (Borko, H; Pea, R)*
325C: *3 units, Spr (Labaree, D; Ramirez, F)*

EDUC 326. Law, Litigation, and Educational Policy—(Same as LAW 364.) Restricted to Education graduate students and Law students. Interplay among educational law and policy, administrative decision making, and practice. Issues include the relationship between schooling and the state, nature and scope of students' substantive and procedural rights inside the schoolhouse, and how law and litigation have advanced or stymied the goal of equality of educational opportunity.

4 units, Aut (Koski, W)

EDUC 327A. The Conduct of Qualitative Inquiry—Two quarter sequence for doctoral students to engage in research that anticipates, is a pilot study for, or feeds into their dissertations. Prior approval for dissertation study not required. Students engage in common research processes including: developing interview questions; interviewing; coding, analyzing, and interpreting data; theorizing; and writing up results. Participant observation as needed. Preference to students who intend to enroll in 327C.

3-4 units, Aut (Carter, P)

EDUC 327C. The Conduct of Qualitative Inquiry—For doctoral students. Students bring research data for analysis and writing. Preference to those who have completed 327A.

1-4 units, Win (Carter, P)

EDUC 328X. Topics in Learning and Technology: Interactivity and Feedback—Content changes each year. Interactivity including manipulation of an object, talking to another person, or clicking on a mouse. Proposals for the active learning ingredient of interactivity, and how different technologies capitalize on these ingredients.

3 units, Win (Schwartz, D)

EDUC 329X. Seminar on Teacher Professional Development—For master's and doctoral students. Theories, principles, and models of professional development. Issues include: different conceptions of teacher, practice, and development; what gets developed in professional development; pedagogies of professional development; structures to support teacher learning; evaluating professional development; and policy issues. Field observation.

1-4 units, Spr (Borko, H)

EDUC 330X. Economic Approaches to Education Policy Analysis—(Same as GSBGEN 347.) Policy issues in education using the tools of microeconomics. How schools are funded; implications for efficiency, equity, and adequacy of resources. The impact of school resources on educational and economic well-being. Teacher labor markets. How teachers impact student achievement. How systems of school choice affect schools and students. How accountability has changed schooling. The effects of changes in affirmative action and financial aid in higher education. Prerequisites: intermediate microeconomics and regression analysis.

4 units, not given this year

EDUC 331A. Introduction to Research Design in Administration and Policy Analysis—Required for first-year APA doctoral students; SSPEP first-year doctoral students with consent of instructor. How to conduct literature reviews. How to use literature to frame and formulate problem statements, research questions, and conceptual frameworks. (APA)

3-5 units, not given this year

EDUC 333A. Understanding Learning Environments—Advanced seminar. Theoretical approaches to learning used to analyze learning environments and develop goals for designing resources and activities to support effective learning practices.

3 units, Aut (McDermott, R; Pea, R)

EDUC 336X. Language, Identity, and Classroom Learning—As contemporary research focuses on how people act and recognize each other, analyzing interaction while acknowledging identity allows for a dynamic examination of cultural interaction. Broad cultural categorization can be overly expansive in identifying the characteristics of large groups of individuals.

1-3 units, Aut (Brown, B)

EDUC 337. Race, Ethnicity, and Linguistic Diversity in Classrooms: Sociocultural Theory and Practices—(Undergraduates register for 103B; see 103B.)

3-5 units, Win (Ball, A)

EDUC 339X. Advanced Topics in Quantitative Policy Analysis—For doctoral students. How to develop a researchable question and research design, identify data sources, construct conceptual frameworks, and interpret empirical results. Presentation by student participants and scholars in the field. May be repeated for credit.

1-2 units, Aut, Win, Spr (Reardon, S)

EDUC 340. Psychology and American Indian Mental Health—Western medicine's definition of health as the absence of sickness, disease, or pathology; Native American cultures' definition of health as the beauty of physical, spiritual, emotional, and social things, and sickness as something out of balance. Topics include: historical trauma; spirituality and healing; cultural identity; values and acculturation; and individual, school, and community-based interventions. Prerequisite: experience working with American Indian communities.

3-5 units, not given this year

EDUC 341X. Urban School District Reform—(Same as OB 314.) Strategies for large-scale reform of complex school systems. Case studies of urban school systems. Sources include approaches developed in management studies, organizational behavior, and school reform. Political and community contexts; the role of urban superintendents and administrators in creating reform strategies. Factors such as labor relations and the regulatory environment. Guest speakers.

4 units, Win (Bryk, A)

EDUC 342. Child Development and New Technologies—Focus is on the experiences computing technologies afford children and how these experiences might influence development. Sociocultural theories of development as a conceptual framework for understanding how computing technologies interact with the social ecology of the child and how children actively use technology to meet their own goals. Emphasis is on influences of interactive technology on cognitive development, identity, and social development equity.

1-3 units, not given this year

EDUC 345X. Adolescent Development and Schooling—How the context of school and its relationship to other major context developments (family, peer group, and neighborhood) influence the social, emotional, and cognitive development of secondary school-aged youths. Metatheoretical approaches (mechanistic, organismic, developmental contextualist metamodels) and methods of conducting research on schooling and development (laboratory, survey, ethnographic, intervention). Topics: school transitions during adolescence; the role of school functioning in broader patterns of competence or distress; and how the organization of academic tasks, classrooms, and school environments as a whole can influence adolescent development. Focus is on middle and high school years. (PSE)

3 units, Aut (Padilla, A)

EDUC 346. Research Seminar in Higher Education—Required for higher education students. Major issues, current structural features of the system, the historical context that shaped it, and theoretical frameworks. The purposes of higher education in light of interest groups including students, faculty, administrators, and external constituents. Issues such as diversity, stratification, decentralization, and changes that cut across these groups. (APA)

4 units, Aut (Antonio, A)

EDUC 347. The Economics of Higher Education—(Same as GSBGEN 348.) Topics: the worth of college and graduate degrees, and the utilization of highly educated graduates; faculty labor markets, careers, and workload; costs and pricing; discounting, merit aid, and access to higher education; sponsored research; academic medical centers; and technology and productivity. Emphasis is on theoretical frameworks, policy matters, and the concept of higher education as a public good. Stratification by gender, race, and social class.

4 units, Spr (Staff)

EDUC 349X. Accountability and Assessment in Higher Education—Organizational report cards and accountability mechanisms: demand for and problems with them. Report cards as policy instruments; how they address information asymmetries; as alternatives to direct regulation; and current policy conditions that support them such as education standards and reform. Politics including interested audiences and organizational responses. An attempt to redesign an education report card.

3 units, not given this year

EDUC 350A,B,C. Psychological Studies in Education—Required of first-year doctoral students in Psychological Studies; others by consent of instructor. Introduction to the doctoral program in Psychological Studies in Education and to faculty and student research. (PSE)

A: *2 units, Aut (Nasir, N)*
B: *2-3 units, Win (Rogosa, D)*
C: *1-2 units, Spr (Rogosa, D)*

EDUC 351A. Design and Analysis of Longitudinal Research—The analysis of longitudinal data as central to empirical research on learning and development. Topics: growth models, measurement of change, reciprocal effects, stability, analysis of durations including survival analysis, and experimental and non-experimental group comparisons. See http://www.stanford.edu/~rag/. Prerequisite: statistics at the level of 257. (PSE)

3 units, not given this year

EDUC 351C. Workshop in Technical Quality of Educational Assessments and Accountability—Topics include: determinations of accuracy for individual scores and group summaries; design and reporting of educational assessments; achievement instruments in state-level accountability systems; and policy implications of statistical properties. See http://www.stanford.edu/~rag/.

3 units, not given this year

EDUC 353A. Problems in Measurement: Item Response Theory—Alternative mathematical models used in test construction, analysis, and equating. Emphasis is on applications of item response theory (latent trait theory) to measurement problems, including estimation of item parameters and person abilities, test construction and scoring, tailored testing, mastery testing, vertical and horizontal test equating, and detection of item bias. Prerequisites: 252 and 257, or PSYCH 248 and 252, or equivalent. (PSE)

3 units, alternate years, not given this year

EDUC 353C. Problems in Measurement: Generalizability Theory—Application to analysis of educational achievement data, including performance assessments. Fundamental concepts, computer programs, and actual applications. (PSE)

3 units, not given this year

EDUC 354X. School-Based Decision Making—Leadership and organizational issues. Emphasis is on building capacity for individual schools to make decisions, establishment of an inquiry process at the school level, use and availability of information, implementation and evaluation of decisions, parental involvement, and support of school-based decisions by districts. (SSPEP/APA)

4 units, Spr (Staff)

EDUC 358X. Developments in Access to Knowledge and Scholarly Communication—Scholarly and educational implications of new academic communication systems. New dissemination methods in light of longstanding issues of epistemology, intellectual property, propriety, access, value, and responsibility within the scholarly community. Contexts include publishing, archiving, indexing, and networking.

3-4 units, Win (Willinsky, J)

EDUC 359A. Research in Science and Mathematics Education: Assessment and Evaluation—Historical and international perspectives. Emphasis is on trends and issues in contemporary American research and policy. Opportunity to develop and discuss dissertation plans. (CTE)

2-4 units, Aut (Shavelson, R)

EDUC 359B. Research in Science and Mathematics Education—For doctoral students interested in science education and literacy in school subjects.

2-3 units, not given this year

EDUC 359C. Research in Science Education: Research in Science Teaching—The changing debate over conceptions of the nature of science and the calls to broaden it. Themes, directions, limitations, and epistemological foundations of the body of research on the nature of science.

2-3 units, Win (Brown, B)

EDUC 359E. Research on Mathematics Education—Comparative and cultural perspectives on mathematics teaching and learning practices in the U.S. Math education in the context of cultural and educational systems.

2-4 units, not given this year

EDUC 360. Action Research in Education—Introduction to the theory and practice of action research. Basic concepts and methods. The historical and ideological influences on this form of inquiry by teachers. Participants analyze action research reports and engage in a small-scale action-research project. (CTE)

3 units, not given this year

EDUC 363X. Research and Practice on Organizing Urban Schools for Improvement—(Same as OB 367.) For masters' and doctoral students in Education and GSB. Empirical research on urban school reform efforts, theoretical frameworks on student and adult learning, the sociology of work in schools, and social organization theory. How community context affects instructional coherence. Dynamics between school professionals and with parents. Authentic instruction and its effects. Case studies on reform implementation.

4 units, not given this year

EDUC 364. Cognition and Learning—Cognitive psychology is the study of human thought including topics such as the nature of expertise, creativity, and memory. Emphasis is on learning. The role of cognitive psychology in helping people learn, and determining the most desirable type of learning and whether people have learned. Students design and conduct their own learning study.

3-4 units, not given this year

EDUC 365. Social, Emotional, and Personality Development—Limited to doctoral students in PSE and those with a background in child and adolescent development. Developmental processes that account for psychological adaptation in social relationships, schools, and other interpersonal settings. Theoretical models of social, personality, and emotional development. Topics such as self-concept, empathy, motivation, aggression, and personality formation.

3 units, Spr (Damon, W)

EDUC 366. Learning in Formal and Informal Environments—How learning opportunities are organized in schools and non-school settings including museums, after-school clubs, community art centers, theater groups, aquariums, sports teams, and new media contexts. Sociocultural theories of development as a conceptual framework. Readings from empirical journals, web publications, and books.Collaborative written or multimedia research project in which students observe and document a non-school learning environment.

3 units, Win (Barron, B)

EDUC 367. Cultural Psychology—(Formerly 292.) The relationship between culture and psychological processes; how culture becomes an integral part of cognitive, social, and moral development. Both historical and contemporary treatments of cultural psychology, including deficit models, crosscultural psychology, ecological niches, culturally specific versus universal development, sociocultural frameworks, and minority child development. The role of race and power in research on cultural psychology.

3 units, Win (Nasir, N)

EDUC 368. Cognitive Development in Childhood and Adolescence—Traditional and current research in cognitive development: changes within the individual from infancy through adolescence. Theoretical and empirical perspectives on research processes that explain developmental changes affecting how a human being thinks about and experiences the world.

3-4 units, Spr (Hakuta, K)

EDUC 369. Human Cognitive Abilities—(Same as PSYCH 133.) Psychological theory and research on human cognitive abilities; their nature, development, and measurement; and their importance in society. Persistent controversies and new areas of research, recent perspectives on the nature-nurture debate and the roles of genetics, health and education in shaping HCAs. Prerequisite: PSYCH 1 or equivalent. (PSE)

3 units, not given this year

EDUC 370X. Theories of Cognitive Development—The contributions of Piaget and Vygotsky to the study of the developing mind of the child. Their theories, concepts, perspectives, empirical work, and lives. Topics: Piaget's genetic epistemology, constructivism, and idea of sensorimotor through formal operational stages; Vygotsky's cultural-historical approach, egocentric speech, and the relation between learning and development.

3 units, Spr (Nasir, N)

EDUC 374A,B,C. Research Workshop: Philanthropy and Civil Society—(Same as SOC 274A/374A.) Seminar. Open to Ph.D. students, coterms, and undergraduates writing honors theses. Activities and institutions that define civil society, emphasizing the interactions between funding sources and nonprofit organizations. May be repeated for credit.

A: *1-3 units, Aut (Powell, W)*
B: *2-3 units, Win (Powell, W)*
C: *2-3 units, Spr (Powell, W)*

EDUC 375A. Seminar on Organizational Theory—(Same as SOC 363A.) The social science literature on organizations assessed through consideration of the major theoretical traditions and lines of research predominant in the field.

5 units, Aut (Powell, W)

EDUC 375B. Seminar on Organizations: Institutional Analysis—(Same as SOC 363B.) Seminar. Key lines of inquiry on organizational change, emphasizing network, institutional, and evolutionary arguments.

3-5 units, Spr (Powell, W)

EDUC 376. State Theory and Educational Policy—The relationship between political system structures and educational change by analyzing theories and interpretations of how political systems function, and the implications of these theories for understanding education. Classical and Marxist interpretations. (SSPEP/ICE)

4 units, Win (Carnoy, M)

EDUC 377. Comparing Institutional Forms: Public, Private, and Nonprofit—(Same as GSBGEN 346, SOC 377.) Seminar. For students in the joint Business and Education program; others welcome. Missions, functions, and capabilities of nonprofit, public, and private organizations. Focus is on sectors with significant competition among institutional forms, including health care, social services, the arts, and education. Sources include scholarly articles, cases, and historical materials. Advanced undergraduates require consent of instructor.

4 units, Spr (Powell, W)

EDUC 377B. Strategic Management of Nonprofits—(Same as STRAMGT 368.) Strategic, governance, and management issues facing nonprofit organizations and their leaders in the era of venture philanthropy and social entrepreneurship. Development and fundraising, investment management, performance management, and nonprofit finance. Case studies include smaller, social entrepreneurial and larger, more traditional organizations, including education, social service, environment, health care, religion, NGOs, and performing arts.

4 units, Win (Meehan, W)

EDUC 377C. Strategic Issues in Philanthropy—(Same as GSBGEN 381.) Operational and strategic distinctions between traditional philanthropic entities, such as community, private, and corporate foundations, and contemporary models, such as funding intermediaries and venture philanthropy partnerships. Philanthropic strategies as they relate to foundation mission, grant making, evaluation, financial management, infrastructure, and board governance. Guest speakers.

4 units, Spr (Arillaga-Andreessen, L)

EDUC 377D. Strategic Leadership of Nonprofits—(Same as STRAMGT 378.) Formulating, evaluating, and implementing mission and strategy. Case studies from nonprofits in social services, health care, education, and arts and culture. The interaction of strategy and mission, industry structure and evolution, strategic change, growth and replication, corporate strategy, governance, commercialization, alliances, capacity building, and leadership.

4 units, not given this year

EDUC 378X. Seminar on Social Change Processes and Organizations—Theories of social change and influence processes within and through organizations. Social change organizations. The interaction of philanthropic institutions and other social change organizations within civil society. Meso-level theories of change.
3-4 units, Spr (Meyerson, D)

EDUC 379B. Children and Public Policy—(Same as LAW 356.)
3 units, not given this year

EDUC 380. Supervised Internship
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 381. Multicultural Issues in Higher Education—(Undergraduates register for 181.) The primary social, educational, and political issues that have surfaced in American higher education due to the rapid demographic changes occurring since the early 80s. Research efforts and the policy debates include multicultural communities, the campus racial climate, and student development; affirmative action in college admissions; multiculturalism and the curriculum; and multiculturalism and scholarship.
4 units, Win (Antonio, A)

EDUC 382. Student Development and the Study of College Impact—The philosophies, theories, and methods that undergird most research in higher education. How college affects students. Student development theories, models of college impact, and issues surrounding data collection, national databases, and secondary data analysis.
4 units, not given this year

EDUC 384. Advanced Topics in Higher Education—Topics vary each year and may include faculty development, legal issues, curricular change, knowledge production, professional socialization, management of organizational decline, leadership and innnovation, authority and power, diversity and equity, and interactions with government and industry. May be repeated for credit. Prerequisites: 346, consent of instructor. (APA)
3-5 units, Win (Staff)

EDUC 386X. Leadership and Administration in Higher Education—Definitions of leadership and leadership roles within colleges and universities. Leadership models and organizational concepts. Case study analysis of the problems and challenges facing today's higher education administrators.
4 units, Spr (Staff)

EDUC 387A,B,C. Workshop: Comparative Studies of Educational and Political Systems—(Same as SOC 311A,B,C.) Analysis of quantitative and longitudinal data on national educational systems and political structures. May be repeated for credit. Prerequisite: consent of instructor. (SSPEP/ICE)
A: *1-5 units, Aut (Ramirez, F; Meyer, J)*
B: *1-5 units, Win (Ramirez, F; Meyer, J)*
C: *1-5 units, Spr (Ramirez, F; Meyer, J)*

EDUC 388A. Language Policies and Practices—For credential candidates and STEP candidates seeking to meet requirements for the English Learner Authorization on their preliminary credential. Historical, political and legal foundations of education programs for English learners. Theories of second language learning, and research on the effectiveness of bilingual education. Theory-based methods to facilitate and measure English learners' growth in language and literacy acquisition, and create environments which promote English language development and content area learning through specially designed academic instruction in English. (STEP)
3-4 units, Win (Hakuta, K)

EDUC 391X. Web-Based Technologies in Teaching and Learning—Project-based. Overview of instructional design theories and educational technologies to evaluate and develop a web-based educational application or system. Web-based applications and technologies designed for online interactions and collaborations. Instructional systems strategies to develop online environments that support and facilitate interactive learning. Students create a small-scale, web-based learning system.
3 units, Aut (Kim, H)

EDUC 393. Proseminar on Research in Education—Overview of the field of education for joint degree (M.B.A./M.A.) students. (SSPEP)
4 units, Spr (Stipek, D)

EDUC 395X. Scholarly Writing in Education and the Social Sciences—Focus is on producing articles for scholarly journals in education and the social sciences. Ethics and craft of scholarly publishing. Writing opinion articles for lay audiences on issues of educational and social import.
3-5 units, not given this year

EDUC 401A. Mini Courses in Methodology: Statistical Packages for the Social Sciences—Statistical analysis using SPSS, including generating descriptive statistics, drawing graphs, calculating correlation coefficients, conducting t-tests, analysis of variance, and linear regression. Building up datasets, preparing datasets for analysis, conducting statistical analysis, and interpreting results.
1 unit, Aut, Win (Staff)

EDUC 401B. Mini Courses in Methodology: Stata—The computer as research tool. Statistical software Stata for data analysis, including t-tests, correlation, ANOVA, and multivariate linear regression.
1 unit, Win (Staff)

EDUC 402. Research Workshop on Gender Issues—Presentations of research on gender issues by doctoral students, faculty, and visitors. May be repeated for credit. Prerequisite: consent of instructor; doctoral student.
1 unit, not given this year

EDUC 408. Research Workshop in International and Comparative Education—Limited to advanced doctoral students in ICE and SSPEP. Research workshop for the review of key issues in the methodology and epistemology of social research in education, research proposals, and findings by students and faculty. Prerequisites: 306A,B,C,D or equivalents. (SSPEP/ICE)
2-5 units, Win (Ramirez, F)

EDUC 417X. Research and Policy on Postsecondary Access—(Undergraduates register for 117X.) The transition from high school to college. K-16 course focusing on high school preparation, college choice, remediation, pathways to college, and first-year adjustment. The role of educational policy in postsecondary access.
3 units, Spr (Antonio, A)

EDUC 418. Foundations of Case Study Research—Rationales for case study research in academic organizations emphasizing colleges and universities; high schools and related organizational contexts. Methodological training in fieldwork through hands-on data collection and analysis from interviews and documents. For doctoral students developing qualifying papers or dissertation proposals; required for higher education doctoral students; APA, SSE, and C&TE students with consent of instructor. (APA)
3-5 units, not given this year

EDUC 420C. Advanced Seminar in Philosophy of Education—Particular issues during designated quarters. Enrollment limited; sign up with instructor prior to beginning of quarter. (SSPEP)
1-3 units, Win (Callan, E)

EDUC 423A. Introduction to Research Design: Educational Administration and Policy Analysis—Preference to APA doctoral students working on their sixth-quarter qualifying paper. Issues in conceptualizing and designing research in the social sciences. (APA)
3-5 units, not given this year

EDUC 424. Introduction to Research in Curriculum and Teacher Education—Limited to second-year doctoral students in CTE. How to conceptualize, design, and interpret research. How to read, interpret, and critique research; formulate meaningful research questions; evaluate and conduct a literature review; and conceptualize a study. Readings include studies from different research paradigms. Required literature review in an area students expect to explore for their qualifying paper.
3-5 units, Aut (Darling-Hammond, L)

EDUC 453. Doctoral Dissertation—For doctoral students only. (all areas)
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 465. Seminar in the Pedagogy of Teacher Education—For doctoral students interested in working in teacher education. Pedagogical approaches, including the use of modeling and simulations and hypermedia materials. Theoretical considerations of how teachers learn to teach.
2-3 units, Win (Grossman, P)

EDUC 466. Doctoral Seminar in Curriculum—Required of doctoral students in CTE, normally during their second year in the program. Students present their ideas regarding a dissertation or other research project, and prepare a short research proposal that often satisfies their second-year review. (CTE)
2-4 units, Win (Grossman, P)

EDUC 470. Practicum—For advanced graduate students. (all areas)
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 480. Directed Reading—For advanced graduate students. (all areas)
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 490. Directed Research—For advanced graduate students. (all areas)
1-15 units, Aut, Win, Spr, Sum (Staff)

EDUC 493. Workshop in Design and Analysis of Non-Experimental Research—For second-year and later students with data analysis or research design activities including in dissertation planning or analysis. Readings and exercises developed around participating student research. Topics may include: multilevel data analysis; usefulness of structural equation models (path analysis); and implementation of matching methods and regression adjustments for comparing non-equivalent groups. Various computing customs accommodated. See http://www-stat.stanford.edu/~rag/ed493/. Prerequisite: intermediate statistical methods course work.
2-3 units, Spr (Rogosa, D)

EDUC 496. Research in History and Social Science Education—For doctoral students. Literature on historical learning and teaching and corresponding social sciences research designs, assessment, and curriculum evaluation.
3-5 units, not given this year

SCHOOL OF ENGINEERING

Dean: James D. Plummer
Senior Associate Deans: Hilary Beech (Administration), Laura L. Breyfogle (External Relations), Anthony J. DiPaolo (Stanford Center for Professional Development), Brad Osgood (Student Affairs), Channing Robertson (Academic and Faculty Affairs)
Associate Dean: Noé P. Lozano (Diversity Programs)
Assistant Dean: Sally Gressens (Graduate Student Affairs)

Faculty Teaching General Engineering Courses

Professors: Mark R. Cutkosky, Charbel Farhat, Roger T. Howe, Larry Leifer, Drew Nelson, Brad Osgood, Channing R. Robertson, Stephen M. Rock, Bernard Roth, Sheri Sheppard, Robert Sinclair, Simon Wong
Associate Professors: Samuel S. Chiu, Christopher Edwards, Ashish Goel, Sanjay Lall, Paul McIntyre, Reginald Mitchell, Olav Solgaard, Benjamin Van Roy
Assistant Professors: Eric Darve, Sarah Heilshorn, Adrian Lew, Nicolas A. Melosh, Gunter Niemeyer, Beth Pruitt, Clifford L. Wang, Thomas A. Weber
Professors (Teaching): Thomas H. Byers, Robert E. McGinn
Associate Professor (Teaching): Mehran Sahami
Lecturers: Jerry Cain, Vadim Khayms, Patrick Young, Julie Zelenski
Consulting Professors: Abbas Emami-Naeini, Thomas Kosnik
Consulting Associate Professors: Randy Komisar, Paul Mitiguy
Consulting Assistant Professors: William Behrman

Mail Code: 94305-4027
Phone: (650) 723-5984
Web Site: http://soe.stanford.edu/

Courses given in Engineering have the subject code ENGR. For a complete list of subject codes, see Appendix.

The School of Engineering offers undergraduate programs leading to the degree of Bachelor of Science (B.S.), programs leading to both B.S. and Master of Science (M.S.) degrees, other programs leading to a B.S. with a Bachelor of Arts (B.A.) in a field of the humanities or social sciences, dual-degree programs with certain other colleges, and graduate curricula leading to the degrees of M.S., Engineer, and Ph.D.

The school has nine academic departments: Aeronautics and Astronautics, Bioengineering, Chemical Engineering, Civil and Environmental Engineering, Computer Science, Electrical Engineering, Management Science and Engineering, Materials Science and Engineering, and Mechanical Engineering. These departments and one interdisciplinary program, the Institute for Computational and Mathematical Engineering, are responsible for graduate curricula, research activities, and the departmental components of the undergraduate curricula. In research where faculty interest and competence embrace both engineering and the supporting sciences, there are numerous programs within the school as well as several interschool activities, including the Alliance for Innovative Manufacturing at Stanford, Center for Integrated Systems, Center on Polymer Interfaces and Macromolecular Assemblies, Collaboratory for Research on Global Projects, Center for Position, Navigation, and Time, and the NIH Biotechnology Graduate Training Grant in Chemical Engineering. Energy Resources Engineering (formerly Petroleum Engineering) is offered through the School of Earth Sciences.

The School of Engineering's Institute of Design (http://dschool.stanford.edu) brings together students and faculty in engineering, business, education, medicine, and the humanities to learn design thinking and work together to solve big problems in a human-centered way.

The Woods Institute for the Environment (http://environment.stanford.edu) brings together faculty, staff, and students from the schools, institutes and centers at Stanford to conduct interdisciplinary research, education, and outreach to promote an environmentally sound and sustainable world.

Instruction in Engineering is offered primarily during the Autumn, Winter, and Spring quarters of the regular academic year. During the Summer Quarter, a small number of undergraduate and graduate courses are offered.

UNDERGRADUATE PROGRAMS

The principal goals of the undergraduate engineering curriculum are to provide opportunities for intellectual growth in the context of an engineering discipline, for the attainment of professional competence, and for the development of a sense of the social context of technology. The curriculum is flexible, with many decisions on individual courses left to the student and the adviser. For a student with well-defined educational goals, there is often a great deal of latitude.

In addition to the special requirements for engineering majors described below, all undergraduate engineering students are subject to the University general education, writing, and foreign language requirements outlined in the first pages of this bulletin. Depending on the program chosen, students have the equivalent of from one to three quarters of free electives to bring the total number of units to 180.

The School of Engineering's *Handbook for Undergraduate Engineering Programs* is available online at http://ughb.stanford.edu and provides detailed descriptions of all undergraduate programs in the school, as well as additional information about extracurricular programs and services. A hard copy version is also available from the Office of Student Affairs in Terman Engineering Center, room 201. Because it is published in the summer, and updates are made to the web site on a continuing basis, the handbook reflects the most up-to-date information for the academic year and is the definitive reference for all undergraduate engineering programs.

Accreditation—The Accreditation Board for Engineering and Technology (ABET) accredits college engineering programs nationwide using criteria and standards developed and accepted by U.S. engineering communities. At Stanford, the following undergraduate programs are accredited: Chemical Engineering, Civil Engineering, Electrical Engineering, Environmental Engineering, and Mechanical Engineering. In ABET-accredited programs, students must meet specific requirements for engineering science, engineering design, mathematics, and science course work. Students are urged to consult the School of Engineering undergraduate handbook and their adviser.

Accreditation is important in certain areas of the engineering profession; students wishing more information about accreditation should consult their department office or the office of the Senior Associate Dean for Student Affairs in Terman 201.

Policy on Satisfactory/No Credit Grading and Minimum Grade Point Average—All courses taken to satisfy major requirements (including the requirements for mathematics, science, engineering fundamentals, Technology in Society, and engineering depth) for all engineering students (including both department and School of Engineering majors) must be taken for a letter grade if the instructor offers that option.

For departmental majors, the minimum combined GPA (grade point average) for all courses taken in fulfillment of the Engineering Fundamentals requirement and the Engineering Depth requirement is 2.0. For School of Engineering majors, the minimum GPA on all engineering courses taken in fulfillment of the major requirements is 2.0.

ADMISSION

Any students admitted to the University may declare an engineering major if they elect to do so; no additional courses or examinations are required for admission to the School of Engineering.

RECOMMENDED PREPARATION

FRESHMEN

Students who plan to enter Stanford as freshmen and intend to major in engineering should take the highest level of mathematics offered in high school. (See the "Mathematics" section of this bulletin for information on advanced placement in mathematics.) High school courses in physics and chemistry are strongly recommended, but not required. Additional elective course work in the humanities and social sciences is also recommended.

TRANSFER STUDENTS

Students who do the early part of their college work elsewhere and then transfer to Stanford to complete their engineering programs should follow an engineering or pre-engineering program at the first school, selecting insofar as possible courses applicable to the requirements of the School of Engineering, that is, courses comparable to those described below under "Undergraduate Programs." In addition, students should work toward completing the equivalent of Stanford's foreign language requirement and as many of the University's General Education Requirements (GERs) as possible before transferring. Some transfer students may require more than four years (in total) to obtain the B.S. degree. However, Stanford affords great flexibility in planning and scheduling individual programs, which makes it possible for transfer students, who have wide variations in preparation, to plan full programs for each quarter and to progress toward graduation without undue delay.

Transfer credit is given for courses taken elsewhere whenever the courses are equivalent or substantially similar to Stanford courses in scope and rigor. The policy of the School of Engineering is to study each transfer student's preparation and make a reasonable evaluation of the courses taken prior to transfer by means of a petition process. Inquiries may be addressed to the Office of Student Affairs in 201 Terman. For more information, see the transfer credit section of the *Handbook for Undergraduate Engineering Programs* at http://ughb.stanford.edu.

DEGREE PROGRAM OPTIONS

For more information about the requirements for the following options, see the "Undergraduate Degrees and Programs" section of this bulletin. Five years are usually required for a dual or coterminal program or for a combination of these two multiple degree programs. For further information, see the School of Engineering's student affairs office, Terman 201, or department contacts listed in the *Handbook for Undergraduate Engineering Programs,* available in hard copy or at http://ughb.stanford.edu.

BACHELOR OF ARTS AND SCIENCE (B.A.S.)

This degree is available to students who complete both the requirements for a B.S. degree in engineering and the requirements for a major or program ordinarily leading to the B.A. degree. For more information, see the "Undergraduate Degrees" section of this bulletin.

DUAL AND COTERMINAL DEGREE PROGRAMS

A Stanford undergraduate may work simultaneously toward two bachelor's degrees or toward a bachelor's and a master's degree, that is, B.A. and M.S., B.A. and M.A., B.S. and M.S., or B.S. and M.A. The degrees may be granted simultaneously or at the conclusion of different quarters. Usually five years are needed for a combined program.

Dual B.A. and B.S. Degree Program—To qualify for both degrees, a student must (1) complete the stated University and department requirements for each degree, (2) complete 15 full-time quarters, or 3 full-time quarters after completing 180 units, and (3) complete a total of 225 units (180 units for the first bachelor's degree plus 45 units for the second bachelor's degree).

Coterminal Bachelor's and Master's Degree Program—A Stanford undergraduate may be admitted to graduate study for the purpose of working simultaneously toward a bachelor's degree and a master's degree, in the same or different disciplines. To qualify for both degrees, a student must (1) complete, in addition to the 180 units required for the bachelor's degree, the number of units required by the graduate department for the master's degree which in no event is fewer than the University minimum of 45 units, (2) complete the requirements for the bachelor's degree (department, school, and University) and apply for conferral of the degree at the appropriate time, and (3) complete the department and University requirements for the master's degree and apply for conferral of the degree at the appropriate time. A student may complete the bachelor's degree before completing the master's degree, or both degrees may be completed in the same quarter.

Admission to the coterminal program requires admission to graduate status by the pertinent department. Admission criteria vary from department to department.

Procedure for Applying for Admission to Coterminal Degree Programs—A Stanford undergraduate may apply to the pertinent graduate department using the University coterminal application form after completing 120 bachelor's degree units. Application deadlines vary by department, but in all cases the student must apply early enough to allow a departmental decision at least one quarter in advance of the anticipated date of conferral of the bachelor's degree.

Students should refer to the University Registrar's Office or its web site for details about when courses begin to count toward the master's degree requirements and when graduate tuition is assessed; this may affect the decision about when to apply for admission to graduate status.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

BACHELOR OF SCIENCE

Departments within the School of Engineering offer programs leading to the B.S. degree in the following fields: Chemical Engineering, Civil Engineering, Computer Science, Electrical Engineering, Environmental Engineering, Management Science and Engineering, Materials Science and Engineering, and Mechanical Engineering. The School of Engineering itself offers interdisciplinary programs leading to the B.S. degree in Engineering with specializations in Aeronautics and Astronautics, Architectural Design, Atmosphere/Energy, Biomechanical Engineering, Biomedical Computation, Computer Systems Engineering, Engineering Physics, and Product Design. In addition, students may elect a B.S. in an Individually Designed Major in Engineering.

The departments of Chemical Engineering, Civil and Environmental Engineering, Computer Science, Electrical Engineering, and Mechanical Engineering offer qualified majors opportunities to do independent study and research at an advanced level with a faculty mentor in order to receive a Bachelor of Science with honors.

Petroleum Engineering—Petroleum Engineering is offered by the Department of Energy Resource Engineering in the School of Earth Sciences. Consult the "Energy Resource Engineering" section of this bulletin for requirements. School of Engineering majors who anticipate summer jobs or career positions associated with the oil industry should consider enrolling in ENGR 120, Fundamentals of Petroleum Engineering.

Programs in Manufacturing—Programs in manufacturing are available at the undergraduate, master's, and doctorate levels. The undergraduate programs of the departments of Civil and Environmental Engineering, Management Science and Engineering, and Mechanical Engineering provide general preparation for any student interested in manufacturing. More specific interests can be accommodated through Individually Designed Majors in Engineering (IDMENs).

SCHOOL OF ENGINEERING MAJORS

The School of Engineering offers two types of B.S. degrees: Bachelor of Science in Engineering and Bachelor of Science for Individually Designed Majors in Engineering (IDMENs). There are eight Engineering B.S. majors that have been proposed by cognizant faculty groups and pre-approved by the Undergraduate Council: Aeronautics and Astronautics; Architectural Design; Atmosphere/Energy; Biomechanical Engineering; Biomedical Computation; Computer Systems Engineering; Engineering Physics; and Product Design. The B.S. for an Individually Designed Major in Engineering has also been approved by the council.

AERONAUTICS AND ASTRONAUTICS (AA)

Mathematics (24 units):	
MATH 53 *or* CME 102/ENGR 155A	5
MATH electives (see Basic Requirement 1)	
Science (18 units):	
PHYSICS 41. Mechanics	4
PHYSICS 43. Electricity and Magnetism	4
One additional Physics course	3
Science electives (see Basic Requirement 2)	9
Technology in Society (one course required; see Basic Requirement 4)	3-5
Engineering Fundamentals (three courses minimum; see Basic Requirement 3):	
ENGR 14. Statics	3
ENGR 30. Engineering Thermodynamics	3
ENGR 70A or X. Programming (recommended)	3-5
Engineering Depth (39 units):	
AA 100. Introduction to Aeronautics and Astronautics	3
AA 190. Directed Research in Aeronautics and Astronautics (WIM)	3
ENGR 15. Dynamics	3
CEE 101A. Mechanics of Materials *or* ME 80. Strength of Materials	4
ME 161. Dynamic Systems *or* PHYSICS 110. Intermediate Mechanics	4
ME 70. Introductory Fluids Engineering	4
ME 131A. Heat Transfer	4
Depth Area I[1]	6
Depth Area II[1]	6
Engineering Elective(s)[2]	3

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] Two of the following areas:
Fluids (AA 200A, 210A, 214A, 283; ME 131B)
Structures (AA 240A, 240B, 256)
Dynamics and Controls (AA 242A, 271A, 279; ENGR 105, 205)
Systems Design (AA 241A, 241B, 236A, 236B)

[2] Electives are to be approved by the adviser, and might be from the depth area lists or courses such as AA 201A, 210B, 252; ENGR 206, 209A, 209B; or other upper-division Engineering courses.

ARCHITECTURAL DESIGN (AD)

Mathematics and Science (36 units minimum):	
MATH 19, 20, and 21, *or* 41 and 42 (required)	10
One course in Statistics (required)	3-5
PHYSICS 21 *or* 41. Mechanics (required)	3-4
Recommended: EARTHSYS 101, 102; GES 1; CEE 64, 70, 101D; CME 100; PHYSICS 23 or 43; *or* from School of Engineering approved list[1]	
Technology in Society (one course required; see Basic Requirement 4)	3-5
Engineering Fundamentals (three courses minimum; see Basic Requirement 3):	
ENGR 14. Applied Mechanics: Statics	3
ENGR 60. Engineering Economy	3
Fundamentals Elective	3-5
Engineering Depth:	
CEE 100. Managing Sustainable Building Projects (WIM)	4
CEE 101A. Mechanics of Materials	4
CEE 110. Building Information Modeling	4
CEE 31 or 31Q. Accessing Architecture Through Drawing	4
CEE 130. Architectural Design: 3D Modeling, Methodology, and Process	4
CEE 136. Green Architecture	4
CEE 137B. Intermediate Architecture Studio (or one of the 137 series)	5
CEE 156. Building Systems	4
ARTHIST 3. Introduction to the History of Architecture	5
Engineering Depth Electives (with at least 3 units from SoE courses): the number of units of Depth Electives must be such that courses in Engineering Fundamentals and Engineering Depth total at least 60 units.[2]	

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] School of Engineering approved list of math and science courses available in the *Handbook for Undergraduate Engineering Programs at* http://ughb.stanford.edu

[2] Engineering depth electives: At least one of the following courses: CEE 111, 115, 131A or 138A; and others from CEE 80N, 101B, 101C, 122A,B, 135A, 139, 154, 172A, 176A, 180, 181, 182, 183; ENGR 50; ME 101, 110A, 115, 120, , 222; ARTSTUDI 60, 70, 140, 145, 148, 271; ARTHIST 142, 143A; FILMPROD 114; DRAMA 137.

ATMOSPHERE/ENERGY (A/E)

Mathematics (23 units minimum, including at least one course from each group):	
Group A:	
MATH 53. Ordinary Differential Equations with Linear Algebra	5
CME 102. Ordinary Differential Equations for Engineers	5
Group B:	
CME 106. Introduction to Probability and Statistics for Engineers	4
STATS 60. Introduction to Statistical Methods: Pre-Calculus	5
STATS 110. Statistical Methods in Engineering and the Physical Sciences	4-5
GES 160. Statistical Methods for Earth and Environmental Sciences	3-4
Science (22 units minimum, including all of the following):	
PHYSICS 41. Mechanics	4
PHYSICS 43. Electricity and Magnetism *or* 45. Light and Heat	4
CHEM 31B. Chemical Principles II *or* CHEM 31X. Chemical Principles	4
CEE 70. Environmental Science and Technology	3
Technology in Society:	
STS 110. Ethics and Public Policy (WIM)	3-5
Engineering Fundamentals (three courses minimum, including the following):	
ENGR 30. Engineering Thermodynamics	3
Plus one of following two courses plus one elective (see Basic Requirement 3):	
ENGR 60. Engineering Economy	3
ENGR 70A or 70X. Programming Methodology	3-5
Engineering Depth (42 units minimum):	
Required:	
CEE 64. Air Pollution: From Urban Smog to Global Change	3
CEE 173A. Energy Resources	5
At least 34 units from the following with at least 4 courses from each group:	
Group A: Atmosphere	
AA 100. Introduction to Aeronautics and Astronautics	3
BIOSCI 147. Controlling Climate Change in the 21st Century	3
CEE 63. Weather and Storms	3
CEE 101B. Mechanics of Fluids *or* ME 70. Introductory Fluids Engineering	4
CEE 161S. The Atmosphere and Global Environmental Change	3
CEE 161T. Aerosols, Clouds, and Climate Change	3
CEE 171. Environmental Planning Methods	3
CEE 172. Air Quality Management	3
CEE 172A. Indoor Air Quality (given alternate years)	2-3
CEE 178. Introduction to Human Exposure Analysis	3
EARTHSYS 111. Biology and Global Change	3
GES 90. Introduction to Geochemistry	3-4
Group B: Energy	
CEE 115. Goals and Methods for the Sustainable Design of Buildings	3-4
CEE 136. Green Architecture	4
CEE 156. Building Systems	4
CEE 176A. Energy Efficient Buildings	3-4
CEE 176B. Electric Power: Renewables and Efficiency	3-4
CEE 176F. Energy Systems Field Trips (given alternate years)	4
EARTHSYS 45N. Powering the Rim: Energy Issues for the Pacific	3
EARTHSYS 101. Energy and the Environment	3
EARTHSYS 102. Renewable Energy Sources and Greener Energy Processes	3
ENERGY. 104 Technology in the Greenhouse	3
GES 145. Energy Flow and Policy: The Pacific Rim	3

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

BIOMECHANICAL ENGINEERING (BME)

Mathematics (21 units minimum; see Basic Requirement 1)	
Science (22 units minimum)[1]	
CHEM 31X or A,B (required)	4-8
BIOSCI 44X. Biology Labs (WIM)	4
Biological Sciences or Human Biology core	10
Additional units from School of Engineering approved list	
Technology in Society (one course required; see Basic Requirement 4)	3-5
Engineering Topics (Engineering Science and Design):	
Engineering Fundamentals (minimum three courses; see Basic Requirement 3):	
ENGR 14. Applied Mechanics: Statics	3
ENGR 25. Biotechnology	3
Fundamentals Elective	3-5
Engineering Depth:	
ENGR 15. Dynamics	3
ENGR 30. Engineering Thermodynamics	3
ME 70. Introductory Fluids Engineering	4
ME 80. Strength of Materials and Lab	4
ME 389. Bioengineering and Biodesign Forum	1
Options to complete the ME depth sequence (3 courses, minimum 9 units):	
ENGR 105. Feedback Control Design	3
ME 101. Visual Thinking	3
ME 103D. Engineering Drawing and Design	1
ME 112. Mechanical Engineering Design	4
ME 113. Mechanical Engineering Design	4
ME 131A. Heat Transfer	3-4
ME 131B. Fluid Mechanics	4
ME 140. Advanced Thermal Systems	5
ME 161. Dynamic Systems	4
ME 203. Manufacturing and Design	3-4
ME 210. Introduction to Mechatronics	4
ME 220. Introduction to Sensors	3-4
Options to complete the BME depth sequence (3 courses, minimum 9 units):	
ME 281. Biomechanics of Movement	3
ME 284A. Cardiovascular Bioengineering	3
ME 284B. Cardiovascular Bioengineering	3

ME 280. Skeleton Development & Evolution	3
ME 294. Medical Device Design	3
Additional courses, as needed or desired:	
BIOSCI 44Y. Core Experimental Lab	4
BIOSCI 112. Human Physiology	4
BIOSCI 118. Genetic Analysis of Biological Processes	5
BIOSCI 129A or B. Cellular Dynamics I or II	4
BIOSCI 136. Evolutionary Paleobiology	4
HUMBIO 160. Human Behavioral Biology	6
SURG 101. Introduction to Surgery	5

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] Science must include both Chemistry and Physics with a depth in at least one, two courses of HUMBIO core or BIOSCI core, and CHEM 31A and B or X, *or* ENGR 31.

BIOMEDICAL COMPUTATION (BMC)

Mathematics (21 unit minimum; see Basic Requirement 1)	
MATH 41. Calculus	5
MATH 42. Calculus	5
STATS 116. Theory of Probability[1]	5
CS 103. Discrete Structures (X, or A and B)	4-6
Science (17 units minimum; see Basic Requirement 2)	
PHYSICS 41. Mechanics	4
CHEM 31X *or* A,B. Chemical Principles	4
CHEM 33. Structure and Reactivity	4
BIOSCI 41. Evolution, Genetics, Biochemistry	
or HUMBIO 2A. Genetics, Evolution, and Ecology	5
BIOSCI 42. Cell Biology, Dev. Biology, and Neurobiology	
or HUMBIO 3A. Cell and Developmental Biology	5
BIOSCI 43. Plant Biology, Evolution, and Ecology	
or HUMBIO 4A. The Human Organism	5
Engineering Fundamentals (two different courses required):	
CS 106. Programming Abstractions (X or A,B)	5
for the second required course, see concentrations	
Technology in Society (one course required; see Basic Requirement 4)	3-5
Engineering	
CS 107. Programming Paradigms	5
One of CS 270, 273A, 274, 275, 278, 279	3
Research: 6 units of biomedical computation research in any department[2,3]	6
Engineering Depth Concentration (choose one of the following concentrations):[7]	
Cellular/Molecular Concentration (10 courses):	
Mathematics: one of the following courses:	5
MATH 51. Advanced Calculus	
STATS 141. Biostatistics	
CME 100. Vector Calculus for Engineers	
Engineering Fundamentals[4]	3-5
Biology: (four courses)	
BIOSCI 129A. Cell Dynamics I	4
BIOSCI 129B. Cell Dynamics II	4
BIOSCI 188. Biochemistry	
or CHEM 135. Physical Chemistry	
or CHEM 171. Physical Chemistry	3
BIOSCI 203. Advanced Genetics	
or BIOSCI 118. Genetic Analysis of Biological Processes	4
Simulation Electives (two courses)[5,6]	6
Informatics Electives (two courses)[5,6]	6
Simulation, Informatics, or Cell/Mol Elective (one course)[5,6]	3
Informatics Concentration:	
Mathematics:	
STATS 141. Biostatistics	4
Engineering Fundamental[4]	3-5
Informatics Core (three courses)	
CS 145. Databases	4
CS 161. Design and Analysis of Algorithms	4
CS 121/221. Artificial Intelligence	3
Informatics Electives (three courses)[5,6]	9
Cellular Electives (two courses)[5,6]	6
Organs Electives (two courses)[5,6]	6
Organs/Organisms Concentration:	
Mathematics (one of the following courses):	
MATH 51. Advanced Calculus	5
STATS 141. Biostatistics	5
CME 100. Vector Calculus for Engineers	5
Engineering Fundamental[4]	3
Biology (three courses)	
BIOSCI 112. Human Physiology	4
BIOSCI 188. Biochemistry	
or BIOE/RAD 220. Introduction to Imaging	3
Organs Elective[5,6]	3-5
Simulation Electives (two courses)[5,6]	6
Informatics Electives (two courses)[5,6]	6
Simulation, Informatics, or Organs Elective (one course)[5,6]	3
Simulation Concentration:	
Mathematics:	
MATH 51 *or* CME 100. Advanced Calculus I	5
MATH 52 *or* CME 102/ENGR 155A. Advanced Calculus II	5
MATH 53 *or* CME 104/ENGR 155B. Advanced Calculus III	5
Science:	
PHYSICS 43 *or* 45	4
Engineering Fundamentals:	
See requirement in Simulation Core	
Simulation Core:	
Two courses chosen from ENGR 14,15; ME 80	6
Simulation Elective (two courses)[5,6]	6
Cellular Elective (one course)[5,6]	3
Organs Elective (one course)[5,6]	3

These requirements are subject to change; see http://bmc.stanford.edu/ for the most up-to date program description. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs.*

[1] MS&E 120, EE 178, and CME 106 are acceptable substitutes for STATS 116.

[2] Research projects require pre-approval of BMC Coordinators

[3] Research units taken as CS 191W or in conjunction with ENGR199W fulfill the Writing in the Major (WIM) requirement. CS 272, which does not have to be taken in conjunction with research, also fulfills the WIM requirement.

[4] One course required 3-5 units. See Fundamentals list in *Handbook for Undergraduate Engineering Programs.*

[5] The list of electives is continually updated to include all applicable courses. For the current list of electives, see http://bmc.stanford.edu.

[6] A course may only be counted towards one elective or core requirement; it may not be double-counted.

[7] A total of 40 Engineering units must be taken. The core classes only provide 27 Engineering units, so the remaining units must be taken from within the electives.

COMPUTER SYSTEMS ENGINEERING (CSE)

Mathematics (23 units minimum):	
MATH 41, 42, 51. Calculus	15
MATH 52 or 53. Multivariable Math	5
STATS 116. Theory of Probability	
or MS&E 120. Probabilistic Analysis	
or CME 106. Probability and Statistics for Engineers	3-5
Science (12 units):	
PHYSICS 41. Mechanics	4
PHYSICS 43. Electricity and Magnetism	4
PHYSICS 45. Light and Heat	4
Technology in Society (one course required; see Basic Requirement 4)	3-5
Engineering Fundamentals (13 units minimum; see Basic Requirement 3):	
ENGR 40. Electronics	5
ENGR 70B or 70X. Programming Methodology and Abstractions (same as CS 106 B or X)	5
Fundamentals Elective (may not be ENGR 70A, B, or X)	3-5
Writing in the Major (one course):	
CS 191W, 194, 201, 294W	3-6
Computer Systems Engineering Core (32 units minimum):	
CS 103X. Discrete Structures	
or CS 103A and B. Discrete Mathematics and Structures	4 or 6
CS 107. Programming Paradigms	5
CS 108. Object-Oriented Systems Design	4
EE 108A. Digital Systems I	4
EE 108B. Digital Systems II	3 or 4
Senior Project (CS 191, 191W, 194, 294, or 294W)[1]	3
Plus two of the following:[2]	
EE 101A. Circuits I	4
EE 101B. Circuits II	4
EE 102A. Signals and Systems I	4
EE 102B. Signals and Systems II	4
Computer Systems Engineering Depth (19-25 units; choose one of the following specializations):	
Digital Systems Specialization	
CS 140. Operating Systems	4
or CS 143. Compilers	
EE 109. Digital Systems Design Lab	4
EE 271. VLSI Systems	3
Plus three to four of the following:[3]	
CS 140 or 143 (if not counted above)	4
CS 240E. Embedded Wireless Systems	4
CS 244A. Introduction to Networking	4
CS 244E. Low-Power Wireless Networking	3
EE 273. Digital Systems Engineering	3
EE 282. Computer Systems Architecture	3
Robotics and Mechatronics Specialization	
CS 205A. Math for Robotics, Vision, Graphics	3
CS 223A. Introduction to Robotics	3
ME 210. Introduction to Mechatronics	4
ENGR 105. Feedback Control Design	3

Plus two to three of the following:[3]	
AA 278. Optimal Control and Hybrid Systems	3
CS 223B. Introduction to Computer Vision	3
CS 225A. Experimental Robotics	3
CS 225B. Robot Programming Lab	4
CS 277. Experimental Haptics	3
ENGR 205. Introduction to Control Design	3
ENGR 206. Control System Design	4
ENGR 207A. Modern Control Design I	3
ENGR 207B. Modern Control Design II	3
Networking Specialization	
CS 140. Operating Systems	4
CS 244A. Introduction to Networking	4
Plus four to five of the following:[3]	
CS 240. Advanced Topics in Operating Systems	3
CS 240E. Embedded Wireless Systems	3
CS 240X. Advanced Operating Systems II	3
CS 244B. Distributed Systems	3
CS 244E. Low-Power Wireless Networking	3
CS 249A. Object-Oriented Programming	3
CS 249B. Advanced Object-Oriented Programming	3
EE 179. Intro to Communications	3
EE 276. Wireless Personal Communications	3

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] Independent study projects (CS 191 or 191W) require faculty sponsorship and must be approved in advance by the adviser, faculty sponsor, and the CSE program adviser (R. Plummer or P. Young). A signed approval form and brief description of the proposed project, should be filed the quarter before work on the project is begun. Further details can be found in the *Handbook for Undergraduate Engineering Programs* at http://ughb.stanford.edu.

[2] Students pursuing the Robotics and Mechatronics or Networking specializations must take EE 102A and B.

[3] Students who take CS 103X instead of 103A,B must complete the higher number of courses.

ENGINEERING PHYSICS (EPHYS)

Mathematics (21 units minimum):	
MATH 51, 52. Multivariable Calculus	
or CME 100, 104. Vector Calculus, Linear Algebra, PDE	10
MATH 53 or CME 102. Ordinary Differential Equations	5
MATH 131. Partial Differential Equations	3
One math elective such as EE 261, PHYSICS 112, *or* CME 106	3-4
Science:	
PHYSICS 41. Mechanics	4
PHYSICS 43/44. Electricity and Magnetism	5
PHYSICS 45/46. Light and Heat	5
PHYSICS 70. Foundations of Modern Physics	4
or	
PHYSICS 61. Mechanics and Special Relativity	4
PHYSICS 63/64. Electricity, Magnetism, and Waves	5
PHYSICS 65/67. Thermodynamics and Modern Physics	6
Technology in Society (one course required; see Basic Requirement 4):	3-5
Engineering Fundamentals	
(three courses minimum; CS 106X or B recommended)	9-11
Engineering Depth (core):	
Intermediate Mechanics:	
ENGR 15. Dynamics	3
or PHYSICS 110. Intermediate Mechanics	4
Intermediate Electricity and Magnetism:	
EE 141,142. Eng. Electromagnetics, Electromagnetic Waves	7
or PHYSICS 120, 121. Intermediate Electricity and Magnetism	8
Numerical Methods:	
APPPHYS 215. Numerical Methods for Physicists and Engineers	3
or CME 108/CS 137. Introduction to Scientific Computing	3-4
or PHYSICS 113. Computational Physics	4
Electronics Lab:	
ENGR 40. Introductory Electronics	5
or EE 122. Analog Circuits Laboratory	3
or PHYSICS 105. Analog Electronics	3
or APPPHYS 207. Laboratory Electronics	3
Writing Lab:	
EE 108A/ENGR 102E. Digital Systems I	4-5
or ENGR 102M/ME 203. Manufacturing and Design	4-5
or MATSCI 161. Nanocharacterization Laboratory	4
or PHYSICS 107. Experimental Techniques and Data Analysis	4
Quantum Mechanics:	
EE 222, 223. Applied Quantum Mechanics	6
or PHYSICS 130, 131. Quantum Mechanics	8
Thermodynamics and Statistical Mechanics:	
PHYSICS 170, 171. Thermodynamics, Kinetic Theory, and Statistical Mechanics	8
Design Course (choose one of the following):	
CS 108. Object-Oriented Systems Design	3-4
EE 133. Analog Communications Design Laboratory	3
EE 144. Wireless Electromagnetic Design Laboratory	3
ME 203. Manufacturing and Design	3-4
ME 210. Introduction to Mechatronics	4
PHYSICS 108. Project Laboratory	3
Three courses from one specialty area:	9-12
Solid State Physics:	
APPPHYS 272. Solid State Physics I	3
APPPHYS 273. Solid State Physics II	3
EE 116. Semiconductor Device Physics	3
EE 216. Principles and Models of Semiconductor Devices	3
MATSCI 199. Electronic and Optical Properties of Solids	4
PHYSICS 172. Physics of Solids I	3
PHYSICS 173. Magnetism and Long Range Order in Solids	3
Photonics:	
EE 216. Principles and Models of Semiconductor Devices	3
EE 231. Introduction to Lasers	3
EE 232. Laser Dynamics	3
EE 234. Photonics Laboratory	3
EE 243. Semiconductor Optoelectronic Devices	3
EE 268. Introduction to Modern Optics	3
MATSCI 199. Electronic and Optical Properties of Solids	4
Materials Science:	
MATSCI 151. Microstructure and Mechanical Properties	4
MATSCI 152. Electronic Materials Engineering	3
MATSCI 155. Nanomaterials Synthesis	4
MATSCI 160. Nanomaterials Laboratory	4
MATSCI 161. Nanocharacterization Laboratory	4
MATSCI 162. X-Ray Diffraction Laboratory	4
MATSCI 163. Mechanical Behavior Laboratory	4
MATSCI 190. Organic Materials	4
MATSCI 194. Phase Equilibria	4
PHYSICS 172. Physics of Solids I	
or MATSCI 199. Electronic and Optical Properties of Materials	3
Electromechanical System Design:	
ME 80. Strength of Materials	4
ME 112. Mechanical Engineering Design	4
ME 210. Introduction to Mechatronics	4
Energy Systems:	
ME 131A. Heat Transfer	3-4
ME 131B. Fluid Mechanics: Compressible Flow and Turbomachinery	4
ME 140. Advanced Thermal Systems	4

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

PRODUCT DESIGN (PD)

Mathematics (20 units minimum):	
Recommended: one course in Statistics	
Science (22 units minimum):	
15 units must be from School of Engineering approved list[1]	
One year of PHYSICS 40 series (required)	
Behavioral Science[1] (7 units minimum)	
PSYCH 1. Introduction to Psychology (required)	5
PSYCH elective from courses numbered 20-95[2]	3-5
Mathematics and Science (maximum combined total of 45 units)	
Technology in Society (one course):	
ME 120. History of Philosophy of Design (required)	3-4
Engineering Fundamentals (three courses minimum):	13-15
ENGR 40 (required), 70A *or* X (required), plus one course from ENGR 10, 15, 20, 25, 30, 50, 60, 62	
Product Design Engineering Depth (48 units):	
ARTSTUDI 60. Design I: Fundamental Visual Language	3
ARTSTUDI 160. Design II: The Bridge	3
Two additional Art Studio courses (ARTSTUDI 70 recommended)	6
ENGR 14. Applied Mechanics	3
ENGR 102M. Technical/Professional Writing for ME Majors[3]	1
ME 80. Strength of Materials	4
ME 101. Visual Thinking	3
ME 103D. Engineering Drawing	1
ME 110A. Design Sketching	1
ME 112. Mechanical Systems	4
ME 115. Human Values in Design	3
ME 116. Product Design: Formgiving	4
ME 203. Manufacturing and Design[3]	4
ME 216A. Advanced Product Design	4
ME 216B. Advanced Product Design	4

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] School of Engineering approved science list available at http://ughb.stanford.edu.

[2] One quarter abroad may substitute for the PSYCH elective.

[3] Must be taken concurrently to fulfill the Writing in the Major requirement.

INDIVIDUALLY DESIGNED MAJORS IN ENGINEERING (IDMENS)

The B.S. degree for IDMENs is intended for undergraduates interested in pursuing engineering programs that, by virtue of their focus and intellectual content, cannot be accommodated by existing departmental majors or the pre-approved School of Engineering majors. IDMEN curricula are designed by students with the assistance of two faculty advisers of their choice and are submitted to the Undergraduate Council's Subcommittee on Individually Designed Majors. The degree conferred is "Bachelor of Science in Individually Designed Major in Engineering: (approved title)."

Students must submit written proposals to the IDMEN subcommittee detailing their course of study. Programs must meet the following requirements: mathematics (21 unit minimum, see Basic Requirement 1 below), science (17 units minimum, see Basic Requirement 2 below), Technology in Society (one approved course, see Basic Requirement 4 below), engineering (40 units minimum), and sufficient relevant additional course work to bring the total number of units to at least 90 and at most 107. Students may take additional courses pertinent to their IDMEN major, but the IDMEN proposal itself may not exceed 107 units. The student's curriculum must include at least three Engineering Fundamentals courses (choosing from ENGR 10, 14, 15, 20, 25, 30, 40, 50/50M, 60, 62, 70A, 70B, 70X). Students are responsible for completing the prerequisites for all courses included in their majors.

Each proposal should begin with a statement describing the proposed major. In the statement, the student should make clear the motivation for and goal of the major, and indicate how it relates to her or his projected career plans. The statement should specify how the courses to be taken relate to and move the student toward realizing the major's goal. A proposed title for the major should be included. The title approved by the IDMEN Subcommittee is listed on the student's official University transcript.

The proposal statement should be followed by a completed Program Sheet listing all the courses comprising the student's IDMEN curriculum, organized by the five categories printed on the sheet (mathematics, science, technology in society, additional courses, and engineering depth). Normally, the courses selected should comprise a well-coordinated sequence or sequences that provide mastery of important principles and techniques in a well-defined field. In some circumstances, especially if the proposal indicates that the goal of the major is to prepare the student for graduate work outside of engineering, a more general engineering program may be appropriate. A four-year study plan, showing courses to be taken each quarter, should also be included in the student's IDMEN proposal.

The proposal must be signed by two faculty members who certify that they endorse the major as described in the proposal and that they agree to serve as the student's permanent advisers. One of the faculty members, who must be from the School of Engineering, acts as the student's primary adviser. The proposal must be accompanied by a statement from that person giving an appraisal of the academic value and viability of the proposed major.

Students proposing IDMENs must have at least four quarters of undergraduate work remaining at Stanford after the quarter in which their proposals are first submitted. Any changes in a previously approved major must be endorsed by the advisers and re-approved by the IDMEN subcommittee. A request by a student to make changes in her or his approved curriculum must be made sufficiently far in advance so that, should the request be denied, adequate time remains to complete the original, approved curriculum. Proposals are reviewed and acted upon once a quarter. Forms may be obtained from the *Handbook for Undergraduate Engineering Programs* at http://ughb.stanford.edu. Completed proposals should be submitted to Bertha Love in the Office of Student Affairs, Terman 201.

DEPARTMENTAL MAJORS

Curricula for majors offered by the departments of Chemical Engineering, Civil and Environmental Engineering, Computer Science, Electrical Engineering, Management Science and Engineering, Materials Science and Engineering, and Mechanical Engineering have the following components: 36-45 units of mathematics and science (see Basic Requirements 1 and 2 at the end of this section); engineering fundamentals (three course minimum, at least one of which must be unspecified by the department, see Basic Requirement 3); Technology in Society (TIS) (one course minimum, see Basic Requirement 4); engineering depth (courses such that the total of units for Engineering Fundamentals and Engineering Depth is between 60 and 72). ABET accredited majors must meet a minimum number of Engineering Science and Engineering Design units; (see Basic Requirement 5). Curricular requirements for departmental majors are being revised at the time of publication. Consult the 2007-08 *Handbook for Undergraduate Engineering Programs* at http://ughb.stanford.edu for the most up-to-date listing of curricular requirements.

Experimentation—Departmental major programs, other than Computer Science and Management Science and Engineering, must include 8 units of experimentation. Lab courses taken in the sciences, as well as experimental work taken in courses within the School of Engineering, can be used in fulfillment of this requirement. By careful planning, the experimentation requirement should not necessitate additional course work beyond that required to meet the other components of an engineering major. A list of courses and their experimentation content (in units) can be found online at http://ughb.stanford.edu in the *Handbook for Undergraduate Engineering Programs*.

CHEMICAL ENGINEERING (CHE)

Mathematics:	
MATH 41, 42.	10
CME 100. Vector Calculus for Engineers	5
or MATH 51 and 52. Calculus	10
CME 102. Ordinary Differential Equations for Engineers	
or MATH 53. Ordinary Differential Equations	5
CME 104. Linear Algebra & Partial Differential Equations for Engineers	5
or CME 106. Intro to Probability and Statistics for Engineers	4
Science:	
CHEM 31X. Chemical Principles	4
or CHEM 31A,B. Chemical Principles I,II	8
CHEM 33. Structure and Reactivity	4
CHEM 35. Organic Monofunctional Compounds	4
CHEM 36. Chemical Separations	3
PHYSICS 41. Mechanics	4
PHYSICS 43. Electricity and Magnetism	4
Technology in Society (one course required; see Basic Requirement 4)	3-5
Engineering Fundamentals (three courses minimum; see Basic Requirement 3):	
ENGR 20/CHEMENG 20. Introduction to Chemical Engineering	3
ENGR 25/CHEMENG 25. Biotechnology	3
Fundamentals Elective	3-5
Chemical Engineering Depth (minimum 68 Engineering Science and Design units; see Basic Requirement 5):	
CHEMENG 10. The Chemical Engineering Profession	1
CHEMENG 100. Chemical Process Modeling, Dynamics, and Control	3
CHEMENG 110. Equilibrium Thermodynamics	3
CHEMENG 120A. Fluid Mechanics	4
CHEMENG 120B. Energy and Mass Transport	4
CHEMENG 130. Separation Process	3
CHEMENG 150. Biochemical Engineering	3
CHEMENG 170. Kinetics and Reactor Design	3
CHEMENG 180. Chemical Engineering Plant Design	3
CHEMENG 185A. Chemical Engineering Laboratory A (WIM)	4
CHEMENG 185B. Chemical Engineering Laboratory B (WIM)	4
CHEMENG 188. Biochemistry I	3
CHEM 130. Qualitative Organic Analysis	4
CHEM 131. Organic Polyfunctional Compounds	3
CHEM 171. Physical Chemistry: Chemical Thermodynamics	3
CHEM 173. Physical Chemistry: Quantum Chemistry	3
CHEM 175. Physical Chemistry	3
Two courses (140 or 160 required):	
CHEMENG 140. Microelectronics Processing Technology	3
CHEMENG 160. Polymer Science and Engineering	3
CHEMENG 174. Environmental Microbiology I	3
CHEMENG 189. Biochemistry II	3

Unit count is higher if program includes one or more of the following: MATH 20 series, MATH 50 series (in lieu of the CME math courses), or CHEM 31A,B (in lieu of CHEM 31X). The above requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*. Handbooks are available at http://ughb.stanford.edu or from the department or school.

CIVIL ENGINEERING (CEE)

Mathematics and Science:	
(45 units minimum[1]; see Basic Requirements 1 and 2)	
Technology in Society (one course):	
(See Basic Requirement 4)	3-5
Engineering Fundamentals (three courses minimum; see Basic Requirement 3)	
ENGR 14. Applied Mechanics: Statics	3
ENGR 60. Engineering Economy	3
Fundamentals Elective	3-5
Engineering Depth: (minimum of 68 Engineering Science and Design units; see Basic Requirement 5):	
CEE 70. Environmental Science and Technology	3
CEE 100. Managing Civil Engineering Projects (WIM)	4
CEE 101A. Mechanics of Materials	4
CEE 101B. Mechanics of Fluids	4
CEE 101C. Geotechnical Engineering	4
Specialty courses in either	
Environmental and Water Studies[2]	
or Structures and Construction[3]	33-40
Other School of Engineering Electives	1-7

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

1 Mathematics must include CME 102/ENGR 155A and a Statistics class. Science must include PHYSICS 41, and GES 1. For students in the Environmental and Water Studies track, CHEM 31B or X, and CHEM 33 are required. For students in the Structures and Construction track, CHEM 31A, CHEM 31X or ENGR 31 is required.

2 Environmental and Water Studies: ENGR 30; CEE 101D, 160, 161A, 166A, 166B, 171, 172, 177, 179A; and either CEE 169, 179B, or 179C. Remaining specialty units from: CEE 63, 64, 164, 169, 173A, 173B, 176A, 176B, 178, 179C, 199.

3 Structures and Construction: ENGR 50; CEE 102, 156, 180, 181, 182, 183. Remaining specialty units from: ENGR 15, ENGR 155B, CME 104; CEE 101D, 111, 122A,B, 140, 143, 147, 151, 154, 160, 161A, 171, 176A,B, 195A/B, 196, 199, 203, and one of 130, 131, 132, 134, 134A, 136, or 137A.

COMPUTER SCIENCE (CS)

Mathematics (23 units minimum):	
CS 103X. Discrete Structures (Accelerated)	
or CS 103A and B. Discrete Mathematics and Structures	4-6
MATH 41, 42. Calculus[1]	10
STATS 116. Theory of Probability	
or MS&E 120. Probabilistic Analysis	
or CME 106. Probability and Statistics for Engineers	3-5
Plus two electives[2]	
Science (11 unit minimum):	
PHYSICS 41. Mechanics	4
PHYSICS 43. Electricity and Magnetism	4
Science Elective[3]	3
Technology in Society (one course; see Basic Requirement 4)	3-5
Engineering Fundamentals (13 units; see Basic Requirement 3)	
CS 106 B or X. Programming Methodology and Abstractions	5
ENGR 40. Electronics	5
Fundamentals Elective (may not be 70A, B, or X)	3-5
Writing in the Major (one course):	
CS 191W, 194, 201, 294W	
Computer Science Depth (43 units minimum):	
Programming (two courses):	
CS 107. Programming Paradigms	5
CS 108. Object-Oriented Systems Design	4
Theory (two courses):	
CS 154. Introduction to Automata and Complexity Theory	4
CS 161. Design and Analysis of Algorithms	4
Systems (three courses):	
EE 108B. Digital Systems II	3-4
Two systems electives[4]	7-8
Applications (two courses):	
CS 121 or 221. Introduction to Artificial Intelligence	3-4
One applications elective[5]	3-4
Project (one course):	
CS 191, 191W, 194, 294, 294W[6]	3
Restricted Electives (two or three courses)[7]	6-12

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

1 MATH 19, 20, and 21 may be taken instead of MATH 41 and 42 as long as at least 23 math units are taken.

2 The math electives list consists of: MATH 51, 103, 108, 109, 110, 113; CS 156, 157, 205A; PHIL 151; CME 100, 102, 104. Completion of MATH 52 and 53 counts as one math elective. Restrictions: MATH 51 and 103, or MATH 51 and CME 100, or MATH 103 and 113, or CS 157 and PHIL 151, may not be used in combination to satisfy the math electives requirement.

3 The science elective may be any course of 3 or more units from the School of Engineering lists plus PSYCH 30 or 55; AP Chemistry also meets this requirement. Either of the PHYSICS sequences 61/63 or 21/23 may be substituted for 41/43 as long as at least 11 science units are taken.

4 The two systems courses must be chosen from the following set: CS 140, 143, 155, 240D, 242, and 244A. The systems electives must include a course with a large software project, currently satisfied by either CS 140 or 143.

5 The applications elective must be chosen from the following: CS 145, 147, 148, 223A, 223B, 248, 262.

6 Independent study projects (CS 191 or 191W) require faculty sponsorship and must be approved by the adviser, faculty sponsor, and the CS program adviser (R. Plummer or P. Young). A signed approval form, along with a brief description of the proposed project, should be filed the quarter before work on the project is begun. Further details can be found in the *Handbook for Undergraduate Engineering Programs*.

7 Students who take CS 103A,B must complete two electives; students who opt for 103X must complete three. The list of approved electives is reviewed annually by the Undergraduate Program Committee. The current list consists of CS 140, 143, 144 or 244A, 145, 147, 148 or 248, 155, 156, 157, 205A, 205B, 222, 223A, 223B, 224M, 224N, 224S, 225A, 225B, 226, 227, 228, 229, 240, 242, 243, 244B, 245, 247, 249A, 249B, , 255, 256, 257, 258, 261, 262, 270, 271, 272, 273A, 274, 276, 277, 295; CME 108; EE 282.

ELECTRICAL ENGINEERING (EE)

Mathematics:	
MATH 41, 42	10
MATH 51 and 52, *or* CME 100/ ENGR 154 and CME 104/ENGR 155B	10
MATH 53 *or* CME 102/ENGR 155A	5
EE 178, STATS 116, MATH 151, *or* CME 106/ENGR 155C	3-5
Science:	
PHYSICS (41, 43) or (61, 63)	8
Math or Science electives[1]:	7-9
Technology in Society (one course; see Basic Requirement 4)	3-5
Technical Writing: ENGR 102E (WIM corequisite for EE 108A)	1
EE 100. The Electrical Engineering Profession	1
Engineering Fundamentals: (three courses minimum; see Basic Requirement 3)	
CS 106X *or* CS 106B	5
At least two additional courses, at least one of which is not in EE or CS	6-10
Engineering Depth (minimum 68 Engineering Science and Design units; see Basic Requirement 5):	
Circuits: EE 101A,B	8
Signals Processing and Linear Systems: EE 102A,B	8
Digital Systems: EE 108A (Laboratory, WIM), 108B	8
Physics in Electrical Engineering: EE 41 *or* EE 141	4-5
Specialty courses[2]	9-12
One course in Design[3]	
Electrical Engineering electives[4]	9-20

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

1 A minimum of 12 science units must be taken. A minimum of 45 math and science units combined must be taken.

2 Three courses from one of the specialty areas shown below (consultation with an adviser in the selection of these courses is especially important):

- Computer Hardware: EE 109, 271 or 275, 273, 282; CS 107
- Computer Software: CS 107, 108, 194, or 244A; EE 284
- Controls: ENGR 105, 205, 206 207A, 207B, 209A, 209B; EE 263
- Circuits and Devices: EE 116, 122, 133, 212, 214, 215, 216, 271
- Fields and Waves: EE 134, 141, 144, 241, 242, 246, 247, 252, 256
- Communications and Signal Processing: EE 133, 168, 179, 261 263, (264 or 265), 276, 278, 279
- Solid State and Photonic Devices: EE 116, 134, 136, 141, 216, 222, 223, 228, 235, 268

3 The design course may be part of the specialty sequence. The following courses satisfy this requirement: EE 109, 133, 134, 144, 168, 256, 262, 265; CS 194, ENGR 206.

4 May include up to two additional Engineering Fundamentals. May include up to 10 units of EE 191. May include any CS 193 course.

ENVIRONMENTAL ENGINEERING (ENV)

Mathematics and Science (see Basic Requirement 1 and 2)	45 units[1]
Technology in Society[2] (one course;see Basic Requirement 4)	3-5
Engineering Fundamentals (three courses minimum; see Basic Requirement 3):	
ENGR 30. Engineering Thermodynamics	3
ENGR 60. Engineering Economy	3
Fundamentals Elective	3-5
Engineering Depth (minimum of 68 Engineering Science and Design units; see Basic Requirement 5):	
CEE 64. Air Pollution: From Urban Smog to Global Change	3
CEE 70. Environmental Science and Technology	3
CEE 100. Managing Civil Engineering Projects (WIM)	4
CEE 101B. Mechanics of Fluids	4
CEE 101D. MathLab Applications in CEE	2
CEE 160. Mechanics of Fluids Laboratory	2
CEE 161A. Rivers, Streams, and Canals	3
CEE 166A. Watersheds and Wetlands	3
CEE 166B. Floods and Droughts, Dams, and Aqueducts	3
CEE 171. Environmental Planning Methods	3
CEE 172. Air Quality Management	3
CEE 177. Aquatic Chemistry and Biology	4
CEE 179A. Aquatic Chemistry Laboratory	2
Capstone design experience: CEE 169, 179B, or 179C	5
CEE Breadth Electives[3]	10
Other School of Engineering Electives	2-9

These requirements are subject to change. The final requirements are published with sample programs in the Handbook for Undergraduate Engineering Programs.

1 Math must include CME 102/ENGR 155A and a Statistics course. Science must include PHYSICS 41; CHEM 31B or X, 33; and GES 1.

2 Should choose a class that specifically includes an ethics component, such as STS 101, 110, 115, or CS 201.

3 Breadth electives currently include CEE 63, 101C, 161S, 161T, 162, 164, 166D, 169, 172A, 173A, 175A, 176A, 176B, 178, 179C, and 199.

MANAGEMENT SCIENCE AND ENGINEERING (MS&E)

Mathematics (32 units minimum[1]; see Basic Requirement 1):	
MATH 41. Calculus	5
MATH 42. Calculus	5
MATH 51. Linear Algebra and Differential Calculus of Several Variables	5
MATH 53. Ordinary Differential Equations with Linear Algebra	5
MS&E 120. Probabilistic Analysis	5
MS&E 121. Introduction to Stochastic Modeling	4
STATS 110 or 200. Statistical Methods/Inference	3-5
Science (11 units minimum[1]; see Basic Requirement 2):	
One of the following three sequences:	
CHEM 31B or X, and 33	8
PHYSICS 21, 22, 23, and 24	8
PHYSICS 41 and 43	8
Science Elective	3
Technology in Society (one course[2]; see Basic Requirement 4)	3-5
Engineering Fundamentals (three courses minimum; see Basic Requirement 3):	
CS 106A *or* X. Programming Methodology[3]	5
ENGR 25. Biotechnology	
or ENGR 40. Introduction to Electronics	3-5
Fundamentals Elective[4]	3-5
Engineering Depth (core):	22-29
CS 106B, unless 106X used as fundamental	3-5
ENGR 60. Engineering Economy[4]	3
MS&E 108. Senior Project	5
MS&E 111. Introduction to Optimization[4]	4
MS&E 130 *or* 134. Information[5]	3-4
MS&E 142 *or* 160. Investment Science or Production[6]	3-4
MS&E 180. Organizations: Theory and Management	4
Engineering Depth (concentration: choose one of the following five concentrations):[7]	20-30
Financial and Decision Engineering Concentration:	27-29
ECON 50. Economic Analysis I	5
ECON 51. Economic Analysis II	5
MS&E 140. Industrial Accounting	4
MS&E 152. Introduction to Decision Analysis (WIM)	4
MS&E 245G or 247S. Finance	3-4
Two of the following courses:	
ENGR 145. Technology Entrepreneurship[8]	4
FINANCE 323. International Financial Management	4
MS&E 107. Interactive Management Science	3
MS&E 160. Production and Operating Systems[6]	4
MS&E 223. Simulation	3
MS&E 250A. Engineering Risk Analysis	3
STATS 240. Statistical Methods in Finance	3-4
Operations Research Concentration:	24-27
MATH 113. Linear Algebra and Matrix Theory[8]	3
MATH 115. Functions of a Real Variable[8]	3
MS&E 112. Network and Integer Optimization	3
MS&E 142 or 160. Investment Science or Production[6]	3-4
MS&E 152. Introduction to Decision Analysis (WIM)	3-4
MS&E 241. Economic Analysis	3-4
MS&E 251. Stochastic Decision Models	3
STATS 202. Data Analysis[8]	3
Organization, Technology, and Entrepreneurship Concentration	24-29
At least one of the following courses:	
ECON 50. Economic Analysis I	5
PSYCH 70. Introduction to Social Psychology	4
SOC 114. Economic Sociology	5
At least two of the following courses:	
ENGR 145. Technology Entrepreneurship[8]	4
MS&E 175. Innovation, Creativity, and Change	4
MS&E 181. Issues in Technology and Work[8]	4
At least four of the following courses (may also include omitted courses from above: ENGR 145, MS&E 175, or MS&E 181):	
Organizations and Technology:	
MS&E 134. Organizations and Info Systems[5]	4
CS 147. Intro Human-Computer Interaction	3-4
MS&E 169. Quality Engineering	4
MS&E 184. Technology and Work	3
Entrepreneurship and Innovation:	
MS&E 140. Industrial Accounting	3-4
MS&E 266. Management of New Product Development	3-4
MS&E 267. Innovations in Manufacturing	3-4
Policy and Strategy Concentration:	25-30
ECON 50. Economic Analysis I	5
ECON 51. Economic Analysis II	5
MS&E 190. Policy and Strategy Analysis	3
At least four of the following courses, including at least one course in policy and at least one course in strategy:	
Policy:	
MS&E 193. Technology and National Security[8]	3
MS&E 197. Ethics and Public Policy (WIM)[8]	5
MS&E 243. Energy and Environmental Policy Analysis	3
MS&E 248. Economics of Natural Resources	3-4
MS&E 292. Health Policy Modeling	3
Strategy:	
ENGR 145. Technology Entrepreneurship[8]	4
MS&E 175. Innovation, Creativity, and Change	3-4
MS&E 266. Mgmt. of New Product Development	3-4
MS&E 267. Innovations in Manufacturing	3-4
Production and Operations Management Concentration:	27-29
ECON 50. Economic Analysis I	5
ECON 51. Economic Analysis II	5
MS&E 140. Industrial Accounting	3-4
MS&E 152. Introduction to Decision Analysis (WIM)	4
and three of the following courses:	
MS&E 142 or 245G. Investment Science/Finance	3-4
MS&E 169. Quality Engineering	4
MS&E 262. Supply Chain Management	3
MS&E 263. Internet-Enabled Supply Chains	3
MS&E 264. Manufacturing Systems Design	3
MS&E 265. Supply Chain Logistics	4
MS&E 266. Management of New Product Development	3-4
MS&E 267. Innovations in Manufacturing	3-4
MS&E 268. Operations Strategy	3

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] Math and Science must total a minimum of 45 units. Electives must come from the School of Engineering approved list, or PHYSICS 21, 22, 23, 24, 25, 26; PSYCH 55, 70. AP credit for Chemistry, Mathematics, and Physics may be used.

[2] Technology in Society course must be one of the following MS&E approved courses: COMM 120, COMM 169, CS 201, MS&E 181, MS&E 193 (WIM), STS 101/ENGR 130, STS 110/MS&E 197 (WIM), STS 115/ENGR 131, STS 160, STS 163, STS 170, STS 279.

[3] AP credit for CS may be used.

[4] Students may not count ENGR 60 or 62 for engineering fundamentals as those courses count toward engineering depth (core) and cannot be double counted.

[5] Students may not count 134 for both core and the Organization, Technology, and Entrepreneurship concentration.

[6] Students may not count 142 or 160 for both core and concentration. Students doing the Financial and Decision Engineering concentration must take 142, students doing the Operations Research concentration must take both 142 and 160, and students doing the Production and Operations Management concentration must take 160.

[7] Engineering fundamentals, engineering depth (core), and engineering depth (concentration) must total a minimum of 60 units.

[8] Courses used to satisfy the Math, Science, Technology in Society, or Engineering Fundamental requirement may not also be used to satisfy an engineering depth requirement.

MATERIALS SCIENCE AND ENGINEERING (MATSCI)

Mathematics (20 units minimum; see Basic Requirement 1):	
MATH 51 and 52, *or* CME 100/ENGR 154 and CME 104/ENGR 155B	10
MATH 53 *or* CME 102/ENGR 155A	5
Science (20 units minimum; see Basic Requirement 2):	
Must include a full year of physics or chemistry, with one quarter of study in the other subject.	
Technology in Society (one course; see Basic Requirement 4)	3-5
Engineering Fundamentals (three courses minimum; see Basic Requirement 3)	
ENGR 50. Intro to Materials Science, Nanotechnology[1]	4
or ENGR 50M. Intro to Materials Science, Biomaterials[1]	4
At least two additional courses	6-8
Engineering Depth:	
Choose four of the following lab courses:	
MATSCI 160. Nanomaterials Laboratory	4
MATSCI 161. Nanocharacterization Laboratory (WIM)	4
MATSCI 162. X-Ray Diffraction Laboratory	4
MATSCI 163. Mechanical Behavior Laboratory	4
MATSCI 164. Electronic and Photonic Materials and Devices Lab	4
Materials Science Fundamentals[2]	24
Science and Engineering Options[3]	10

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] If both ENGR 50 courses are taken, one may be used for the MATSCI depth fundamentals requirement.

[2] MATSCI Fundamentals; 24 units (6 courses) from ENGR 50 or 50M (alternatively, MATSCI 70N), 151,152, 153,154, 155, 156, 157, 190, 192, 193, 194, 195, 196, 197, 198, 199.

[3] MATSCI Options; 10 units from one of the following areas:
- Bioengineering: BIOE 220, 222A, 222B, 280, 281, 284A, 284B; MATSCI 380, 381; ME 80, 81
- Chemical Engineering: CHEM 171; CHEMENG 130, 140, 150, 150A, 160
- Chemistry: CHEM 151, 153, 171, 173, 175
- Electronics and Photonics: EE 101A, 101B, 102A, 116, 134, 136, 141
- Energy Technology: EE 293A, 293B; MATSCI 302; ME 260
- Materials Characterization Techniques: MATSCI 320, 321, 323, 324, 325, 326, 405

Mechanical Behavior and Design: AA 240A, 240B, 256; MATSCI 170, 358; ME 80, 81 (or CEE 101A), 203, 294
Physics: PHYSICS 70, 110, 120, 121,130, 131, 134 170, 171, 172, 173
Self-Defined Option: petition for a self-defined cohesive program, minimum of 10 units.

MECHANICAL ENGINEERING (ME)

Mathematics (24 units minimum[1]; see Basic Requirement 1):	
CME 102/ENGR 155A. Ordinary Differential Equations for Engineers *or* MATH 53 Ordinary Differential Equations with Linear Algebra	5
CME 106/ENGR 155C. Intro to Probability and Statistics for Engineers *or* STATS 110. Statistical Methods in Engineering *or* STATS 116. Theory of Probability	3-5
Science (21 units minimum[1]; see Basic Requirement 2):	
CHEM 31X *or* 31A,B (required)	
Technology in Society (one course from approved ME list;[2] see Basic Requirement 4)	3-5
Engineering Fundamentals: (three courses minimum; see Basic Requirement 3)	
ENGR 40. Introductory Electronics (required)	5
ENGR 70A/B *or* X (same as CS 106A/B *or* X). Programming Methodology and Abstractions (required)	3-5
Fundamentals Elective	3-5
Engineering Depth (minimum of 68 Engineering Science and Design units; see Basic Requirement 5):	
ENGR 14. Applied Mechanics: Statics	3
ENGR 15. Dynamics	3
ENGR 30. Engineering Thermodynamics	3
ENGR 102M. Technical Writing (WIM corequisite for ME 203)	1
ME 70. Introductory Fluids Engineering	4
ME 80. Strength of Materials	4
ME 101. Visual Thinking	3
ME 103D. Engineering Drawing	1
ME 112. Mechanical Engineering Design	4
ME 113. Mechanical Engineering Design	4
ME 131A. Heat Transfer	4
ME 131B. Fluid Mechanics	4
ME 140. Advanced Thermal Systems	5
ME 161. Dynamic Systems	4
ME 203. Manufacturing and Design (WIM; take with ENGR 102M)	4
Options to complete the ME depth sequence (choose three courses):	
ENGR 105. Feedback Control Design	3
ME 150. Internal Combustion Engines	3
ME 210. Introduction to Mechatronics	4
ME 220. Introduction to Sensors	3
ME 227. Vehicle Dynamics and Control	3
ME 280. Skeletal Development and Evolution	3
ME 281. Biomechanics of Movement	3
ME 284A. Cardiovascular Bioengineering	3
ME 284B. Cardiovascular Bioengineering	3

These requirements are subject to change. The final requirements are published with sample programs in the *Handbook for Undergraduate Engineering Programs*.

[1] Math and science must total 45 units. Math: 24 units required and must include a course in differential equations (CME 102/ENGR 155A or MATH 53) and Statistics (CME 106/ENGR 155C or STATS 110 or 116). Science: 21 units minimum and requires courses in Physics, Chemistry, or Biology, with at least a full year in either Physics or Chemistry.

[2] ME majors must choose their TIS course from the following list: STS 101, 110, ME 190, POLISCI 114S, MS&E 193, PUBPOL 194 or CS 201.

BASIC REQUIREMENTS

Basic Requirement 1 (Mathematics)—Engineering students need a solid foundation in the calculus of continuous functions including differential equations, an introduction to discrete mathematics, and an understanding of statistics and probability theory. The minimum preparation should normally include calculus to the level of MATH 53. Knowledge of ordinary differential equations and matrices is important in many areas of engineering, and students are encouraged to select additional courses in these topics. To meet ABET accreditation criteria, a student's program must include the study of differential equations.

Courses that satisfy the math requirement are listed at http://ughb.stanford.edu in the *Handbook for Undergraduate Engineering Programs*.

Basic Requirement 2 (Science)—A strong background in the basic concepts and principles of natural science in such fields as biology, chemistry, geology, and physics is essential for engineering. Most students include the study of physics and chemistry in their programs.

Courses that satisfy the science requirement are listed at http://ughb.stanford.edu in the *Handbook for Undergraduate Engineering Programs.*

Basic Requirement 3 (Engineering Fundamentals)—The Engineering Fundamentals requirement is satisfied by a nucleus of technically rigorous introductory courses chosen from the various engineering disciplines. It is intended to serve several purposes. First, it provides students with a breadth of knowledge concerning the major fields of endeavor within engineering. Second, it allows the incoming engineering student an opportunity to explore a number of courses before embarking on a specific academic major. Third, the individual classes each offer a reasonably deep insight into a contemporary technological subject for the interested non-engineer.

The requirement is met by taking three courses from the following list, at least one of which must be chosen by the student rather than by the department:

ENGR 10. Introduction to Engineering Analysis
ENGR 14. Applied Mechanics: Statics and Deformables
ENGR 15. Dynamics
ENGR 20/CHEMENG 20. Introduction to Chemical Engineering
ENGR 25/CHEMENG 25. Biotechnology
ENGR 30. Engineering Thermodynamics
ENGR 40. Introductory Electronics[1]
ENGR 50/50M. Introductory Science of Materials[1]
ENGR 60. Engineering Economics
ENGR 62/MS&E 111. Introduction to Optimization
ENGR 70A,B/CS 106A,B *or ENGR 70X/CS 106X. Introduction to* Software Engineering

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[1] ENGR 40 and 50 may be taken on video at some of Stanford's Overseas Centers.

Basic Requirement 4 (Technology in Society)—It is important for the student to obtain a broad understanding of engineering as a social activity. To foster this aspect of intellectual and professional development, all engineering majors must take one course devoted to exploring issues arising from the interplay of engineering, technology, and society. Courses that fulfill this requirement are listed online at http://ughb.stanford.edu in the *Handbook for Undergraduate Engineering Programs*.

Basic Requirement 5 (Science and Design)—In order to satisfy ABET (Accreditation Board for Engineering and Technology) requirements, a student majoring in Chemical, Civil, Electrical, Environmental, or Mechanical Engineering must complete one and a half years of Engineering topics, consisting of a minimum of 68 units of Engineering Science and Engineering Design appropriate to the student's field of study. In most cases, students meet this requirement by completing the major program core and elective requirements in Fundamentals and Depth. For example, ENGR 40 is a 5-unit course; 3 of these 5 units are assigned to Engineering Science and the remaining 2 units are assigned to Engineering Design. A student may need to take additional courses in Depth in order to fulfill the minimum requirement. The science and design units assigned to each major's depth courses are listed online at http://ughb.stanford.edu/ in the *Handbook for Undergraduate Engineering Programs.*

MINORS

An undergraduate minor in Engineering may be pursued by interested students in many of the school's departments; consult with a department's undergraduate program representative or the Office of Student Affairs, Terman Engineering Center, room 201. General requirements and policies for a minor in the School of Engineering are: (1) a set of courses totaling not less than 18 and not more than 36 units, with a minimum of six courses of at least 3 units each; (2) the set of courses should be sufficiently coherent as to present a body of knowledge within a discipline or subdiscipline; (3) prerequisite mathematics, statistics, or science courses, such as those normally used to satisfy the school's requirements for a department major, may not be used to satisfy the requirements of the minor; conversely, engineering courses that serve as prerequisites for subsequent courses must be included in the unit total of the minor program; (4) departmentally based minor programs are structured at the discretion of the sponsoring department, subject only to requirements 1, 2, and 3 above. Interdisciplinary minor programs may be submitted to the Undergraduate Council for approval and sponsorship. A general Engineering minor is not offered.

AERONAUTICS AND ASTRONAUTICS (AA)

The Aero/Astro minor introduces undergraduates to the key elements of modern aerospace systems. Within the minor, students may focus on aircraft, spacecraft, or disciplines relevant to both. The course requirements for the minor are described in detail below. Courses cannot be double-counted within a major and a minor, or within multiple minors; if necessary, the Aero/Astro adviser can help select substitute courses to fulfill the AA minor core.

The following core courses fulfill the minor requirements:

AA 100. Introduction to Aeronautics and Astronautics	3
ENGR 14. Statics[1]	3
ENGR 15. Dynamics[1]	3
ENGR 30. Thermodynamics[1]	3
ME 70. Introductory Fluids	4
ME 131A. Heat Transfer	4
Two courses from one of the upper-division elective areas below (min. 6 units) plus one course from a second area below (min. 3 units):	9-11
Aerospace Systems Synthesis/Design:	
AA 236A,B. Spacecraft Design	8
AA 241A,B. Aircraft Design	6
Dynamics and Controls:	
AA 242A. Classical Dynamics	3
AA 271A. Dynamics and Control of Spacecraft/Aircraft	3
AA 279. Space Mechanics	3
ENGR 105. Feedback Control Design	3
ENGR 205. Introduction to Control Design Techniques	3
Fluids:	
AA 200A. Applied Aerodynamics	3
AA 210A. Fundamentals of Compressible Flow	3
AA 214A. Numerical Methods in Fluid Mechanics	3
or AA 283. Aircraft Propulsion	3
Structures:	
AA 240A. Analysis of Structures	3
AA 240B. Analysis of Structure II	3
AA 256. Mechanics of Composites	3

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[1] ENGR 14, 15, or 30 are waived as minor requirements if already taken as part of the major.

CHEMICAL ENGINEERING (CHE)

The following core courses fulfill the minor requirements:

ENGR 20/CHEMENG 20. Introduction to Chemical Engineering	3
CHEMENG 100. Chemical Process Modeling, Dynamics, and Control	3
CHEMENG 110. Equilibrium Thermodynamics	3
CHEMENG 120A. Fluid Mechanics	4
CHEMENG 120B. Energy and Mass Transport	4
CHEMENG 140. Microelectronics Processing Technology	
or CHEMENG 150. Biochemical Engineering	
or CHEMENG 160. Polymer Science and Engineering	3
CHEMENG 170. Kinetics and Reactor Design	3
CHEMENG 180. Chemical Engineering Plant Design	3
CHEMENG 185. Chemical Engineering Lab	4
CHEM 171. Physical Chemistry	3

CIVIL ENGINEERING (CEE)

The Civil Engineering minor is intended to give students an in-depth introduction to one or more areas of civil engineering. Departmental expertise and undergraduate course offerings are available in the areas of Construction Engineering and Management, Structural Engineering, Environmental Engineering, and Architectural Design. The minimum prerequisite for a Civil Engineering minor focusing on construction engineering and management or structural engineering is MATH 42 (or 21); however, many courses of interest require PHYSICS 41 and/or MATH 51 as prerequisites. The minimum prerequisite for a Civil Engineering minor focusing on architectural design is MATH 41 (or 19) and a course in Statistics. Students should recognize that a minor in Civil Engineering is not an ABET-accredited degree program.

Since civil engineering is a broad field and undergraduates with varying backgrounds may be interested in obtaining a civil engineering minor, no single set of course requirements is appropriate for all students. Instead, interested students are encouraged to propose their own set of courses within the guidelines listed below; this list must be officially approved by the Civil and Environmental Engineering (CEE) undergraduate minor adviser. Additional information on preparing a minor program, including example programs focusing on each of the areas of expertise listed above, is available in the CEE office (Environment and Energy Building, Room 316). While each example program focuses on a different area of expertise within the department, other combinations of courses are also possible.

General guidelines are:

1. A Civil Engineering minor must contain at least 24 units of course work not taken for the major, and must consist of at least six classes of at least 3 units each.
2. The list of courses must represent a coherent body of knowledge in a focused area, and should include classes that build upon one another.
3. Professor Anne Kiremidjian (kiremidjian@stanford.edu) is the CEE undergraduate minor adviser in Structural Engineering and Construction. Professor Lynn Hildemann (hildemann@stanford.edu) is the CEE minor adviser in Environmental Engineering. Patti Walters (pwalters@stanford.edu), Program Director for Architectural Design, is the CEE undergraduate minor adviser in Architectural Design. Students must consult one of these advisers in developing their minor program, and obtain approval of the finalized study list from them.

COMPUTER SCIENCE (CS)

The following core courses fulfill the minor requirements. Prerequisites include the standard mathematics sequence through MATH 51.

Introductory Programming (AP Credit may be used to fulfill this requirement):	
CS 106A,B. Programming Method/Abstractions	10
or CS 106X. Programming Method/Abstractions (Accelerated)	5
Core:	
CS 103A/B. Discrete Math/Structures	4-6
or CS 103X. Discrete Structures	
CS 107. Programming Paradigms	5
CS 108. Object-Oriented Systems Design	4
Electives (choose two courses from different areas):	
Artificial Intelligence:	
CS 121. Introduction to Artificial Intelligence	3
CS 221. AI: Principles and Techniques	4
Human-Computer Interaction:	
CS 147. Introduction to Human-Computer Interaction Design	3-4
Systems:	
CS 140. Operating Systems	4
CS 143. Compilers	4
CS 144. Networking	4
CS 145. Databases	4
CS 148. Graphics	3
Theory:	
CS 154. Automata and Complexity Theory	4
CS 157. Logic and Automated Reasoning	3
CS 161. Design and Analysis of Algorithms	4

Note: for students with no programming background and who begin with CS 106A, the minor consists of seven or eight courses.

ELECTRICAL ENGINEERING (EE)

Courses from any of the following three options, along with four graded EE courses of level 100 or higher (13-21 units), fulfill the minor requirements:

Option I:	
ENGR 40. Introductory Electronics	5
EE 101A. Circuits I	4
EE 101B. Circuits II	4
Four graded EE courses numbered 100 or higher	
Option II:	
ENGR 40. Introductory Electronics	5
EE 102A. Signal Processing and Linear Systems I	4
EE 102B. Signal Processing and Linear Systems II	4
Four graded EE courses numbered 100 or higher	
Option III:	
ENGR 40. Introductory Electronics	5
EE 108A. Digital Systems I	4
EE 108B. Digital Systems II	4
Four graded EE courses numbered100 or higher	

ENVIRONMENTAL ENGINEERING (ENV)

The Environmental Engineering minor is intended to give students a broad introduction to one or more areas of Environmental Engineering. Departmental expertise and undergraduate course offerings are available in the areas of environmental engineering and science, environmental fluid mechanics and hydrology, and atmosphere/energy. The minimum prerequisite for an Environmental Engineering minor is MATH 42 (or 21); however, many courses of interest require PHYSICS 41 and/or MATH 51 as prerequisites. Students should recognize that a minor in Environmental Engineering is not an ABET-accredited degree program.

Since undergraduates having widely varying backgrounds may be interested in obtaining an environmental engineering minor, no single set of course requirements is appropriate for all students. Instead, interested students are encouraged to propose their own set of courses within the guidelines listed below; this list must be officially approved by the Civil and Environmental Engineering (CEE) undergraduate minor adviser. Additional information on preparing a minor program, including example programs focusing on each of the areas of expertise listed above, is available in the CEE office (Environment and Energy Building, Room 316). While each example program focuses on a different area of expertise within the department, other combinations of courses are also possible.

General guidelines are:

1. An Environmental Engineering minor must contain at least 24 units of course work not taken for the major, and must consist of at least six classes of at least 3 units each.
2. The list of courses must represent a coherent body of knowledge in a focused area, and should include classes that build upon one another.
3. Professor Lynn Hildemann (hildemann@stanford.edu) is the CEE undergraduate minor adviser in Environmental Engineering. Students must consult with Professor Hildemann in developing their minor program, and obtain approval of the finalized study list from her.

MANAGEMENT SCIENCE AND ENGINEERING (MS&E)

The following courses fulfill the minor requirements:

Background requirement:	
MATH 51. Calculus	
Minor requirements:	
ENGR 60. Engineering Economy (prerequisite: MATH 41)	3
MS&E 111. Introduction to Optimization	4
MS&E 120. Probabilistic Analysis (prerequisite: MATH 51)	5
MS&E 121. Introduction to Stochastic Modeling	4
MS&E 130 *or* 134. Information	3-4
MS&E 142 *or* 160. Investment Science or Production	3-4
MS&E 180. Organizations: Theory and Management	4
Elective (any 100- or 200-level MS&E course)	3-4

MATERIALS SCIENCE AND ENGINEERING (MATSCI)

A minor in Materials Science and Engineering allows interested students to explore the role of materials in modern technology and to gain an understanding of the fundamental processes that govern materials behavior.

The following courses fulfill the minor requirements:

Fundamentals (choose one of the following):	
ENGR 50. Introductory Science of Materials, Nanotechnology Emphasis	4
ENGR 50M. Introductory Science of Materials, Biomaterials Emphasis	4
Materials Science Fundamentals and Depth (choose 6 of the following):	24
MATSCI 151. Microstructure and Mechanical Properties	4
MATSCI 152. Electronic Materials Engineering	4
MATSCI 153. Nanostructure and Characterization	4
MATSCI 154. Solid State Thermodynamics	4
MATSCI 155. Nanomaterials Synthesis	4
MATSCI 156. Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution	4
MATSCI 157. Quantum Mechanics for Materials Scientists	4
MATSCI 160. Nanomaterials Laboratory	4
MATSCI 161. Nanocharacterization Laboratory	4
MATSCI 162. X-Ray Diffraction Laboratory	4
MATSCI 163. Mechanical Behavior Laboratory	4
MATSCI 164. Electronic and Photonic Materials and Devices Laboratory	4
MATSCI 190. Organic Materials	4
MATSCI 192. Materials Chemistry	4
MATSCI 193. Atomic Arrangements in Solids	4
MATSCI 194. Phase Equilibria	4
MATSCI 195. Waves and Diffraction in Solids	4
MATSCI 196. Imperfections in Crystalline Solids	4
MATSCI 197. Rate Processes in Materials	4
MATSCI 198. Mechanical Properties of Materials	4
MATSCI 199. Electrical and Optical Properties of Solids	4

MECHANICAL ENGINEERING (ME)

The following courses fulfill the minor requirements:

General Minor: This minor aims to expose students to the breadth of ME in terms of topics and analytic and design activities. Prerequisites: MATH 41, 42, and PHYSICS 41.

ENGR 14. Applied Mechanics: Statics	3
ENGR 15. Dynamics	3
ENGR 30. Thermodynamics	3
ME 70. Introductory Fluids Engineering	4
ME 101. Visual Thinking	3
Plus two of the following:	
ME 80. Strength of Materials	4
ME 131A. Heat Transfer	4
ME 161. Dynamic Systems	4
ME 203. Manufacturing and Design	4

Thermosciences Minor Prerequisites: MATH 41, 42, 43, and PHYSICS 41.

ENGR 14. Applied Mechanics: Statics	3
ENGR 30. Thermodynamics	3
ME 70. Introductory Fluids Engineering	4
ME 131A. Heat Transfer	4
ME 131B. Fluid Mechanics	4
ME 140. Advanced Thermal Systems	5

Mechanical Design: This minor aims to expose students to design activities supported by analysis. Prerequisites: MATH 41, 42, and PHYSICS 41.

ENGR 14. Applied Mechanics: Statics	3
ENGR 15. Dynamics	3
ME 80. Strength of Materials	4
ME 101. Visual Thinking	3
ME 112. Mechanical Engineering Design	4
ME 203. Manufacturing and Design	4
Plus one of the following:	
ME 113. Engineering Design	4
ME 210. Introduction to Mechatronics	4
ME 220. Introduction to Sensors	4

GRADUATE PROGRAMS

ADMISSION

Application for admission with graduate standing in the school should be made to the graduate admissions committee in the appropriate department or program. While most graduate students have undergraduate preparation in an engineering curriculum, it is feasible to enter from other programs, including chemistry, geology, mathematics, or physics.

Fellowships and Assistantships—Departments and divisions of the School of Engineering award graduate fellowships, research assistantships, and teaching assistantships each year.

For further information and application instructions, see the department sections in this bulletin or http://gradadmissions.stanford.edu. Stanford undergraduates may also apply as coterminal students; details can be found in the "Degree Program Options" section above.

Registration—New graduate students should follow procedures for registration as listed in the University's quarterly *Time Schedule*. Adviser assignments can be obtained from department offices.

THE HONORS COOPERATIVE PROGRAM

Industrial firms, government laboratories, and other organizations may participate in the Honors Cooperative Program (HCP), a program that permits qualified engineers, scientists, and technology professionals admitted to Stanford graduate degree programs to register for Stanford courses and obtain the degree on a part-time basis in 55 areas of concentration. In 23 of these areas of concentration, the master's degree can be obtained entirely online.

Through this program, many graduate courses offered by the School of Engineering on campus are made available through the Stanford Center for Professional Development (SCPD). SCPD delivers more than 250 courses a year on television and online. For HCP employees who are not part of a graduate degree program at Stanford, courses and certificates are also available through a non-degree option and a non-credit professional education program. Non-credit short courses may be customized to meet a company's needs. For a full description of educational services provided by SCPD: see http://scpd.stanford.edu; call (650) 725-3000; fax (650) 725-2868; write Durand Building, Room 300, Stanford, CA 94305-4036; or email scpd-registration@stanford.edu.

MANUFACTURING

Programs in manufacturing are available at the undergraduate, master's, and Ph.D. level. Master's programs are offered by the departments of Civil and Environmental Engineering, Management Science and Engineering (MS&E), and Mechanical Engineering. The Construction Engineering and Management program, offered by the Department of Civil and Environmental Engineering, is also a manufacturing program for students interested in facility and public works manufacturing. Doctoral programs related to manufacturing are available in a number of departments and involve research projects ranging from reliable manufacturing methods for nanofabricated devices to models of production scheduling and supply chain management.

Doctoral programs related to manufacturing are available in a number of departments and involve research projects ranging from machine tool design to the integration of databases into production software.

For detailed information about the master's and Ph.D. programs, see the sections of this bulletin pertaining to management science, mechanical, and civil and environmental engineering. For more information on manufacturing research and education in Engineering, see http://www.stanford.edu/group/AIM and the web sites of departments.

CURRICULA

For further details about the following programs, see the department sections in this bulletin.

Related aspects of particular areas of graduate study are commonly covered in the offerings of several departments and divisions. Graduate students are encouraged, with the approval of their department advisers, to select courses in departments other than their own to achieve a broader appreciation of their field of study. For example, most departments in the school offer courses concerned with nanoscience, and a student interested in an aspect of nanotechnology can often gain appreciable benefit from the related courses given by departments other than her or his own.

Departments and divisions of the school offer graduate curricula as follows.

AERONAUTICS AND ASTRONAUTICS

The current research and teaching activities cover a number of advanced fields, with special emphasis on:

Active Noise Control
Aerodynamic Noise
Aeroelasticity
Aircraft Design, Performance, and Control
Applied Aerodynamics
Biomedical Mechanics
Computational Aero-Acoustics
Computational Fluid Dynamics
Computational Mechanics and Dynamical Systems
Control of Robots, including Space and Deep-Underwater Robots
Conventional and Composite Structures/Materials
Direct and Large Eddy Simulation of Turbulence
Distributed Control of Networks
High-Lift Aerodynamics
Hybrid Propulsion
Hypersonic and Supersonic Flow
Inertial Instruments
Multidisciplinary Design Optimization
Navigation Systems (especially GPS)
Networked and Hybrid Control
Optimal Control, Estimation, System Identification
Physical Gas Dynamics
Spacecraft Design and Satellite Engineering
Turbulent Flow and Combustion

BIOENGINEERING

Biomedical Computation
Biomedical Devices
Biomedical Imaging
Cardiovascular Engineering
Cell and Molecular Engineering
Mechanobiology
Musculoskeletal Engineering
Neuroscience Engineering
Regenerative Medicine

CHEMICAL ENGINEERING

Applied Statistical Mechanics
Biocatalysis
Biochemical Engineering and Biophysics
Bioengineering
Computational Materials Science
Colloid Science
Dynamics of Complex Fluids
Functional Genomics
Hydrodynamic Stability
Kinetics and Catalysis
Microrheology
Molecular Assemblies
Newtonian and Non-Newtonian Fluid Mechanics
Polymer Physics
Protein Biotechnology
Semiconductor Processing
Surface and Interface Science
Transport Mechanics

CIVIL AND ENVIRONMENTAL ENGINEERING

Atmosphere/Energy
Construction Engineering and Management
Design/Construction Integration
Environmental and Water Studies
  Environmental Engineering and Science
  Environmental Fluid Mechanics and Hydrology
Structural Engineering and Geomechanics
  Geomechanics
  Structural Engineering

COMPUTATIONAL AND MATHEMATICAL ENGINEERING

Applied and Computational Mathematics
Computational Fluid Dynamics
Computational Geometry and Topology
Discrete Mathematics and Algorithms
Numerical Analysis
Optimization
Partial Differential Equations
Stochastic Processes

COMPUTER SCIENCE

Algorithmic Game Theory
Analysis of Algorithms
Artificial Intelligence
Automated Deduction
Autonomous Agents
Biomedical Computation
Compilers
Complexity Theory
Computational Biology
Computational Geometry
Computational Logic
Computational Physics
Computer Architecture
Computer Graphics
Computer Logic
Computer Security
Computer Vision
Cryptography
Database Systems
Design Automation
Digital Libraries
Distributed and Parallel Computation
Electronic Commerce
Enterprise Management
Formal Verification
Haptic Display of Virtual Environments
Human-Computer Interaction
Image Processing
Knowledge-Based and Expert Systems

Knowledge Representation and Logic
Machine Learning
Mathematical Theory of Computation
Multi-Agent Systems
Natural Language and Speech Processing
Networks, Internet Infrastructure, and Distributed Systems
Operating Systems
Parallel Computing
Programming Systems/Languages
Reasoning Under Uncertainty
Robotics
Robust System Design
Scientific Computing and Numerical Analysis
Sensor Networks
Ubiquitous and Pervasive Computing

ELECTRICAL ENGINEERING

Computer Hardware
Computer Software Systems
Control and Systems Engineering
Communication Systems
Dynamic Systems and Optimization
Electronic Circuits
Electronic Devices, Sensors, and Technology
Fields, Waves, and Radioscience
Image Systems
Lasers, Optoelectronics, and Quantum Electronics
Network Systems
Signal Processing
Solid State Materials and Devices
VLSI Design

ENGINEERING

Interdepartmental Programs
Interdisciplinary Programs

MANAGEMENT SCIENCE AND ENGINEERING

Decision and Risk Analysis
Dynamic Systems
Economics
Entrepreneurship
Finance
Information
Marketing
Optimization
Organization Behavior
Organizational Science
Policy
Production
Stochastic Systems
Strategy

MATERIALS SCIENCE AND ENGINEERING

Biomaterials
Ceramics and Composites
Computational Materials Science
Electrical and Optical Behavior of Solids
Electron Microscopy
Fracture and Fatigue
Imperfections in Crystals
Kinetics
Magnetic Behavior of Solids
Magnetic Storage Materials
Nanomaterials
Photovoltaics
Organic Materials
Phase Transformations
Physical Metallurgy
Solid State Chemistry
Structural Analysis
Thermodynamics
Thin Films
X-Ray Diffraction

MECHANICAL ENGINEERING

Biomechanics
Combustion Science
Computational Mechanics
Controls
Design of Mechanical Systems
Dynamics
Environmental Science
Experimental Stress and Analysis
Fatigue and Fracture Mechanics
Finite Element Analysis
Fluid Mechanics
Heat Transfer
High Temperature Gas Dynamics
Kinematics
Manufacturing
Mechatronics
Product Design
Robotics
Sensors
Solids
Thermodynamics
Turbulence

MASTER OF SCIENCE

The M.S. degree is conferred on graduate students in engineering according to the University regulations stated in the "Graduate Degrees" section of this bulletin, and is described in the various department listings. A minimum of 45 units is usually required in M.S. programs in the School of Engineering. The presentation of a thesis is not a school requirement. Further information is found in departmental listings.

MASTER OF SCIENCE IN ENGINEERING

The M.S. in Engineering is available to students who wish to follow an interdisciplinary program of study that does not conform to a normal graduate program in a department.

There are three school requirements for the M.S. degree in Engineering: (1) the student's program must be a coherent one with a well-defined objective and must be approved by a department within the school; (2) the student's program must include at least 21 unit of courses within the School of Engineering with numbers 200 or above in which the student receives letter grades; and (3) the program must include a total of at least 45 units. Each student's program is administered by the particular department in which it is lodged and must meet the standard of quality of that department. Transfer into this program is possible from any program within the school by application to the appropriate department.

ENGINEER

The degree of Engineer is intended for students who want additional graduate training beyond that offered in an M.S. program. The program of study must satisfy the student's department and must include at least 90 units beyond the B.S. degree. The presentation of a thesis is required. The University regulations for the Engineer degree are stated in the "Graduate Degrees" section of this bulletin, and further information is available in the individual departmental sections of this bulletin.

DOCTOR OF PHILOSOPHY

Programs leading to the Ph.D. degree are offered in each of the departments of the school. University regulations for the Ph.D. are given in the "Graduate Degrees" section of this bulletin. Further information is found in departmental listings.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

The following Engineering courses deal with subject areas within engineering that are, in their essential nature, broader than the confines of any particular branch of engineering. These courses are taught by professors from several departments of the School of Engineering.

Of the courses described in this section, many are of general interest to both engineering and non-engineering students. In addition, certain departmental courses are of general interest and without prerequisites.

Students interested in the interactions between technology and society should also see the "Science, Technology, and Society" section of this bulletin.

PRIMARILY FOR UNDERGRADUATES

ENGR 10. Introduction to Engineering Analysis—Integrated approach to the fundamental scientific principles that are the cornerstones of engineering analysis: conservation of mass, atomic species, charge, momentum, angular momentum, energy, production of entropy expressed in the form of balance equations on carefully defined systems, and incorporating simple physical models. Emphasis is on setting up analysis problems arising in engineering. Topics: simple analytical solutions, numerical solutions of linear algebraic equations, and laboratory experiences. Provides the foundation and tools for subsequent engineering courses.

4 units, not given this year

ENGR 14. Applied Mechanics: Statics—The mechanics of particles, rigid bodies, trusses, frames, and machines in static equilibrium emphasizing the use of free-body diagrams and the principle of virtual work. Frictional effects and internal forces in structural members. Lab in Autumn; no lab in Spring. Prerequisite: PHYSICS 41 or consent of instructor. GER:DB-EngrAppSci

3 units, Aut (Farhat, C), Spr (Mitiguy, P)

ENGR 15. Dynamics—The application of Newton's Laws to solve static and dynamic problems, particle and rigid body dynamics, freebody diagrams, and writing equations of motion. 2-D and 3-D cases including gyroscopes, spacecraft, and rotating machinery. Solution of equations of motion and dynamic response of simple mechanical systems. Problem sessions. Prerequisites: MATH 23 or 43, PHYSICS 41. GER:DB-EngrAppSci

3 units, Aut (Niemeyer, G), Spr (Lew, A)

ENGR 20. Introduction to Chemical Engineering—(Same as CHEMENG 20.) Overview of chemical engineering through discussion and engineering analysis of physical and chemical processes. Topics: overall staged separations, material and energy balances, concepts of rate processes, energy and mass transport, and kinetics of chemical reactions. Applications of these concepts to areas of current technological importance: biotechnology, production of chemicals, materials processing, and purification. Prerequisite: CHEM 31. GER:DB-EngrAppSci

3 units, Spr (Robertson, C)

ENGR 25. Biotechnology—(Same as CHEMENG 25.) Interplay among biology, technology, and society. Topics include biological fundamentals, genetic engineering, protein production, pharmaceuticals, antibodies, plant biotechnology, vaccines, transgenic animals, and stem cells. The role of intellectual property, business, government regulations, and ethics in biotechnology. GER:DB-EngrAppSci

3 units, Spr (Wang, C)

ENGR 30. Engineering Thermodynamics—Concepts of energy and entropy from elementary considerations of the microscopic nature of matter. Use of basic thermodynamic concepts in the solution of engineering problems. Methods and problems in socially responsible economic generation and utilization of energy in central power stations, solar systems, gas turbine engines, refrigeration devices, and automobile engines. Prerequisites: MATH 19, 20, 21, or 41, 42, and PHYSICS 45 (formerly 51) or equivalent high school physics. GER:DB-EngrAppSci

3 units, Aut (Edwards, C), Win (Mitchell, R)

ENGR 31. Chemical Principles with Application to Nanoscale Science and Technology—Preparation for engineering disciplines emphasizing modern technological applications of solid state chemistry. Topics include: crystallography; chemical kinetics and equilibria; thermodynamics of phase changes and reaction; quantum mechanics of chemical bonding, molecular orbital theory, and electronic band structure of crystals; and the materials science of basic electronic and photonic devices. Prerequisite: high school or college chemistry background in stoichiometry, periodicity, Lewis and VSEPR structures, dissolution/precipitation and acid/base reactions, gas laws, and phase behavior. GER: DB-NatSci

4 units, Aut (McIntyre, P)

ENGR 40. Introductory Electronics—Electrical quantities and their measurement, including operation of the oscilloscope. Function of electronic components including resistor, capacitor, and inductor. Analog circuits including the operational amplifier and tuned circuits. Digital logic circuits and their functions. Lab assignments. Enrollment limited to 200. Lab. Prerequisite: PHYSICS 43. GER:DB-EngrAppSci

5 units, Aut (Howe, R), Spr (Wong, S)

ENGR 50. Introduction to Materials Science, Nanotechnology Emphasis—The structure, bonding, and atomic arrangements in materials leading to their properties and applications. Topics include electronic and mechanical behavior, emphasizing nanotechnology, solid state devices, and advanced structural and composite materials. GER:DB-EngrAppSci

4 units, Win (Melosh, N), Spr (Sinclair, R)

ENGR 50M. Introduction to Materials Science, Biomaterials Emphasis—Topics include: the relationship between atomic structure and macroscopic properties of man-made and natural materials; mechanical and thermodynamic behavior of surgical implants including alloys, ceramics, and polymers; and materials selection for biotechnology applications such as contact lenses, artificial joints, and cardiovascular stents. GER:DB-EngrAppSci

4 units, Aut (Heilshorn, S)

ENGR 60. Engineering Economy—Fundamentals of economic analysis. Interest rates, present value, and internal rate of return. Applications to personal and corporate financial decisions. Mortgage evaluation, insurance decision, hedging/risk reduction, project selection, capital budgeting, and investment valuation. Decisions under uncertainty and utility theory. Prerequisite: MATH 41 or equivalent. Recommended: sophomore or higher class standing; knowledge of elementary probability. GER:DB-EngrAppSci

3 units, Aut (Chiu, S), Win (Weber, T), Sum (Weber, T)

ENGR 62. Introduction to Optimization—(Same as MS&E 111.) Formulation and analysis of linear optimization problems. Solution using Excel solver. Polyhedral geometry and duality theory. Applications to contingent claims analysis, production scheduling, pattern recognition, two-player zero-sum games, and network flows. Prerequisite: MATH 51. GER:DB-EngrAppSci

4 units, Aut (Goel, A), Spr (Van Roy, B)

ENGR 70A. Programming Methodology—(Same as CS 106A.) Introduction to the engineering of computer applications emphasizing modern software engineering principles: object-oriented design, decomposition, encapsulation, abstraction, and testing. Uses the Java programming language. Emphasis is on good programming style and the built-in facilities of the Java language. No prior programming experience required. GER:DB-EngrAppSci

3-5 units, Aut (Sahami, M), Win, Spr (Young, P), Sum (Staff)

ENGR 70B. Programming Abstractions—(Same as CS 106B.) Abstraction and its relation to programming. Software engineering principles of data abstraction and modularity. Object-oriented programming, fundamental data structures (such as stacks, queues, sets) and data-directed design. Recursion and recursive data structures (linked lists, trees, graphs). Introduction to time and space complexity analysis. Uses the programming language C++ covering its basic facilities. Prerequisite: 106A or equivalent. GER:DB-EngrAppSci

3-5 units, Win (Zelenski, J), Spr (Staff), Sum (Staff)

ENGR 70X. Programming Abstractions (Accelerated)—(Same as CS 106X.) Intensive version of 106B for students with a strong programming background interested in a rigorous treatment of the topics at an accelerated pace. Additional advanced material and more challenging projects. Prerequisite: excellence in 106A or equivalent, or consent of instructor. GER:DB-EngrAppSci

3-5 units, Aut (Zelenski, J), Win (Cain, G)

ENGR 100. Teaching Public Speaking—The theory and practice of teaching public speaking and presentation development. Lectures/discussions on developing an instructional plan, using audiovisual equipment for instruction, devising tutoring techniques, and teaching delivery, organization, audience analysis, visual aids, and unique speaking situations. Weekly practice speaking. Students serve as apprentice speech tutors. Those completing course may become paid speech instructors in the Technical Communications Program. Prerequisite: consent of instructor.

5 units, Aut, Win, Spr (Staff)

ENGR 102E. Technical/Professional Writing for Electrical Engineers—Required of Electrical Engineering majors. The process of writing technical/professional documents. Lectures, writing assignments, individual conferences. Prerequisite: freshman English. Corequisite for WIM: EE 108A.

1 unit, Aut, Win (Staff)

ENGR 102M. Technical/Professional Writing for Mechanical Engineers—Required of Mechanical Engineering majors. The process of writing technical/professional documents. Lecture, writing assignments, individual conferences. Corequisite for WIM: ME 203, or consent of instructor.

1 unit, Aut, Win (Staff)

ENGR 103. Public Speaking—Priority to Engineering students. Speaking activities, from impromptu talks to carefully rehearsed formal professional presentations. How to organize and write speeches, analyze audiences, create and use visual aids, combat nervousness, and deliver informative and persuasive speeches effectively. Weekly class practice, rehearsals in one-on-one tutorials, videotaped feedback. Limited enrollment.

3 units, Aut, Win, Spr (Staff)

ENGR 105. Feedback Control Design—Design of linear feedback control systems for command-following error, stability, and dynamic response specifications. Root-locus and frequency response design techniques. Examples from a variety of fields. Some use of computer aided design with MATLAB. Prerequisite: EE 102, ME 161, or equivalent. GER:DB-EngrAppSci

3 units, Win (Rock, S), Sum (Emami-Naeini, A)

ENGR 110. Perspectives in Assistive Technology—(Graduate students register for 210.) Seminar. The medical, social, psychological, and technical challenges in designing assistive technologies to improve the lives of people with disabilities. Guest speakers include professionals, clinicians, and device users. Additional unit for students who prepare a project background and preliminary design report for an assistive technology project to be undertaken in ME 113 or as independent study in Spring Quarter.

1-2 units, Win (Nelson, D)

ENGR 115. Design the Tech Challenge—(Graduate students register for 215.) Students work with Tech Museum of San Jose staff to design the Tech Challenge, a yearly engineering competition for 6-12th grade students. Brainstorming, field trips to the museum, prototyping, coaching, and presentations to the Tech Challenge advisory board. See at http://techchallenge.thetech.org. May be repeated for credit.

2 units, Win (Staff)

ENGR 120. Fundamentals of Petroleum Engineering—(Same as ENERGY 120.) Lectures, problems, field trip. Engineering topics in petroleum recovery; origin, discovery, and development of oil and gas. Chemical, physical, and thermodynamic properties of oil and natural gas. Material balance equations and reserve estimates using volumetric calculations. Gas laws. Single phase and multiphase flow through porous media. GER:DB-EngrAppSci

3 units, Aut (Horne, R)

ENGR 130. Science, Technology, and Contemporary Society—(Same as STS 101/201.) Key social, cultural, and values issues raised by contemporary scientific and technological developments; distinctive features of science and engineering as sociotechnical activities; major influences of scientific and technological developments on 20th-century society, including transformations and problems of work, leisure, human values, the fine arts, and international relations; ethical conflicts in scientific and engineering practice; and the social shaping and management of contemporary science and technology. GER:DB-SocSci

4-5 units, Aut (McGinn, R)

ENGR 131. Ethical Issues in Engineering—(Same as STS 115) Moral rights and responsibilities of engineers in relation to society, employers, colleagues, and clients; cost-benefit-risk analysis, safety, and informed consent; the ethics of whistle blowing; ethical conflicts of engineers as expert witnesses, consultants, and managers; ethical issues in engineering design, manufacturing, and operations; ethical issues arising from engineering work in foreign countries; and ethical implications of the social and environmental contexts of contemporary engineering. Case studies, guest practitioners, and field research. Limited enrollment. GER:DB-Hum

4 units, alternate years, not given this year

ENGR 140A. Management of Technology Ventures—First of three-part sequence for students selected to the Mayfield Fellows Program. Management and leadership within high technology startups, focusing on entrepreneurial skills related to product and market strategy, venture financing and cash flow management, team recruiting and organizational development, and the challenges of managing growth and handling adversity in emerging ventures. Other engineering faculty, founders, and venture capitalists participate as appropriate. Recommended: accounting or finance course (MS&E 140, ECON 90, or ENGR 60).

3-4 units, Spr (Byers, T)

ENGR 140B. Management of Technology Ventures—Open to Mayfield Fellows only; summer internship at a technology startup. Students exchange experiences and continue the formal learning process. Activities journal. Credit given following quarter.

1 unit, Aut (Byers, T)

ENGR 140C. Management of Technology Ventures—Open to Mayfield Fellows only. Capstone to the 140 sequence. Students, faculty, employers, and venture capitalists share internship experiences and analytical frameworks. Students develop case studies and integrative project reports.

3 units, Aut (Byers, T)

ENGR 145. Technology Entrepreneurship—For juniors, seniors, and coterminal students of any major. The formation and growth of a high-impact enterprise including concepts essential to the entrepreneurial process, and the role of the individual and team in achieving success. Case studies, workshops, and a team project. GER:DB-SocSci

4 units, Aut (Gould, A; Kosnik, T), Win (Byers, T; Komisar, R; Kosnik, T)

ENGR 150. Social Innovation and Entrepreneurship—(Graduate students register for 250.) The art of innovation and entrepreneurship for social benefit. Project team develops, tests, and iteratively improves technology-based social innovation and business plan to deploy it. Feedback and coaching from domain experts, product designers, and successful social entrepreneurs. Limited enrollment; application required. See http://sie.stanford.edu.

1-6 units, Aut, Win, Spr (Behrman, W)

ENGR 154. Vector Calculus for Engineers—(Same as CME 100.) Computation and visualization using MATLAB. Differential vector calculus: analytic geometry in space, functions of several variables, partial derivatives, gradient, unconstrained maxima and minima, Lagrange multipliers. Integral vector calculus: multiple integrals in Cartesian, cylindrical, and spherical coordinates, line integrals, scalar potential, surface integrals, Green's, divergence, and Stokes' theorems. Examples and applications drawn from various engineering fields. Prerequisites: MATH 41 and 42, or 10 units AP credit. GER:DB-Math

5 units, Aut (Khayms, V; Darve, E)

ENGR 155A. Ordinary Differential Equations for Engineers—(Same as CME 102.) Analytical and numerical methods for solving ordinary differential equations arising in engineering applications: solution of initial and boundary value problems, series solutions, Laplace transforms, and non-linear equations; numerical methods for solving ordinary differential equations, accuracy of numerical methods, linear stability theory, finite differences. MATLAB programming as a tool kit for computations. Problems from various engineering fields. Prerequisite: CME 100/ENGR 154 or MATH 51. GER:DB-Math

5 units, Win (Darve, E)

ENGR 155B. Linear Algebra and Partial Differential Equations for Engineers—(Same as CME 104.) Linear algebra: matrix operations, systems of algebraic equations, Gaussian elimination, undetermined and overdetermined systems, coupled systems of ordinary differential equations, eigensystem analysis, normal modes. Fourier series with applications, partial differential equations arising in science and engineering, analytical solutions of partial differential equations. Numerical methods for solution of partial differential equations: iterative techniques, stability and convergence, time advancement, implicit methods, von Neumann stability analysis. Examples and applications from various engineering fields. Prerequisite: CME 102/ENGR 155A. GER:DB-Math

5 units, Spr (Khayms, V)

ENGR 155C. Introduction to Probability and Statistics for Engineers—(Same as CME 106.) Probability: random variables, independence, and conditional probability; discrete and continuous distributions, moments, distributions of several random variables. Topics in mathematical statistics: random sampling, point estimation, confidence intervals, hypothesis testing, non-parametric tests, regression and correlation analyses; applications in engineering, industrial manufacturing, medicine, biology, and other fields. Prerequisite: CME 100/ENGR154 or MATH 51. GER:DB-Math

3-4 units, Win, Sum (Khayms, V)

ENGR 159Q. Japanese Companies and Japanese Society—(Same as MATSCI 159Q.) Stanford Introductory Seminar. Preference to sophomores. The structure of a Japanese company from the point of view of Japanese society. Visiting researchers from Japanese companies give presentations on their research enterprise. The Japanese research ethic. The home campus equivalent of a Kyoto SCTI course. GER:DB-SocSci

3 units, Spr (Sinclair, R)

ENGR 192. Engineering Public Service Project—Volunteer work on a public service project with a technical engineering component. Project requires a faculty sponsor and a community partner such as a nonprofit organization, school, or individual. Required report. See http://soe.stanford.edu/publicservice. May be repeated for credit. Prerequisite: consent of instructor.

1-2 units, Aut (Staff), Win (Sheppard, S), Spr (Staff), Sum (Sheppard, S)

ENGR 199. Special Studies in Engineering—Special studies, lab work, or reading under the direction of a faculty member. Often research experience opportunities exist in ongoing research projects. Students make arrangements with individual faculty and enroll in the section number corresponding to the particular faculty member. May be repeated for credit. Prerequisite: consent of instructor.

1-15 units, Aut, Win, Spr (Staff)

ENGR 199W. Writing of Original Research for Engineers—Technical writing in science and engineering. Students produce a substantial document describing their research, methods, and results. Prerequisite: completion of freshman writing requirements; prior or concurrent in 2 units of research in the major department; and consent of instructor. WIM for BioMedical Computation.

1-3 units, Aut, Win, Spr, Sum (Staff)

PRIMARILY FOR GRADUATE STUDENTS

ENGR 202S. Writing: Special Projects—Structured writing instruction for students working on non-course related materials including theses, dissertations, and journal articles. Weekly individual conferences.

1-5 units, Aut, Win, Spr (Staff)

ENGR 202W. Technical and Professional Writing—The process of writing technical and professional documents. Analyzing audiences; defining purpose; generating and selecting appropriate report materials; structuring, designing, and drafting clear and convincing reports; and clear, concise, emphatic, and mechanically and grammatically clean editing. Weekly writing assignments and individual conferences.

3 units, Aut, Win, Spr (Staff)

ENGR 205. Introduction to Control Design Techniques—Review of root-locus and frequency response techniques for control system analysis and synthesis. State-space techniques for modeling, full-state feedback regulator design, pole placement, and observer design. Combined observer and regulator design. Lab experiments on computers connected to mechanical systems. Prerequisites: 105, MATH 103, 113. Recommended: Matlab.

3 units, Aut (Rock, S)

ENGR 206. Control System Design—Design and construction of a control system and working plant. Topics include: linearity, actuator saturation, sensor placement, controller and model order; linearization by differential actuation and sensing; analog op-amp circuit implementation. Emphasis is on qualitative aspects of analysis and synthesis, generation of candidate design, and engineering tradeoffs in system selection. Large team-based project. Limited enrollment. Prerequisite: 105.

4 units, Spr (Niemeyer, G)

ENGR 207A. Linear Control Systems I—Introduction to control of discrete-time linear systems. State-space models. Controllability and observability. The linear quadratic regulator. Prerequisite: 105 or 205.

3 units, Aut (Lall, S)

ENGR 207B. Linear Control Systems II—Probabilistic methods for control and estimation. Statistical inference for discrete and continuous random variables. Linear estimation with Gaussian noise. The Kalman filter. Prerequisite: 207A or EE 263.

3 units, Win (Lall, S)

ENGR 207C. Linear Control Systems III—Introduction to stochastic control. Markov decision processes and stochastic dynamic programming. Separation of control and estimator design. Stochastic optimal control. Prerequisite: 207B.

3 units, not given this year (Lall, S)

ENGR 209A. Analysis and Control of Nonlinear Systems—First of series. Introduction to nonlinear phenomena: multiple equilibria, limit cycles, bifurcations, complex dynamical behavior. Planar dynamical systems, analysis using phase plane techniques. Describing functions. Lyapunov stability theory. SISO feedback linearization, sliding mode control. Design examples. Prerequisites: 205, MATH 113, EE 263.

3 units, Win (Staff)

ENGR 210. Perspectives in Assistive Technology—(Undergraduates register for 110; see 110.)

1-2 units, Win (Nelson, D)

ENGR 210A. Robust Control—Analysis and design techniques for multivariable feedback systems. Stability and robustness of feedback loops, passivity, and the small-gain theorem. Prerequisite: 207A or EE 263.

3 units, not given this year (Lall, S)

ENGR 210B. Advanced Topics in Computation for Control—Recent developments in computational techniques for feedback control systems. The use of convex optimization to solve problems in control. Prerequisites: Background in convex optimization, such as EE 364, and background in control, such as ENGR 207B.

3 units, not given this year (Lall, S)

ENGR 215. Design the Tech Challenge—(Undergraduates register for 115; see 115.)
2 units, Win (Staff)

ENGR 231. Transformative Design—Project-based. How interactive technologies can be designed to encourage behavioral transformation. Topics such as self-efficacy, social support, and mechanism of cultural change in domains such as weight-loss, energy conservation, or safe driving. Lab familiarizes students with hardware and software tools for interaction prototyping. Students teams create functional prototypes for self-selected problem domains.
3-5 units, Win (Roth, B; Ju, W; Jain, S)

ENGR 240. Introduction to Micro and Nano Electromechanical Systems (M/NEMS)—For first-year graduate students and seniors. The role of miniaturization technologies in materials, mechanical, biomedical engineering, and information technology. M/NEMS facbrication techniques, device applications, and the design tradeoffs in developing systems.
3 units, Aut (Pruitt, B)

ENGR 250. Social Innovation and Entrepreneurship—(Undergraduates register for 150; see 150.)
1-6 units, Aut, Win, Spr (Behrman, W)

ENGR 251. Work Seminar—Students participate in the Creating Research Examples Across the Teaching Enterprise (CREATE) writing program. Goal is for students to produce, through a peer reviewed process, 1,000 word statements describing their research in ways that are understandable and compelling to undergraduates and other novices in the field. Unit credit when the final approved statements appear on the CREATE web site.
1 unit, not given this year

ENGR 290. Graduate Environment of Support—For course assistants (CAs) and tutors in the School of Engineering tutorial and learning program. Interactive training for effective academic assistance. Pedagogy, developing course material, tutoring, and advising. Sources include video, readings, projects, and role playing.
1 unit, Aut (Osgood, B; Lozano, N)

ENGR 298. Seminar in Fluid Mechanics—Interdepartmental. Problems in all branches of fluid mechanics, with talks by visitors, faculty, and students. Graduate students may register for 1 unit, without letter grade; a letter grade is given for talks. May be repeated for credit.
1 unit, Aut (Staff), Win (Staff), Spr (Staff)

ENGR 299. Special Studies in Engineering—Special studies, lab work, or reading under the direction of a faculty member. Often research experience opportunities exist in ongoing research projects. Students make arrangements with individual faculty and enroll in the corresponding section. Prerequisite: consent of instructor.
1-15 units, Aut, Win, Spr, Sum (Staff)

ENGR 310A. Tools for Team-Based Design—(Same as ME 310A.) For graduate students; open to limited SITN/global enrollment. Project-based, exposing students to the tools and methodologies for forming and managing an effective engineering design team in a business environment, including product development teams that may be spread around the world. Topics: personality profiles for creating teams with balanced diversity; computational tools for project coordination and management; real time electronic documentation as a critical design process variable; and methods for refining project requirements to ensure that the team addresses the right problem with the right solution. Computer-aided tools for supporting geographically distributed teams. Final project analyzes industry-sponsored design projects for consideration in 310B,C. Investigation includes benchmarking and meetings with industrial clients. Deliverable is a detailed document with project specifications and optimal design team for subsequent quarters. Limited enrollment.
3-4 units, Aut (Cutkosky, M; Leifer, L)

ENGR 310B,C. Design Project Experience with Corporate Partners—(Same as ME 310B,C.) Two quarter project for graduate students with design experience who want involvement in an entrepreneurial design team with real world industrial partners. Products developed are part of the student's portfolio. Each team functions as a small startup company with a technical advisory board of the instructional staff and a coach. Computer-aided tools for project management, communication, and documentation; budget provided for direct expenses including technical assistants and conducting tests. Corporate liaisons via site visits, video conferencing, email, fax, and phone. Hardware demonstrations, peer reviews, scheduled documentation releases, and a team environment provide the mechanisms and culture for design information sharing. Enrollment by consent of instructor; depends on a pre-enrollment survey in December and recommendations by project definition teams in 310A. For some projects, 217 and 218 may be prerequisites or corequisites; see http://me310.stanford.edu for admission guidelines.
3-5 units, **B:** *Win,* **C:** *Spr (Cutkosky, M; Leifer, L)*

ENGR 310X. Tools for Team-Based Design Global Teaming Lab—(Same as ME 310X.) Participation in a global design team with students in Sweden or Japan. Limited enrollment. May be repeated for credit. Prerequisite: consent of instructor. Corequisite: ENGR 310A,B,C.
1-5 units, Aut, Win, Spr, Sum (Leifer, L; Cutkosky, M)

ENGR 311A. Women's Perspective: Choose Your Own Adventure—Master's and Ph.D. seminar series driven by student interests. Possible topics: time management, career choices, health and family, diversity, professional development, and personal values. Graduate students share experiences and examine scientific research in these areas. Guests speakers from academia and industry, student presentations with an emphasis on group discussion. May be repeated for credit.
1 unit, Win (Staff)

ENGR 311B. Design the Engineer—The nature of engineering work; how to integrate this work into students' future. Prerequisite: 311A or consent of instructor.
1 unit, Spr (Roth, B)

ENGR 341. Micro/Nano Systems Design and Fabrication Laboratory—Theory and fundamentals. Hands-on training in the Stanford Nanofabrication Facility. Prerequisite: ENGR 240 or equivalent.
3-5 units, Spr (Solgaard, O; Pruitt, B)

OVERSEAS STUDIES

These courses are approved for the School of Engineering and offered on video overseas at the location indicated. Students should discuss with their major department adviser which courses would best meet individual needs. Descriptions are in the "Overseas Studies" section of this bulletin.

BERLIN

OSPBER 40B. Introductory Electronics
5 units, Aut, Win (Howe, R), Spr (Wong, S)

OSPBER 50B. Introductory Science of Materials
4 units, Aut, Win, Spr (Staff)

FLORENCE

OSPFLOR 50F. Introductory Science of Materials
4 units, Aut Aut, Win, Spr (Staff)

KYOTO

OSPKYOTO 40K. Introductory Electronics
5 units, Spr (Wong, S)

PARIS

OSPPARIS 40P. Introductory Electronics
5 units, Aut, Spr (Wong, S)

OSPPARIS 50P. Introductory Science of Materials
4 units, Aut, Win (Staff)

AERONAUTICS AND ASTRONAUTICS

Emeriti: (Professors) Peter Bradshaw, Arthur E. Bryson, Robert H. Cannon, I-Dee Chang, Chi-Chang Chao, Richard Christensen,* Daniel B. DeBra,* Erastus H. Lee, Jean Mayers, Bradford W. Parkinson,* J. David Powell,* Charles R. Steele, Stephen W. Tsai,* Milton D. Van Dyke, Walter G. Vincenti

Chair: Brian J. Cantwell

Professors: Brian J. Cantwell, Fu-Kuo Chang, Per Enge, Antony Jameson, Ilan Kroo, Sanjiva Lele, Robert W. MacCormack, Stephen Rock, George S. Springer, Claire Tomlin

Associate Professors: Juan Alonso, Sanjay Lall

Assistant Professor: Matthew West

Lecturer: Thomas H. Pulliam

Courtesy Professors: Charbel Farhat, Ronald K. Hanson, Lambertus Hesselink

Consulting Professors: Belgacem Jaroux, Arif Karabeyoglu, Cynthia H. Null, Robert Twiggs, Stanley Weiss, Gregory Zilliac

Consulting Assistant Professors: James Cutler, Steven Murray

Visiting Associate Professor: Dennis Akos

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* Recalled to active duty.

Phone: (650) 723-3317

Web Site: http://aa.stanford.edu

Courses given in Aeronautics and Astronautics have the subject code AA. For a complete list of subject codes, see Appendix.

The Department of Aeronautics and Astronautics prepares students for professional positions in industry, government, and academia by offering a comprehensive program of graduate teaching and research. In this broad program, students have the opportunity to learn and integrate multiple engineering disciplines. The program emphasizes structural, aerodynamic, guidance and control, and propulsion problems of aircraft and spacecraft. Courses in the teaching program lead to the degrees of Master of Science, Engineer, and Doctor of Philosophy. Undergraduates and doctoral students in other departments may also elect a minor in Aeronautics and Astronautics.

Requirements for all degrees include courses on basic topics in Aeronautics and Astronautics, as well as in mathematics, and related fields in engineering and the sciences.

The current research and teaching activities cover a number of advanced fields, with emphasis on:

Active Noise Control
Aerodynamic Noise
Aeroelasticity and Flow Simulation
Aircraft Design, Performance, and Control
Applied Aerodynamics
Biomedical Mechanics
Computational Aero-Acoustics
Computational Fluid Dynamics
Computational Mechanics and Dynamical Systems
Control of Robots, including Space and Deep-Underwater Robots
Conventional and Composite Materials and Structures
Direct and Large-Eddy Simulation of Turbulence
High-Lift Aerodynamics
Hybrid Propulsion
Hypersonic and Supersonic Flow
Inertial Instruments
Multidisciplinary Design Optimization
Navigation Systems (especially GPS)
Networked and Hybrid Control
Optimal Control, Estimation, System Identification
Physical Gas Dynamics
Spacecraft Design and Satellite Engineering
Turbulent Flow and Combustion

INSTRUCTION AND RESEARCH

FACILITIES

The work of the department is centered in the William F. Durand Building for Space Engineering and Science. This 120,000 square foot building houses advanced research and teaching facilities and concentrates in one complex the Department of Aeronautics and Astronautics as well as some of the activities of the Mechanical Engineering Department.

The Durand Building also houses faculty and staff offices and several conference rooms. Attached to the building is a modern classroom building equipped for televising lectures; it contains a lecture auditorium.

Through the department's close relations with nearby NASA-Ames Research Center, students and faculty have access to one of the best and most extensive collections of experimental aeronautical research facilities in the world, as well as the latest generation of supercomputers.

GENERAL INFORMATION

Further information about the facilities and programs of the department is available at http://aa.stanford.edu/, or from the department's student services office.

The department has a student branch of the American Institute of Aeronautics and Astronautics, which sponsors programs and speakers covering aerospace topics and social events. It also conducts visits to nearby research, government, and industrial facilities, and sponsors a Young Astronauts Program in the local schools.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

Although primarily a graduate-level department, Aeronautics and Astronautics offers both an undergraduate minor and an interdisciplinary program in Aeronautics and Astronautics (AA) leading to the B.S. degree in Engineering. For detailed information, see the "School of Engineering" section of this bulletin and the *Handbook for Undergraduate Engineering Programs*, available from the Office of the Dean of Engineering or at http://ughb.stanford.edu.

Undergraduates interested in aerospace are encouraged to combine either a minor or a coterminal M.S. in Aeronautics and Astronautics with a major in a related discipline (such as Mechanical or Electrical Engineering). Students considering these options are encouraged to contact the department's student services office.

COTERMINAL DEGREES PROGRAM

This special program allows Stanford undergraduates an opportunity to work simultaneously toward a B.S. in another field and an M.S. in Aeronautics and Astronautics. General requirements for this program and admissions procedures are described in the "School of Engineering" section of this bulletin. Admission is granted or denied through the departmental faculty Admissions and Awards Committee. A coterminal student must meet the course and scholarship requirements detailed for the M.S. below.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

Admission—To be eligible to apply for admission to the department, a student must have a bachelor's degree in engineering, physical science, mathematics, or an acceptable equivalent. Students who have not yet received a master's degree in a closely allied discipline will be admitted to the master's program; eligibility for the Ph.D. program is considered after the master's year (see "Doctor of Philosophy" below). Applications for admission with financial aid (fellowships or assistantships) or without financial aid must be received and completed by December 4 for the next Autumn Quarter.

Information about admission to the Honors Cooperative Program is included in the "School of Engineering" section of this bulletin. The department may consider HCP applications for Winter or Spring quarters as well as for Autumn Quarter; prospective applicants should contact the department's student services office.

Further information and application forms for all graduate degree programs may be obtained from Graduate Admissions, the Registrar's Office, http://gradadmissions.stanford.edu/.

Waivers and Transfer Credits—Students may receive departmental waivers of required courses for the M.S. degree in Aeronautics and Astronautics by virtue of substantially equivalent and satisfactorily performed course work at other institutions. A waiver petition (signed by the course instructor and adviser) should be submitted to the student services office indicating (1) the Stanford University course number and title, and (2) the institution, number(s), and title(s) of the course(s) wherein substantially equivalent material was treated. If a waiver is granted, the student must take an additional technical elective, chosen in consultation with their adviser, from graduate courses in Aeronautics and Astronautics. The total 45-unit requirement for the master's degree is not reduced by course waivers.

A similar procedure should be followed for transfer credits. The number of transfer credits allowed for each degree (Engineer and Ph.D.) is delineated in the "Graduate Degrees" section of this bulletin; transfer credit is not accepted for the M.S. degree. Transfer credit is allowed only for courses taken as a graduate student, after receiving a bachelor's degree, in which equivalence to Stanford courses is established and for which a grade of 'B' or better has been awarded. Transfer credits, if approved, reduce the total number of Stanford units required for a degree.

Fellowships and Assistantships—Fellowships and course or research assistantships are available to qualified graduate students. Fellowships sponsored by Gift Funds, Stanford University, and Industrial Affiliates of Stanford University in Aeronautics and Astronautics provide grants to several first-year students for the nine-month academic year to cover tuition and living expenses. Stanford Graduate Fellowships, sponsored by the University, provide grants for three full years of study and research; each year, the department is invited to nominate several outstanding doctoral or predoctoral students for these prestigious awards. Students who have excelled in their master's-level course work at Stanford are eligible for course assistantships in the department; those who have demonstrated research capability are eligible for research assistantships from individual faculty members. Students may also hold assistantships in other departments if the work is related to their academic progress; the criteria for selecting course or research assistants are determined by each hiring department. A standard, 20 hours/week course or research assistantship provides a semi-monthly salary and an 8-10 unit tuition grant per quarter. Research assistants may be given the opportunity of additional summer employment. They may use their work as the basis for a dissertation or Engineer's thesis.

MASTER OF SCIENCE

The University's basic requirements for the master's degree are outlined in the "Graduate Degrees" section of this bulletin. Students with an aeronautical engineering background should be able to qualify for the master's degree in three quarters of work at Stanford. Students with a bachelor's degree in Physical Science, Mathematics, or other areas of Engineering may find it necessary to take certain prerequisite courses, which would lengthen the time required to obtain the master's degree. The following are departmental requirements.

Grade Point Averages—A minimum grade point average (GPA) of 2.75 is required to fulfill the department's M.S. degree requirements and a 3.4 is the minimum required for eligibility to attempt the Ph.D. qualifying examination. It is incumbent upon both M.S. and potential Ph.D. candidates to request letter grades in all courses except those that do not offer a letter grade option and those that fall into the categories of colloquia and seminars (for example, AA 297 and ENGR 298). Insufficient grade points on which to base the GPA may delay expected degree conferral or result in refusal of permission to take the qualifying examinations. Candidates with GPAs of 3.0 through 3.4 may request the permission of the candidacy committee to attempt the qualifying examinations.

AERONAUTICS AND ASTRONAUTICS

The master's program (45 units) in Aeronautics and Astronautics (AA) is designed to provide a solid grounding in the basic disciplines. All candidates for this degree are expected to meet the basic course requirements in experimentation in aeronautics and astronautics, fluid mechanics, guidance and control, propulsion, and structural mechanics (category A below), in addition to work in applied mathematics (category B) and technical electives (category C).

A. *Basic Courses*—Candidates choose eight courses as follows:

1. One course in each basic area of Aeronautics and Astronautics:
    a) Experimentation: 241X, 236A, 257, 284B, or 290; or ENGR 205, 206, or 207A
    b) Fluids: one of 200A, 200B, 210A
    c) Guidance and Control: ENGR 105
    d) Propulsion: 283
    e) Structures: 240A
2. Three courses, one each from three of the areas below:
    a) Fluids: 200A or 200B (if 210A was taken or waived in item 1); or 210A (if 200A or 200B was taken or waived in item 1)
    b) Structures: 240B or 256
    c) Guidance and Control: 242A, 271A, or 279
    d) Aero/Astro elective: AA course numbered 200 and above, excluding seminars and independent research.

Candidates who believe they have satisfied a basic course requirement in previous study may request a waiver of one or more courses (see "Waivers and Transfer Credits" above).

B. *Mathematics Courses*—During graduate study, each candidate is expected to develop a competence in the applied mathematics pertinent to his or her major field. This requirement can be met by matriculating in a minimum of 6 units in either (1) applied mathematics (for example, complex variables, linear algebra, partial differential equations, probability), or (2) technical electives that strongly emphasize applied mathematics. A list of courses approved for the mathematics requirement is available in the departmental student services office. (Calculus, ordinary differential equations, and vector analysis are fundamental mathematics prerequisites, and do not satisfy the master's mathematics requirement.) Students planning to continue to the Ph.D. should note that 25 percent of the major-field Ph.D. qualifying examination is devoted to pertinent mathematics.

C. *Technical Electives*—Candidates, in consultation with their advisers, select at least four courses (totaling at least 12 units) in their major field from among the graduate-level courses offered by the departments of the School of Engineering and related science departments. This requirement increases by one course, taken in either the major or peripheral fields, for each basic course that is waived. Normally, one course (3 units) in this category may be directed research. Courses taken in satisfaction of the other master's requirements (categories A, B, and D) may not also be counted as technical electives.

D. *Other Electives*—It is recommended that all candidates enroll in at least one humanities or social science course. Language classes qualify in this category, but practicing courses in, for example, art, music, and physical education do not qualify.

When planning their programs, candidates should check course descriptions carefully to ensure that all prerequisites have been satisfied. A course that is taken to satisfy a prerequisite for courses in category A (basic courses) or B (mathematics) cannot be counted as a technical elective, but can count toward the M.S. degree in category D (other electives).

ENGINEERING

Students whose career objectives require a more interdepartmental or narrowly focused program than is possible in the M.S. program in Aeronautics and Astronautics (AA) may pursue a program for an M.S. degree in Engineering (45 units). This program is described in the School of Engineering "Graduate Programs of Study" section of this bulletin.

Sponsorship by the Department of Aeronautics and Astronautics in this more general program requires that the student file a proposal before completing 18 units of the proposed graduate program. The proposal must be accompanied by a statement explaining the objectives of the program and how the program is coherent, contains depth, and fulfills a well-defined career objective. The proposed program must include at least 12 units of graduate-level work in the department and meet rigorous standards of technical breadth and depth comparable to the regular AA Master of Science program. The grade and unit requirements are the same as for the M.S. degree in Aeronautics and Astronautics.

ENGINEER

The degree of Engineer represents an additional year (or more) of study beyond the M.S. degree and includes a research thesis. The program is designed for students who wish to do professional engineering work upon graduation and who want to engage in more specialized study than is afforded by the master's degree alone. It is expected that fulltime students will be able to complete the degree within two years of study after the master's degree.

The University's basic requirements for the degree of Engineer are outlined in the "Graduate Degrees" section of this bulletin. The following are department requirements.

The candidate's prior study program should have fulfilled the department's requirements for the master's degree or a substantial equivalent. Beyond the master's degree, a total of 45 units of work is required, including a thesis and a minimum of 30 units of courses chosen as follows:

1. 24 units of approved technical electives, of which 9 are in mathematics or applied mathematics. (A list of courses approved for the mathematics requirement is available in the departmental student services office.) The remaining 15 units are chosen in consultation with the adviser, and represent a coherent field of study related to the thesis topic. Suggested fields include: (a) acoustics, (b) aerospace structures, (c) aerospace systems synthesis and design, (d) analytical and experimental methods in solid and fluid mechanics, (e) computational fluid dynamics, and (f) guidance and control.
2. 6 units of free electives.
3. The remaining 15 units may be thesis, research, technical courses, or free electives.

Candidates for the degree of Engineer are expected to have a minimum grade point average (GPA) of 3.0 for work in courses beyond those required for the master's degree. All courses except seminars and directed research should be taken for a letter grade.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree are outlined in the "Graduate Degrees" section of this bulletin. Department requirements are stated below.

Qualifications for candidacy for the doctoral degree are contingent on:

1. Having fulfilled department requirements for the master's degree or its substantial equivalent.
2. Maintaining a high scholastic record for graduate course work.
3. Completing 3 units of a directed research problem (AA 290 or an approved alternative).
4. In the first year of doctoral study, passing an oral Ph.D. qualifying examination given by the department during Autumn and Spring quarters.

Detailed information about the deadlines, nature, and scope of the Ph.D. qualifying examination can be obtained from the department. Research on the doctoral dissertation may not be formally started before passing this examination.

Beyond the master's degree, a total of 90 additional units of work is required, including a minimum of 36 units of approved formal course work (excluding research, directed study, and seminars). The courses should consist primarily of graduate courses in engineering and related sciences, and should form a strong and coherent doctoral program. At least 12 units must be from graduate-level courses in mathematics or applied mathematics (a list of approved courses is available from the department student services office). University requirements for continuous registration apply to doctoral students for the duration of the degree.

Dissertation Reading Committee—Each Ph.D. candidate is required to establish a reading committee for the doctoral dissertation within six months after passing the department's Ph.D. Qualifying exams. Thereafter, the student should consult frequently with all members of the committee about the direction and progress of the dissertation research.

A dissertation reading committee consists of the principal dissertation adviser and at least two other readers. Reading committees in Aeronautics and Astronautics often include faculty from another department. It is expected that at least two members of the AA faculty be on each reading committee. If the principal research adviser is not within the AA department, then the student's AA academic adviser should be one of those members. The initial committee, and any subsequent changes, must be officially approved by the department Chair.

University Oral and Dissertation—The Ph.D. candidate is required to take the University oral examination after the dissertation is substantially completed (with the dissertation draft in writing), but before final approval. The examination consists of a public presentation of dissertation research, followed by substantive private questioning on the dissertation and related fields by the University oral committee (four selected faculty members, plus a chair from another department). Once the oral has been passed, the student finalizes the dissertation for reading committee review and final approval. Forms for the University oral scheduling and a one-page dissertation abstract should be submitted to the department student services office at least three weeks prior to the date of the oral for departmental review and approval.

PH.D. MINOR

A student who wishes to obtain a Ph.D. minor in Aeronautics and Astronautics should consult the department office for designation of a minor adviser. A minor in Aeronautics and Astronautics may be obtained by completing 20 units of graduate-level courses in the Department of Aeronautics and Astronautics, following a program (and performance) approved by the department's candidacy chair.

The student's Ph.D. reading committee and University oral committee must each include at least one faculty member from Aeronautics and Astronautics.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement. (AU) indicates that the course is subject to the University Activity Unit limitations for undergraduates (8 units maximum).

AA 100. Introduction to Aeronautics and Astronautics—The principles of fluid flow, flight, and propulsion; the creation of lift and drag, aerodynamic performance including take-off, climb, range, and landing performance, structural concepts, propulsion systems, trajectories, and orbits. The history of aeronautics and astronautics. Prerequisites: MATH 41, 42; elementary physics. GER:DB-EngrAppSci

3 units, Aut (MacCormack, R)

AA 113N. Structures: Why Things Don't (and Sometimes Do) Fall Down—Stanford Introductory Seminar. Preference to freshmen. How structures created by nature or built by human beings keep things up and keep things in. Topics: nature's structures from microorganisms to large vertebrae; buildings from ancient dwellings to modern skyscrapers; spacecraft and airplanes; boats from ancient times to America's Cup sailboats, and how they win or break; sports equipment from Odysseus's bow to modern skis; and biomedical devices including bone replacements and cardiovascular stents. How composite materials are used to make a structure light and strong. GER:DB-EngrAppSci

3 units, Win (Springer, G)

AA 190. Directed Research and Writing in Aero/Astro—For undergraduates. Experimental or theoretical work under faculty direction, and emphasizing development of research and communication skills. Written report(s) and letter grade required; if this is not appropriate, enroll in 199. Consult faculty in area of interest for appropriate topics, involving one of the graduate research groups or other special projects. May be repeated for credit. Prerequisite: consent of student services manager and instructor. WIM

3-5 units, Aut, Win, Spr, Sum (Staff)

AA 199. Independent Study in Aero/Astro—Directed reading, lab, or theoretical work for undergraduate students. Consult faculty in area of interest for appropriate topics involving one of the graduate research groups or other special projects. May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

AA 200A. Applied Aerodynamics—Fundamental equations of fluid dynamics and the physical assumptions on which they are based; overview of appropriate methods for solving these equations including nonlinear CFD, linear panel and vortex methods; estimation of pressure distributions and resultant airloads on 2-D airfoils, finite wings, slender bodies, and lifting systems; compressibility effects; boundary layer analysis and prediction of drag, separation, and displacement effects. Application to airfoil and wing design. Prerequisite: undergraduate aeronautics course. Recommended: 210A.
3 units, Win (MacCormack, R)

AA 200B. Applied Aerodynamics II—Analytical and numerical techniques for the aerodynamic analysis of aircraft, focusing on finite wing theory, far-field and Trefftz-plane analysis, two-dimensional laminar and turbulent boundary layers in airfoil analysis, similarity rules, aerodynamic stability derivatives. Bi-weekly assignments require MATLAB or a suitable programming language. Prerequisite: 200A or equivalent. Recommended: 210A.
3 units, Aut (Kroo, I)

AA 201A. Fundamentals of Acoustics—Acoustic equations for a stationary homogeneous fluid; wave equation; plane, spherical, and cylindrical waves; harmonic (monochromatic) waves; simple sound radiators; reflection and transmission of sound at interfaces between different media; multipole analysis of sound radiation; Kirchoff integral representation; scattering and diffraction of sound; propagation through ducts (dispersion, attenuation, group velocity); sound in enclosed regions (reverberation, absorption, and dispersion); radiation from moving sources; propagation in the atmosphere and underwater. Prerequisite: first-year graduate standing in engineering, mathematics, sciences; or consent of instructor.
3 units, Spr (Lele, S)

AA 206. Bio-Aerodynamics—Topics: flapping flight, low Reynolds number aerodynamics, wing design, flocks, swarms, and dynamic soaring. Readings from current and historical literature dealing with theoretical and observational studies. Applications in aircraft design, and simulation-based problem sets. Prerequisite: course in aerodynamics such as 100, 200A, or 241A.
3 units, not given this year (Kroo, I)

AA 208. Aerodynamics of Aircraft Dynamic Response and Stability—Companion to 200A for those interested in control and guidance. Typical vehicles and the technical tradeoffs affecting their design. Equations of motion, stressing applications to dynamic performance, stability, and forced response. Forms and sources for the required aerodynamic data. Response to small disturbances and stability derivatives. Static stability and trim. Review of aerodynamic fundamentals, leading to airload predictions for wings, bodies, and complete aircraft. Paneling and other methods for derivative estimation. Natural motions of the aircraft, and the influence on them of various configuration parameters. Vehicle behavior in maneuvers of small and large amplitudes. Prerequisites: 200A, 210A, or equivalents (may be taken concurrently).
3 units, Win (Kroo, I)

AA 210A. Fundamentals of Compressible Flow—Topics: development of the three-dimensional, nonsteady, field equations for describing the motion of a viscous, compressible fluid; differential and integral forms of the equations; constitutive equations for a compressible fluid; the entropy equation; compressible boundary layers; area-averaged equations for one-dimensional steady flow; shock waves; channel flow with heat addition and friction; flow in nozzles and inlets; oblique shock waves; Prandtl-Meyer expansion; unsteady one-dimensional flow; the shock tube; small disturbance theory; acoustics in one-dimension; steady flow in two-dimensions; potential flow; linearized potential flow; lift and drag of thin airfoils. Prerequisites: undergraduate background in fluid mechanics and thermodynamics.
3 units, Aut (Cantwell, B)

AA 210B. Fundamentals of Compressible Flow—Continuation of 210A with emphasis on more general flow geometry. Use of exact solutions to explore the hypersonic limit. Identification of similarity parameters. Solution methods for the linearized potential equation with applications to wings and bodies in steady flow; their relation to physical acoustics and wave motion in nonsteady flow. Nonlinear solutions for nonsteady constant area flow and introduction to Riemann invariants. Elements of the theory of characteristics; nozzle design; extension to nonisentropic flow. Real gas effects in compressible flow. Flows in various gas dynamic testing facilities. Prerequisite: 210A.
3 units, not given this year

AA 214A. Numerical Methods in Fluid Mechanics—Principles underlying the Navier-Stokes equations. Relations between time-accurate and relaxation methods. Implicit and explicit methods combined with flux splitting and space factorization. Considerations of accuracy, stability of numerical methods, and programming complexity. Prerequisites: knowledge of linear algebra and CME 200, 204, or equivalents with consent of instructor.
3 units, Aut (Pulliam, T)

AA 214B. Numerical Computation of Compressible Flow—Numerical methods for solving hyperbolic sets of partial differential equations. Explicit, implicit, flux-split, finite difference, and finite volume procedures for approximating the governing equations and boundary conditions. Numerical solution by direct approximate factorization and iterative Gauss-Seidel line relaxation. Application to Euler equations. Computational problems. Prerequisite: 214A.
3 units, Win (MacCormack, R)

AA 214C. Numerical Computation of Viscous Flow—Numerical methods for solving parabolic sets of partial differential equations. Numerical approximation of the equations describing compressible viscous flow with adiabatic, isothermal, slip, and no-slip wall boundary conditions. Applications to the Navier-Stokes equations in two and three dimensions at high Reynolds number. Computational problems are assigned. Prerequisite: 214B.
3 units, Spr (MacCormack, R)

AA 215A,B. Advanced Computational Fluid Dynamics—(Same as CME 215A,B.) High resolution schemes for capturing shock waves and contact discontinuities; upwinding and artificial diffusion; LED and TVD concepts; alternative flow splittings; numerical shock structure. Discretization of Euler and Navier Stokes equations on unstructured meshes; the relationship between finite volume and finite element methods. Time discretization; explicit and implicit schemes; acceleration of steady state calculations; residual averaging; math grid preconditioning. Automatic design; inverse problems and aerodynamic shape optimization via adjoint methods. Pre- or corequisite: 214B or equivalent.
3 units, **A:** *Win,* **B:** *Spr (Jameson, A)*

AA 218. Introduction to Symmetry Analysis—Methods of symmetry analysis and their use in the reduction and simplification of physical problems. Topics: dimensional analysis, phase-space analysis of autonomous systems of ordinary differential equations, use of Lie groups to reduce the order of nonlinear ODEs and to generate integrating factors, use of Lie groups to reduce the dimension of partial differential equations and to generate similarity variables, exact solutions of nonlinear PDEs generated from groups. Mathematica-based software developed by the instructor is used for finding invariant groups of ODEs and PDEs.
3 units, given next year (Cantwell, B)

AA 222. Introduction to Multidisciplinary Design Optimization—Design of aerospace systems within a formal optimization environment. Mathematical formulation of the multidisciplinary design problem (parameterization of design space, choice of objective functions, constraint definition); survey of algorithms for unconstrained and constrained optimization and optimality conditions; description of sensitivity analysis techniques. Hierarchical techniques for decomposition of the multidisciplinary design problem; use of approximation theory. Applications to design problems in aircraft and launch vehicle design. Prerequisites: multivariable calculus; familiarity with a high-level programming language: FORTRAN, C, C++, or MATLAB.

3 units, Spr (Kroo, I)

AA 236A. Spacecraft Design—The design of unmanned spacecraft and spacecraft subsystems emphasizing identification of design drivers and current design methods. Topics: spacecraft configuration design, mechanical design, structure and thermal subsystem design, attitude control, electric power, command and telemetry, and design integration and operations.

5 units, Aut (Cutler, J)

AA 236B,C,D. Spacecraft Design Laboratory—Continuation of 236A. Emphasis is on practical application of systems engineering to the life cycle program of spacecraft design, testing, launching, and operations. Prerequisite: 236A or consent of instructor.

3 units, **B:** *Win,* **C:** *Spr,* **D:** *Sum (Cutler, J)*

AA 238. Human-Centered Design for Aerospace Engineers—The what, when, who, and how of human-centered design. Is it art, magic, science, or engineering? How to integrate human-centered processes into engineering design processes. Analysis of recent human-centered aeronautical and space systems to evaluate successes and limitations.

3 units, Win (Null, C)

AA 240A. Analysis of Structures—Elements of two-dimensional elasticity theory. Boundary value problems; energy methods; analyses of solid and thin walled section beams, trusses, frames, rings, monocoque and semimonocoque structures. Prerequisite: ENGR 14 or equivalent.

3 units, Aut (Chang, F)

AA 240B. Analysis of Structures—Thin plate analysis. Structural stability. Material behavior: plasticity and fracture. Introduction of finite element analysis; truss, frame, and plate structures. Prerequisite: 240A or consent of instructor.

3 units, Win (West, M)

AA 241A,B. Introduction to Aircraft Design, Synthesis, and Analysis—New aircraft systems emphasizing commercial aircraft. Economic and technological factors that create new aircraft markets. Determining market demands and system mission performance requirements; optimizing configuration to comply with requirements; the interaction of disciplines including aerodynamics, structures, propulsion, guidance, payload, ground support, and parametric studies. Applied aerodynamic and design concepts for use in configuration analysis. Application to a student-selected aeronautical system; applied structural fundamentals emphasizing fatigue and fail-safe considerations; design load determination; weight estimation; propulsion system performance; engine types; environmental problems; performance estimation. Direct/indirect operating costs prediction and interpretation. Aircraft functional systems; avionics; aircraft reliability and maintainability. Prerequisite: 100 or equivalent.

3 units, not given this year

AA 241X. Design, Construction, and Testing of Autonomous Aircraft—Students grouped according to their expertise to carry out the multidisciplinary design of a solar-powered autonomous aircraft that must meet a clearly stated set of design requirements. Design and construction of the airframe, integration with existing guidance, navigation, and control systems, and development and operation of the resulting design. Design reviews and reports. Prerequisites: expertise in any of the following by having satisfied the specified courses or equivalent: conceptual design (241A,B); applied aerodynamics (200A,B); structures (240A); composite manufacturing experience; guidance and control (208/271, ENGR 205).

3 units, not given this year

AA 242A. Classical Dynamics—(Same as ME 331A.) Accelerating and rotating reference frames. Kinematics of rigid body motion; Euler angles, direction cosines. D'Alembert's principle, equations of motion. Inertia properties of rigid bodies. Dynamics of coupled rigid bodies. Lagrange's equations and their use. Dynamic behavior, stability, and small departures from equilibrium. Prerequisite: ENGR 15 or equivalent.

3 units, Aut (West, M)

AA 242B. Advanced Dynamics—(Same as ME 331B.) Formulation of equations of motion with Newton/Euler equations; angular momentum principle; D'Alembert principle; power, work, and energy; Kane's method; and Lagrange's equations. Numerical solutions of nonlinear algebraic and dfferential equations govering the behavior of multiple degree of freedom systems. Computed torque control.

3 units, Win (Mitiguy, P)

AA 243. Modern Dynamics—Vector fields on manifolds. Curvilinear coordinate transforms. Tensor calculus. Lagrangian and Hamiltonian systems. Symmetry groups and conservation laws. Holonomic and non-holonomic constraints. Unilateral constraints and contact. Invariant structures in phase space. Linearized dynamics. Linear and nonlinear stability. Prerequisite: 242A.

3 units, not given this year (West, M)

AA 246. Computational Impact and Contact Modeling—Rigid body contact including multi-body impact, persistent contact, complementarity formulations, and solution techniques. Impact of elastic bodies using finite elements including penalty and mixed constraint formulations, solution techniques, and time-stepping methods. Shocks and vibration induced by impact. Friction and plasticity models for impact and persistent contact. Prerequisites: 242A, 242B or equivalent, familiarity with MATLAB.

3 units, not given this year (West, M)

AA 252. Techniques of Failure Analysis—Introduction to the field of failure analysis, including fire and explosion analysis, large scale catastrophe projects, traffic accident reconstruction, aircraft accident investigation, human factors, biomechanics and accidents, design defect cases, materials failures and metallurgical procedures, and structural failures. Product liability, failure modes and effects analysis, failure prevention, engineering ethics, and the engineer as expert witness.

3 units, Spr (Murray, S)

AA 253. Aerospace Product and Systems Development—Modern approaches to aerospace design development for life cycle value. Concepts of air and space systems development in a systems context. Stakeholder value issues and requirements through manufacturing and delivery. Processes and practices for functional analysis, concept and architecture development, trades, domain criteria, interfaces, and verification and validation. Reliability, risk, and safety. Value stream analysis, integrated product and process development, key characteristics, and hardware/software integration aimed at information systems. Tools involve quality function deployment, design structure matrices, and decision mechanisms.

3 units, Spr (Weiss, S)

AA 254. Information Systems in Aerospace Vehicles—Sensors, processors, activators, and operators, and the media and protocols that integrate them for performance and safety.

2 units, Win (Staff)

AA 256. Mechanics of Composites—Fiber reinforced composites. Stress, strain, and strength of composite laminates and honeycomb structures. Failure modes and failure criteria. Environmental effects. Manufacturing processes. Design of composite structures. Individual design project required of each student, resulting in a usable computer software. Prerequisite: ENGR 14 or equivalent.

3 units, Win (Chang, F)

AA 257. Design of Composite Structures—Hands-on design, analysis, and manufacturing in composites. Composite beams, columns, and plates; application of finite element methods to composite structures; failure analysis and damage tolerance design of composite structures; and impact damage, compression after impact, and bolted and bonded composites joints. Class divided into working teams (design, analysis, manufacturing, and tests) to design and build a composite structure to be tested to failure; the structure may enter the national SAMPE composite bridge design contest. Prerequisite: 256 or consent of instructor.
3 units, not given this year (Chang, F)

AA 271A. Dynamics and Control of Spacecraft and Aircraft—The dynamic behavior of aircraft and spacecraft, and the design of automatic control systems for them. For aircraft: non-linear and linearized longitudinal and lateral dynamics; linearized aerodynamics; natural modes of motion; autopilot design to enhance stability, control the flight path, and perform automatic landings. For spacecraft in orbit: natural longitudinal and lateral dynamic behavior and the design of attitude control systems. Prerequisites: AA242A, ENGR 105.
3 units, Spr (Rock, S)

AA 272C. Global Positioning Systems—The principles of satellite navigation using GPS. Positioning techniques using code tracking, single and dual frequency, carrier aiding, and use of differential GPS for improved accuracy and integrity. Use of differential carrier techniques for attitude determination and precision position determination. Prerequisite: familiarity with matrix algebra.
3 units, Win (Enge, P)

AA 272D. Integrated Navigation Systems—Navigation satellites (GPS, GLONASS), GPS receivers, principles of inertial navigation for ships, aircraft, and spacecraft. Kalman Filters to integrate GPS and inertial sensors. Radio navigation aids (VOR, DME, LORAN, ILS). Doppler navigation systems. Prerequisites: 272C; ENGR 15, 105. Recommended: ENGR 205.
3 units, Spr (Enge, P)

AA 279. Space Mechanics—Orbits of near-earth satellites and interplanetary probes; transfer and rendezvous; decay of satellite orbits; influence of earth's oblateness; sun and moon effects on earth satellites. Prerequisite: ENGR 15 or equivalent.
3 units, Spr (West, M)

AA 283. Aircraft and Rocket Propulsion—Introduction to the design and performance of airbreathing and rocket engines. Topics: the physical parameters used to characterize propulsion system performance; gas dynamics of nozzles and inlets; cycle analysis of ramjets, turbojets, turbofans, and turboprops; component matching and the compressor map; introduction to liquid and solid propellant rockets; multistage rockets; hybrid rockets; thermodynamics of reacting gases. Prerequisites: undergraduate background in fluid mechanics and thermodynamics.
3 units, Win (Cantwell, B)

AA 284A. Advanced Rocket Propulsion—The principles of rocket propulsion system design and analysis. Fundamental aspects of the physics and chemistry of rocket propulsion. Focus is on the design and analysis of chemical propulsion systems including liquids, solids, and hybrids. Nonchemical propulsion concepts such as electric and nuclear rockets. Launch vehicle design and optimization issues including trajectory calculations. Limited enrollment. Prerequisites: 283 or consent of instructor.
3 units, Spr (Karabeyoglu, M)

AA 284B. Propulsion System Design Laboratory—Propulsion systems engineering through the design and operation of a sounding rocket. Students work in small teams through a full project cycle including requirements definition, performance analysis, system design, fabrication, ground and flight testing, and evaluation. Prerequisite: 284A and consent of instructor.
3 units, Aut (Zilliac, G)

AA 284C. Propulsion System Design Laboratory—Continuation of 284A,B. Prerequisite: 284B, and consent of instructor.
3 units, Win (Zilliac, G)

AA 290. Problems in Aero/Astro—(Undergraduates register for 190 or 199.) Experimental or theoretical investigation. Students may work in any field of special interest. Register for section belonging to your research supervisor.
1-5 units, Aut, Win, Spr (Staff)
1-15 units, Sum (Staff)

AA 291. Practical Training—Educational opportunities in high-technology research and development labs in aerospace and related industries. Internship integrated into a student's academic program. Research report outlining work activity, problems investigated, key results, and any follow-on projects. Meets the requirements for Curricular Practical Training for students on F-1 visas. Student is responsible for arranging own employment and should see department student services manager before enrolling. May be repeated for credit.
1-3 units, Sum (Staff)

AA 294. Case Studies in Aircraft Design—Presentations by researchers and industry professionals. Registration for credit optional. May be repeated for credit.
1 unit, Spr (Jameson, A)

AA 297. Seminar in Guidance, Navigation, and Control—For graduate students with an interest in automatic control applications in flight mechanics, guidance, navigation, and mechanical design of control systems; others invited. Problems in all branches of vehicle control, guidance, and instrumentation presented by researchers on and off campus. Registration for credit optional. May be repeated for credit.
1 unit, Aut (Rock, S), Win (Lall, S), Spr (Enge, P)

AA 300. Engineer Thesis—Thesis for degree of Engineer. Students register for section belonging to their thesis adviser.
1-15 units, Aut, Win, Spr, Sum (Staff)

AA 301. Ph.D. Dissertation—Prerequisite: completion of Ph.D qualifying exams. Students register for section belonging to their thesis adviser.
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CME 200. Linear Algebra with Application to Engineering Computations—(Same as ME 300A.)
3 units, Aut (Moin, P)

CME 204. Partial Differential Equations in Engineering—(Same as ME 300B.)
3 units, Win (Shaqfeh, E)

CME 206. Introduction to Numerical Methods for Engineering—(Same as ME 300C.)
3 units, Spr (Moin, P)

CME 342. Parallel Methods in Numerical Analysis
3 units, Spr (Staff)

EE 366. Introduction to Fourier Optics
3 units, Aut (Hesselink, L)

ENGR 105. Feedback Control Design
3 units, Win (Rock, S), Sum (Emami-Naeini, A)

ENGR 205. Introduction to Control Design Techniques
3 units, Aut (Rock, S)

ENGR 206. Control System Design
4 units, Spr (Niemeyer, G)

ENGR 207A. Linear Control Systems I
3 units, Aut (Lall, S)

ENGR 207B. Linear Control Systems II
3 units, Win (Lall, S)

ENGR 209A. Analysis and Control of Nonlinear Systems
3 units, Win (Staff)

ENGR 210A. Robust Control
3 units, not given this year (Lall, S)

ENGR 298. Seminar in Fluid Mechanics
1 unit, Aut, Win, Spr (Staff)

ME 359A. Advanced Design and Engineering of Space Systems I
4 units, not given this year

ME 359B. Advanced Design and Engineering of Space Systems II
4 units, not given this year

ME 361. Turbulence
3 units, Spr (Pitsch, H)

ME 451A. Advanced Fluid Mechanics
3 units, not given this year

ME 451B. Advanced Fluid Mechanics
3 units, Spr (Shaqfeh, E)

ME 461. Advanced Topics in Turbulence
3 units, Aut (Lele, S)

ME 469A. Computational Methods in Fluid Mechanics
3 units, Win (Iaccarino, G)

BIOENGINEERING

Chair: Russ B. Altman
Co-Chair: Stephen R. Quake
Professors: Russ B. Altman, Annelise E. Barron, Dennis R. Carter, Scott L. Delp, Norbert J. Pelc, Stephen R. Quake, Matthew Scott, James R. Swartz, Paul Yock
Associate Professors: Kwabena Boahen, Charles Taylor
Assistant Professors: Zev David Bryant, Jennifer R. Cochran, Markus Wilard Covert, Karl Deisseroth
Courtesy Professors: Sanjiv Sam Gambhir, Michael T. Longaker
Courtesy Associate Professors: Jeffrey A. Feinstein, Garry E. Gold, Christopher Jacobs, Kim Butts Pauly
Affiliated Faculty: Atul J. Butte, Rebecca Fahrig, Stuart B. Goodman, Marc E Levenston, Craig Levin, John Linehan, Mark Musen, David S. Paik, Sylvia K. Plevritis, Mark J. Schnitzer, Krishna V. Shenoy, Daniel Mark Spielman

Student Services: Clark Center, Room S-166
Mail Code: 94305-5444
Student Services Phone: (650) 723-8632
Web Site: http://bioengineering.stanford.edu/

Courses given in Bioengineering have the subject code BIOE. For a complete list of subject codes, see Appendix.

The mission of the Department of Bioengineering is to create a fusion of engineering and the life sciences that promotes scientific discovery and the invention of new technologies and therapies through research and education. The department encompasses both the use of biology as a new engineering paradigm and the application of engineering principles to medical problems and biological systems. The discipline embraces biology as a new science base for engineering.

Bioengineering is jointly supported by the School of Engineering and the School of Medicine. The facilities and personnel of the Department of Bioengineering are housed in the James H. Clark Center, Allen Center for Integrated Systems, William F. Durand Building for Space Engineering and Science, William M. Keck Science Building, and the Richard M. Lucas Center for Magnetic Resonance Spectroscopy and Imaging.

The departmental headquarters is located in the James H. Clark Center for Biomedical Engineering and Sciences, along with approximately 600 faculty, staff, and students from more than 40 University departments. The Clark Center is also home to Stanford's Bio-X program, a collaboration of the Schools of Engineering, Medicine, Humanities and Sciences, and Earth Sciences.

Courses in the teaching program lead to the degrees of Master of Science and Doctor of Philosophy. The department collaborates in research and teaching programs with faculty members in Chemical Engineering, Mechanical Engineering, Electrical Engineering, and departments in the School of Medicine. Quantitative biology is the core science base of the department. The research and educational thrusts are in biomedical computation, biomedical imaging, biomedical devices, regenerative medicine, and cell/molecular engineering. The clinical dimension of the department includes cardiovascular medicine, neuroscience, orthopedics, cancer care, neurology, and environment.

UNDERGRADUATE PROGRAMS

Although primarily a graduate-level department, pre-approved B.S. majors in Biomechanical Engineering and Biomedical Computation can be arranged through the School of Engineering. For detailed information, see the "School of Engineering" section of this bulletin and the *Handbook for Undergraduate Engineering Programs* at http://ughb.stanford.edu and available from the Office of the Dean of Engineering.

COTERMINAL B.S./M.S. PROGRAM

This option is available to outstanding Stanford undergraduates who wish to work simultaneously toward a B.S. in another field and an M.S. in Bioengineering. The degrees may be granted simultaneously or at the conclusion of different quarters, though the bachelor's degree cannot be awarded after the master's degree has been granted. As Bioengineering does not currently offer an undergraduate program, the B.S. degree must be from another department. The University minimum requirements for the coterminal bachelor's/master's program are 180 units for the bachelor's degree plus 45 unduplicated units for the master's degree. Students may apply for the coterminal B.S. and M.S. program after 120 units are completed and they must be accepted into our program one quarter before receiving the B.S. degree. Students should apply directly to the Bioengineering Department. We require students interested in our coterminal degree to take the Graduate Record Examination (GRE); applications may be obtained at http://www.gre.org. New coterminal applications and procedures are now available on the Office of the University Registrar web site. Access the new application form, instructions, and supporting documents online at http://bioengineering.stanford.edu/education/coterminal.html; University regulations and forms concerning coterminal degree programs are available at http://registrar.stanford.edu/shared/publications.htm#Coterm.

The application must provide evidence of potential for strong academic performance as a graduate student. The application is evaluated and acted by the graduate admissions committee of the department. Students are expected to enter with a series of core competencies in mathematics, biology, chemistry, physics, computing, and engineering. Typically, a GPA of at least 3.5 in engineering, science, and math is expected.

GRADUATE PROGRAMS

The University's requirements for the M.S. and Ph.D. degrees are outlined in the "Graduate Degrees" section of this bulletin.

Admission—Students are expected to enter with a series of core competencies in mathematics, biology, chemistry, physics, computing, and engineering. Students entering the program are assessed by the examination of their undergraduate transcripts and research experiences. Specifically, we require that students have completed mathematics through multivariable calculus and differential equations, completed a series of undergraduate biology courses (equivalent to BIOSCI 41, 42, 43 series) and completed physics, chemistry, and computer sciences courses required of all undergraduate majors in engineering.

Qualified applicants are encouraged to apply for predoctoral national competitive fellowships, especially those from the National Science Foundation. Applicants to the Ph.D. program should consult with their financial aid officers for information and applications.

The deadline for receiving applications is January 8, 2008.

Further information and application forms for all graduate degree programs may be obtained from Graduate Admissions, the Registrar's Office, http://gradadmissions.stanford.edu/.

MASTER OF SCIENCE

The Master of Science in Bioengineering requires 45 units of course work. The curriculum consists of core bioengineering courses, technical electives, seminars and unrestricted electives. Core courses focus on quantitative biology and biological systems analysis. Approved technical electives are chosen by the student in consultation with his/her graduate adviser, and can be selected from graduate course offerings in mathematics, statistics, engineering, physical sciences, life sciences, and medicine. Seminars highlight emerging research in bioengineering and provide training in research ethics. Unrestricted electives can be freely chosen by the student in association with his/her adviser.

The department's requirements for the M.S. in Bioengineering are:

1. Core *Bioengineering courses* (9 units); the following courses are required:
    - BIOE 300A. Molecular and Cellular Bioengineering
    - BIOE 300B. Quantitative Mammalian Physiology and Tissue Engineering
    - BIOE 301A. Molecular and Cellular Bioengineering Lab
    - BIOE 301B. Clinical Needs and Technology

    These courses, together with the approved technical electives, should form a cohesive course of study that provides depth and breadth.
2. *Approved Technical Electives* (27 units): these units must be selected from graduate courses in mathematics, statistics, engineering, physical science, life science, and medicine. They should be chosen in concert with the bioengineering courses to provide a cohesive degree program in a bioengineering focus area. Students are required to take at least one course in some area of design or instrumentation. Up to 9 units of directed study and research may be used as approved electives.
3. *Seminars* (3 units): the seminar units should be fulfilled through BIOE 390, Introduction to Bioengineering Research, BIOE 393, Bioengineering Forum, or BIOE 459, Frontiers in Interdisciplinary Biosciences. Other relevant seminar units may also be used with the approval of the faculty adviser. One of the seminar units must be MED 255, The Responsible Conduct of Research.
4. *Unrestricted Electives* (6 units).

Students are assigned an initial faculty adviser to assist them in designing a plan of study that creates a cohesive degree program with a concentration in a particular bioengineering focus area. These focus areas include, but are not limited to: Biomedical Computation, Regenerative Medicine/Tissue Engineering, Molecular and Cell Bioengineering, Biomedical Imaging, and Biomedical Devices.

To ensure that an appropriate program is pursued by all M.S. candidates, students who first matriculate at Stanford at the graduate level (a) submit an adviser approved Program Proposal for a Master's Degree form to the student services office during the first month of the first quarter of enrollment and (b) obtain approval from the M.S. adviser and the Chair of Graduate Studies for any subsequent program change or changes. It is expected that the requirements for the M.S. in Bioengineering can be completed within approximately one year. There is no thesis requirement for the M.S.

DOCTOR OF PHILOSOPHY

A student studying for the Ph.D. degree must complete a master's degree (45 units) comparable to that of the Stanford M.S. degree in Bioengineering. Up to 45 units of master's degree residency units may be counted towards the degree. The Ph.D. degree is awarded after the completion of a minimum of 135 units of graduate work as well as satisfactory completion of any additional University requirements. Students admitted to the Ph.D. program with an M.S. degree must complete at least 90 units of work at Stanford. The maximum number of transfer units is 45.

On the basis of the research interests expressed in their application, students are assigned an initial faculty adviser who assists them in choosing courses and identifying research opportunities. The department does not require formal lab rotations, but students are encouraged to explore research activities in two or three labs during their first academic year.

Prior to being formally admitted to candidacy for the Ph.D. degree, the student must demonstrate knowledge of bioengineering fundamentals and a potential for research by passing a qualifying oral examination.

Typically, the exam is taken shortly after the student earns a master's degree. The student is expected to have a nominal graduate Stanford GPA of 3.25 to be eligible for the exam. Once the student's faculty sponsor has agreed that the exam is to take place, the student must submit an application folder containing items including a curriculum vitae, research project abstract, and preliminary dissertation proposal to the student services office. Information about the exam may be obtained from the student services office.

In addition to the course requirements of the M.S. degree, doctoral candidates must complete a minimum of 15 additional units of approved formal course work (excluding research, directed study, and seminars).

Dissertation Reading Committee—Each Ph.D. candidate is required to establish a reading committee for the doctoral dissertation within six months after passing the department's Ph.D. Qualifying exams. Thereafter, the student should consult frequently with all members of the committee about the direction and progress of the dissertation research.

A dissertation reading committee consists of the principal dissertation adviser and at least two other readers. Reading committees in Bioengineering may include faculty from another department. It is expected that at least one member of the Bioengineering faculty be on each reading committee. The initial committee, and any subsequent changes, must be officially approved by the department Chair.

University Oral and Dissertation—The Ph.D. candidate is required to take the University oral examination after the dissertation is substantially completed (with the dissertation draft in writing), but before final approval. The examination consists of a public presentation of dissertation research, followed by substantive private questioning on the dissertation and related fields by the University oral committee (four selected faculty members, plus a chair from another department). Once the oral has been passed, the student finalizes the dissertation for reading committee review and final approval. Forms for the University oral scheduling and a one-page dissertation abstract should be submitted to the department student services office at least three weeks prior to the date of the oral for departmental review and approval.

M.D./PH.D. DUAL DEGREE PROGRAM

Students interested in a career oriented towards bioengineering and medicine can pursue the combined M.D./Ph.D. degree program. Stanford has two ways to do an M.D./Ph.D. U.S. citizens and permanent residents can apply to the Medical Scientist Training Program and can be accepted with funding from both M.D. and Ph.D. programs for stipend and tuition. They can then select a bioengineering laboratory for their Ph.D. Students not admitted to the Medical Scientist Training Program must apply to be admitted separately to the M.D. program and the Ph.D. program of their choice.

The Ph.D. is administered by the Department of Bioengineering. To be formally admitted as a Ph.D. degree candidate in this combined degree program, the student must apply through normal departmental channels and must have earned or have plans to earn an M.S. in bioengineering or other engineering discipline at Stanford or another university. The M.S. requires 45 units of course work which consists of core bioengineering courses, technical electives, seminars, and 6 unrestricted units. Students must also pass the Department of Bioengineering Ph.D. qualifying examination.

For students fulfilling the full M.D. requirements who earned their master's level engineering degree at Stanford, the Department of Bioengineering waives the normal departmental requirement of 15 units applied towards the Ph.D. degree beyond the master's degree level through formal course work. Consistent with the University Ph.D. requirements, the department accepts 15 units comprised of courses, research, or seminars approved by the student's academic adviser and the department chair. Students not completing their M.S. engineering degree at Stanford are required to take 15 units of formal course work in engineering-related areas as determined by their academic adviser.

COURSES

STANFORD INTRODUCTORY SEMINARS

BIOE 70Q. Medical Device Innovation—Stanford Introductory Seminar. Preference to sophomores. Commonly used medical devices in different medical specialties. Guest lecturers include Stanford Medical School physicians, entrepreneurs, and venture capitalists. How to identify clinical needs and design device solutions to address these needs. Fundamentals of starting a company. Field trips to local medical device companies; workshops. No previous engineering training required.

3 units, Spr (Doshi, R; Mandato, J)

ADVANCED UNDERGRADUATE AND GRADUATE

BIOE 191. Bioengineering Problems and Experimental Investigation—Directed study and research for undergraduates on a subject of mutual interest to student and instructor. Prerequisites: consent of instructor and adviser.

1-5 units, Aut, Win, Spr, Sum (Staff)

BIOE 212. Introduction to Biomedical Informatics Research Methodology—(Same as BIOMEDIN 212, CS 272, GENE 212.) Hands-on software building. Student teams conceive, design, specify, implement, evaluate, and report on a software project in the domain of biomedicine. Creating written proposals, peer review, providing status reports, and preparing final reports. Guest lectures from professional biomedical informatics systems builders on issues related to the process of project management. Software engineering basics. Prerequisites: 210, 211 or 214, or consent of instructor.

3 units, Aut (Altman, R; Cheng, B; Klein, T)

BIOE 214. Representations and Algorithms for Computational Molecular Biology—(Same as BIOMEDIN 214, CS 274, GENE 214.) Topics: algorithms for alignment of biological sequences and structures, computing with strings, phylogenetic tree construction, hidden Markov models, computing with networks of genes, basic structural computations on proteins, protein structure prediction, protein threading techniques, homology modeling, molecular dynamics and energy minimization, statistical analysis of 3D biological data, integration of data sources, knowledge representation and controlled terminologies for molecular biology, graphical display of biological data, machine learning (clustering and classification), and natural language text processing. Prerequisites: programming skills; consent of instructor for 3 units.

3-4 units, Spr (Altman, R)

BIOE 215. Physics-Based Simulation of Biological Structure—Modeling, simulation, analysis, and measurement of biological systems. Computational tools for determining the behavior of biological structures from molecules to organisms. Numerical solutions of algebraic and differential equations governing biological processes. Simulation laboratory examples in biology, engineering, and computer science. Limited enrollment. Prerequisites: basic biology, mechanics (F=ma), ODEs, and proficiency in C or C++ programming.

3 units, Spr (Altman, R; Delp, S; Mitiguy, P.)

BIOE 220. Imaging Anatomy—(Same as RAD 220.) The physics of medical imaging and human anatomy through medical images. Emphasis is on normal anatomy, contrast mechanisms, and the relative strengths of each imaging modality. Labs reinforce imaging techniques and anatomy. Recommended: basic biology, physics.

3 units, Win (Gold, G; Butts-Pauly, K)

BIOE 222A. Multimodality Molecular Imaging in Living Subjects I—(Same as RAD 222A.) Instruments for imaging molecular and cellular events in animals and human beings using novel assays. Instrumentation physics, chemistry of molecular imaging probes, and applications to preclinical models and clinical disease management.

4 units, Aut (Gambhir, S; Rao, J)

BIOE 222B. Multimodality Molecular Imaging in Living Subjects II—(Same as RAD 222B.) In vivo imaging techniques and applications to preclinical models and clinical disease management. Focus on cancer research, neurobiology, cardiovascular and musculoskeletal diseases.

4 units, Win (Gambhir, S; Rao, J)

BIOE 261. Principles and Practice of Stem Cell Engineering—(Same as NSUR 261.) Quantitative models used to characterize incorporation of new cells into existing tissues emphasizing pluripotent cells such as embryonic and neural stem cells. Molecular methods to control stem cell decisions to self-renew, differentiate, die, or become quiescent. Practical, industrial, and ethical aspects of stem cell technology application. Final projects: team-reviewed grants and business proposals.

3 units, Aut (Deisseroth, K; Palmer, T)

BIOE 281. Biomechanics of Movement—(Same as ME 281.) Experimental techniques to study human and animal movement including motion capture systems, EMG, force plates, medical imaging, and animation. The mechanical properties of muscle and tendon, and quantitative analysis of musculoskeletal geometry. Projects and demonstrations emphasize applications of mechanics in sports, orthopedics, and rehabilitation.

3 units, Aut (Delp, S)

BIOE 284A. Cardiovascular Bioengineering—(Same as ME 284A.) Bioengineering principles applied to the cardiovascular system. Anatomy of human cardiovascular system, comparative anatomy, and allometric scaling principles. Cardiovascular molecular and cell biology. Overview of continuum mechanics. Form and function of blood, blood vessels, and the heart from an engineering perspective. Normal, diseased, and engineered replacement tissues.

3 units, Aut (Taylor, C)

BIOE 284B. Cardiovascular Bioengineering—(Same as ME 284B.) Continuation of ME 284A. Integrative cardiovascular physiology, blood fluid mechanics, and transport in the microcirculation. Sensing, feedback, and control of the circulation. Overview of congenital and adult cardiovascular disease, diagnostic methods, and treatment strategies. Engineering principles to evaluate the performance of cardiovascular devices and the efficacy of treatment strategies.

3 units, Win (Taylor, C)

GRADUATE

BIOE 300A. Molecular and Cellular Bioengineering—(Formerly 200A.) The molecular and cellular bases of life from an engineering perspective. Quantitative analysis and engineering of biomolecular structure and dynamics, enzyme function, molecular interactions, metabolic pathways, signal transduction, and cellular mechanics. Required: course work in biochemistry and thermodynamics.

3 units, Win (Bryant, Z)

BIOE 300B. Quantitative Mammalian Physiology and Tissue Engineering—(Formerly 200B.) The interaction, communication, and disorders of major organ systems and relevant developmental biology and tissue engineering from cells to complex organs.

3 units, Spr (Deisseroth, K; Covert, M)

BIOE 301A. Molecular and Cellular Bioengineering Lab—(Formerly 201A.) Preference to Bioengineering graduate students. Practical applications of biotechnology and molecular bioengineering including recombinant DNA techniques, molecular cloning, microbial cell growth and manipulation, library screening, and microarrays. Emphasis is on experimental design and data analysis. Limited enrollment. Corequisite: 300A.

2 units, Win (Cochran, J)

BIOE 301B. Clinical Needs and Technology—(Formerly 201B.) Diagnostic and therapeutic methods employed in medicine. Each student paired with a physician. Labs include a pathology/histology session, pulmonary function testing, and the Goodman Simulation Center. Clinical experience, chosen from 12 specialties, includes observation of an operation or procedure. Final paper. Limited enrollment. Corequisite: 300B.

1 unit, Spr (Feinstein, J)

BIOE 310. Dynamic Models in Biology—How to use the power of computational modeling in biological research. Biological problems including population dynamics, membrane currents, cellular dynamics, the spread of infectious disease, and spatial pattern formation. Key modeling approaches such as linear systems of differential equations, stochastic models, network models, and agent-based models. Matlab tutorial.

3 units, not given this year (Covert, M)

BIOE 331. Protein Engineering—The design and engineering of biomolecules emphasizing proteins, antibodies, and enzymes. Combinatorial methodologies, rational design, protein structure and function, and biophysical analyses of modified biomolecules. Clinically relevant examples from the literature and biotech industry. Prerequisite: basic biochemistry.

3 units, alternate years, not given this year (Cochran, J)

BIOE 332A,B. Large-Scale Neural Modeling—Emphasis is on cortical computation, from feature maps in the neocortex to episodic memory in the hippocampus, with attention to the roles of recurrent connectivity, rhythmic activity, spike synchrony, synaptic plasticity, and noise and heterogeneity. Large-scale models run in real-time on neuromorphic hardware developed for this purpose. Techniques to analyze and predict network behavior; applications to data recorded from models in laboratory. Techniques introduced are used to develop projects in second half of two-quarter sequence.

3 units, **A:** *Win,* **B:** *Spr (Boahen, K)*

BIOE 355. Advanced Biochemical Engineering—(Same as CHEMENG 355.) Combining new biological knowledge and methods with quantitative engineering principles. Quantitative review of biochemistry and metabolism; recombinant DNA technology and synthetic biology (metabolic engineering). The production of protein pharmaceuticals as paradigm for the application of chemical engineering principles to advanced process development within the framework of current business and regulatory requirements. Prerequisite: CHEMENG 181 (formerly 188) or BIOSCI 41, or equivalent.

3 units, Spr (Swartz, J)

BIOE 361. Biomaterials in Regenerative Medicine—(Same as MATSCI 381.) How materials interact with cells through their micro- and nanostructure, mechanical properties, degradation characteristics, surface chemistry, and biochemistry. Examples include novel materials for drug and gene delivery, materials for stem cell proliferation and differentiation, and tissue engineering scaffolds. Prerequisites: undergraduate chemistry, and cell/molecular biology or biochemistry.

3 units, Win (Heilshorn, S; Cochran, J)

BIOE 370. Microfluidic Device Laboratory—Fabrication of microfluidic devices for biological applications. Photolithography, soft lithography, and micromechanical valves and pumps. Emphasis is on device design, fabrication, and testing.

2 units, Win (Quake, S; Gomez-Sjoberg, R), Spr (Quake, S)

BIOE 374A. Biodesign Innovation: Needs Finding and Concept Creation—(Same as OIT 384, ME 374A, MED 272A.) Two quarter sequence. Strategies for interpreting clinical needs, researching literature, and searching patents. Clinical and scientific literature review, techniques of intellectual property analysis and feasibility, basic prototyping, and market assessment. Student entrepreneurial teams create, analyze, and screen medical technology ideas, and select projects for development.

3-4 units, Win (Yock, P; Brinton, T; Zenios, S; Milroy, C)

BIOE 374B. Biodesign Innovation: Concept Development and Implementation—(Same as OIT 385, ME 374B, MED 272B.) Two quarter sequence. Concept development and implementation. Early factors for success; how to prototype inventions and refine intellectual property. Lectures, guest medical pioneers, and entrepreneurs about strategic planning, ethical considerations, new venture management, and financing and licensing strategies. Cash requirements; regulatory (FDA), reimbursement, clinical, and legal strategies, and business or research plans.

3-4 units, Spr (Yock, P; Brinton, T; Zenios, S; Milroy, C)

BIOE 386. Neuromuscular Biomechanics—(Same as ME 386.) The interplay between mechanics and neural control of movement. State of the art assessment through a review of classic and recent journal articles. Emphasis is on the application of dynamics and control to the design of assistive technology for persons with movement disorders.
3 units, not given this year (Delp, S)

BIOE 390. Introduction to Bioengineering Research—(Same as MED 289.) Preference to medical and Bioengineering graduate students. Bioengineering is an interdisciplinary field that leverages the disciplines of biology, medicine, and engineering to understand living systems, and engineer biological systems and improve engineering designs and human and environmental health. Topics include: imaging; molecular, cell, and tissue engineering; biomechanics; biomedical computation; biochemical engineering; biosensors; and medical devices. Limited enrollment.
1-2 units, Aut, Win (Taylor, C)

BIOE 391. Directed Study—May be used to prepare for research during a later quarter in 392. Faculty sponsor required. May be repeated for credit.
1-6 units, Aut, Win, Spr, Sum (Staff)

BIOE 392. Directed Investigation—For Bioengineering graduate students. Previous work in 391 may be required for background; faculty sponsor required. May be repeated for credit.
1-10 units, Aut (Staff), Win (Block, S), Spr, Sum (Staff)

BIOE 393. Bioengineering and Biodesign Forum—(Same as ME 389) Guest speakers present research topics at the interfaces of biology, medicine, physics, and engineering. May be repeated for credit.
1 unit, Aut, Win, Spr (Altman, R)

BIOE 454. Synthetic Biology and Metabolic Engineering—(Same as CHEMENG 454.) Principles for the design and optimization of new biological systems. Development of new enzymes, metabolic pathways, other metabolic systems, and communication systems among organisms. Example applications include the production of central metabolites, amino acids, pharmaceutical proteins, and isoprenoids. Economic challenges and quantitative assessment of metabolic performance. Pre- or corequisite: CHEMENG 355 or equivalent.
3 units, alternate years, not given this year

BIOE 459. Frontiers in Interdisciplinary Biosciences—(Crosslisted in departments in the schools of H&S, Engineering, and Medicine; students register through their affiliated department; otherwise register for CHEMENG 459.) For specialists and non-specialists. Sponsored by the Stanford BioX Program. Three seminars per quarter address scientific and technical themes related to interdisciplinary approaches in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and the world present breakthroughs and endeavors that cut across core disciplines. Pre-seminars introduce basic concepts and background for non-experts. Registered students attend all pre-seminars; others welcome. See http://www.stanford.edu/group/biox/courses/459.html. Recommended: basic mathematics, biology, chemistry, and physics.
1 unit, Aut, Win, Spr (Robertson, C)

BIOE 484. Computational Methods in Cardiovascular Bioengineering—(Same as ME 484.) Lumped parameter, one-dimensional nonlinear and linear wave propagation, and three-dimensional modeling techniques applied to simulate blood flow in the cardiovascular system and evaluate the performance of cardiovascular devices. Construction of anatomic models and extraction of physiologic quantities from medical imaging data. Problems in blood flow within the context of disease research, device design, and surgical planning.
3 units, alternate years, not given this year (Taylor, C)

BIOE 485. Modeling and Simulation of Human Movement—(Same as ME 485.) Direct experience with the computational tools used to create simulations of human movement. Lecture/labs on animation of movement; kinematic models of joints; forward dynamic simulation; computational models of muscles, tendons, and ligaments; creation of models from medical images; control of dynamic simulations; collision detection and contact models. Prerequisite: 281, 331A,B, or equivalent.
3 units, Spr (Delp, S)

BIOE 500. Thesis (Ph.D.)
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOC 218. Computational Molecular Biology—(Same as BIOMEDIN 231.)
3 units, Aut (Staff), Win, Spr (Brutlag, D)

BIOMEDIN 210. Introduction to Biomedical Informatics: Fundamental Methods—(Same as CS 270.)
3 units, Aut (Musen, M)

BIOMEDIN 217. Translational Bioinformatics—(Same as CS 275.)
4 units, Win (Butte, A; Hillenmeyer, M; Southworth, L)

CHEMENG 450. Advances in Biotechnology
3 units, Spr (Hwang, L; Swartz, J)

EE 369A. Medical Imaging Systems I
3 units, not given this year

EE 369B. Medical Imaging Systems II
3 units, Spr (Nishimura, D)

EE 369C. Medical Image Reconstruction
3 units, Aut (Pauly, J)

ME 280. Skeletal Development and Evolution
3 units, Spr (Carter, D)

ME 287. Soft Tissue Mechanics
3 units, Aut (Levenston, M)

ME 381. Orthopaedic Bioengineering
3 units, Aut (Carter, D)

ME 382A. Medical Device Design
4 units, Win (Andriacchi, T)

ME 382B. Medical Device Design
4 units, Spr (Andriacchi, T)

ME 385. Tissue Engineering Lab
1-2 units, Win (Jacobs, C)

RAD 226. In Vivo Magnetic Resonance Spectroscopy and Imaging
3 units, Win (Spielman, D)

CHEMICAL ENGINEERING

Emeriti: (Professors) Andreas Acrivos, Michel Boudart, George M. Homsy, Robert J. Madix
Chair: Chaitan Khosla
Professors: Stacey F. Bent, Curtis W. Frank, Gerald G. Fuller, Chaitan Khosla, Channing R. Robertson, Eric S. G. Shaqfeh, James R. Swartz
Associate Professor: Zhenan Bao
Assistant Professors: Thomas F. Jaramillo, Charles B. Musgrave, Andrew J. Spakowitz, Clifford L. Wang
Courtesy Professors: Daniel Herschlag, Jeffrey R. Koseff, Franklin M. Orr, Jr., Robert M. Waymouth
Lecturers: Shari B. Libicki, Sara Loesch-Frank, John E. Moalli, Anthony Pavone
Acting Assistant Professor: Lisa Y. Hwang
Consulting Professors: Douglas C. Cameron, Kay Kanazawa, Wolfgang Knoll, Jaan Noolandi, Conrad Schadt, Do Yeung Yoon
Visiting Professor: Subhash Risbud

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Courses given in Chemical Engineering have the subject code CHEMENG. For a complete list of subject codes, see Appendix.

Chemical engineers are responsible for the conception and design of processes involved in the production, transformation, and transport of materials. This activity begins with experimentation in the laboratory and is followed by implementation of the technology into full-scale production. The mission of the Department of Chemical Engineering at Stanford is to provide professional training, development, and education for the next generation of leaders in the chemical and biological sciences and engineering. A large number of industries depend on the synthesis and processing of chemicals and materials. In addition to traditional examples such as the chemical and energy industries, there are increasing opportunities in biotechnology, pharmaceuticals, electronic device fabrication and materials, and environmental engineering. Chemical and biological engineering is essential in these and other fields whenever processes involve the chemical, biological, or physical transformation of matter.

UNDERGRADUATE PROGRAMS

The University's basic requirements for the bachelor's degree and coterminal bachelor's and master's degrees are discussed in the "Undergraduate Degrees" section of this bulletin.

BACHELOR OF SCIENCE

The Chemical Engineering depth sequence required for the B.S. degree provides training in applied chemical kinetics, biochemical engineering, electronic materials, engineering thermodynamics, plant design, polymers, process analysis and control, separation processes, and transport phenomena. The B.S. program in Chemical Engineering additionally requires basic courses in biology, chemistry, engineering, mathematics, and physics. Undergraduates who wish to major in Chemical Engineering (CHEMENG) should consult the curriculum outlined in the "School of Engineering" section of this bulletin. Courses taken for the departmental major (math; science; science, technology, and society; engineering fundamentals; and engineering depth) must be taken for a letter grade if this option is offered.

There are several 4-year sequences of courses for a B.S. in Chemical Engineering. While each sequence starts at a different level based on prior preparation, all complete the major at the same level. Sample programs are available from the department's student services and faculty advisers for undergraduates, the Office of Student Affairs in the School of Engineering, and in the *Handbook for Undergraduate Engineering Programs,* available at http://ughb.stanford.edu/. It is recommended that students discuss their prospective programs with chemical engineering advisers, especially if transferring from biology, chemistry, physics, or another engineering major. With advanced planning, students can usually arrange to attend one of the overseas campuses.

For information about the requirements for a Chemical Engineering minor, see the "School of Engineering" section of this bulletin.

BACHELOR OF SCIENCE WITH HONORS

The Department of Chemical Engineering offers a program leading to a Bachelor of Science in Chemical Engineering with honors. Qualified undergraduate majors conduct independent study and research at an advanced level with a faculty mentor, graduate students, and fellow undergraduates. This three quarter sequential program involves research study in an area proposed to and agreed to by a Department of Chemical Engineering faculty adviser, completion of a faculty-approved thesis, and participation in the Chemical Engineering Honors Symposium held annually during Spring Quarter. The last requirement may also be fulfilled through an alternative, public, oral presentation with the approval of the department chair.

Admission to the honors program is by application. Declared Chemical Engineering students with a cumulative grade point average (GPA) of 3.5 or higher are eligible to submit an application. Students should submit their applications by Winter Quarter of their junior year; applications are not accepted later than the first week of Autumn Quarter of the senior year. An application includes a research proposal, sponsored by a research thesis adviser and a second faculty reader. The adviser, or alternatively a sponsor, must be a member of the Chemical Engineering faculty. Students should start honors research in their junior year and are encouraged to consider incorporating research opportunities such as those sponsored by Undergraduate Advising and Research (see http://urp.stanford.edu/StudentGrants/) into their three or four quarter honors research proposal. Subject to faculty approval, it is recommended that students include a writing course in the second quarter of their honors project. See departmental student services for a proposal template and other assistance.

In order to receive departmental honors, students admitted to the honors program must:

1. Maintain an overall grade point average (GPA) of at least 3.5 as calculated on the unofficial transcript.
2. Complete at least three quarters of research with a minimum total of 9 units of CHEMENG 190H for a letter grade. All quarters must focus on the same topic. The same faculty adviser and faculty reader should be maintained throughout if feasible.
3. Participate in the Chemical Engineering Honors Symposium held during Spring Quarter with a poster and oral presentation of thesis work or, at the faculty's discretion, in a comparable public event.
4. Submit a completed draft of thesis simultaneously to the adviser and reader and, if appropriate, to the Chemical Engineering faculty sponsor, no later than May 1, or the first day of the second month of the quarter in which the degree is to be conferred.
5. Complete all work and thesis revisions and obtain indicated faculty approvals on the Certificate of Final Reading of Thesis form by the end of the third week of May, or the second month of the graduation quarter.
6. Submit to Chemical Engineering student services four final copies of the honors thesis as approved by the appropriate faculty and with a certificate form for each copy. The deadline is May 19, 2008, or the Monday at the beginning of the fourth week of the second month of the graduation quarter.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

Undergraduates with strong academic records may apply to study for a master's degree while completing their bachelor's degree(s). Further details are in the "Undergraduate Degrees" section of this bulletin. Interested students should discuss their educational goals with their faculty advisers and departmental student services.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

The University's requirements, including residency requirements, for the M.S., Engineer, and Ph.D. degrees are outlined in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

An M.S. program comprising appropriate course work is available to accommodate students wishing to obtain further academic preparation, after receiving a B.S. degree, before pursuing a professional chemical engineering career. This degree is not a prerequisite for nor does it lead directly into the department's Ph.D. program. For conferral of an M.S. degree, a formal thesis is not required, but the following departmental requirements must be met.

Unit and Course Requirements—For students terminating their graduate work with the M.S. degree in Chemical Engineering, a graduate-level, thematic program consisting of a minimum of 45 units of academic work is required, including (1) four Chemical Engineering lecture courses selected from the 300 series; (2) 3 units of 699 Colloquia; (3) an additional 30 units, selected from graduate-level science or engineering lecture courses in any department and, by petition to the Chair of the Department of Chemical Engineering, from upper-division undergraduate lecture courses in science and engineering. Alternatively, for terminal M.S. degree students, up to 6 units of research may be used in lieu of up to 6 units of the additional 30 lecture units to partially satisfy the 45-unit minimum requirement. Another option for terminal M.S. students is an up-to-six-units combination of research units and no more than 3 units of 459 or other 1- or 2-unit graduate seminar courses in other departments, used in lieu of up to 6 units of the required additional 30 lecture units. Credit toward the M.S. degree is not given for Chemical Engineering special topics courses numbered in the 500 series nor for similar courses in other departments.

To ensure that an appropriate Chemical Engineering graduate program is pursued by all M.S. candidates, students who first matriculate at Stanford at the graduate level must (a) submit during the first quarter, no later than the ninth week, an adviser-approved Program Proposal for a Master's Degree form to departmental student services for review by the department chair, and (b) obtain approval from the M.S. adviser and the department chair for any subsequent program change or changes. Stanford undergraduates admitted to the coterminal master's program must (a) submit an adviser-approved Program Proposal for a Master's Degree (a graduate degree progress form) either during their first quarter of graduate standing or upon the completion of 15 units of graduate work (whichever occurs first), and (b) document with student services their M.S. adviser's review and approval of their graduate program when they have accrued 30 units toward the degree in Chemical Engineering. All M.S. programs must be reviewed and given final approval by the Chemical Engineering M.S. adviser and the department chair no later than the quarter before the quarter of M.S. degree conferral, in order to permit amendment of the final quarter's study list if the faculty deem this necessary. Students with questions should contact student services.

Minimum Grade Requirement—Any course used to satisfy the 45-unit minimum for the M.S. degree must be taken for a letter grade, if offered. An overall grade point average (GPA) of 3.0 must be maintained for these courses.

Research Experience—Students in the M.S. program wishing to obtain research experience should work with the M.S. adviser on the choice of research adviser in advance of the quarter(s) of research, and, upon approval, then enroll in the appropriate section of CHEMENG 600. A written report describing the results of the research undertaken must be submitted to and approved by the research adviser. CHEMENG 600 may not be taken in lieu of any of the required four 300-level lecture courses.

ENGINEER

The degree of Engineer is awarded after completion of a minimum of 90 units of graduate work beyond the B.S. degree and satisfactory completion of all University requirements plus the following departmental requirements. (This degree is not required to enter the Ph.D. program.)

Unit and Course Requirements—A minimum of 90 total units (including research) within which 45 units of lecture course work is required for the Engineer degree, including (1) 300, 310A, 340, 345, 355 and (2) 3 units of 699. The remaining lecture courses, to total at least 45 units, may be chosen from the basic sciences and engineering according to the guidelines given in the Master of Science section and with the consent of the graduate adviser and the department chair. An aggregate of 6 units maximum of the required 45-unit minimum of course work may include such courses as 459 and 699. Students seeking the Engineer degree may apply for the M.S. degree once the requirements for that degree have been fulfilled (see General Requirements in the "Graduate Degrees" section of this bulletin and Chemical Engineering's "Master of Science" section above).

Minimum Grade Requirement—Any course intended to satisfy the degree requirements must be taken for a letter grade, if offered. An overall grade point average (GPA) of 3.0 must be maintained for these courses.

Reading Committee Requirement—All candidates are required to have an initial meeting with their reading committees consisting of two members of the Chemical Engineering faculty, by the end of their seventh quarter. Following this initial meeting, additional committee meetings must occur no less than once a year until all the requirements for the degree are satisfied. Students are encouraged to hold meetings on a more frequent basis to help focus and guide the thesis project. It is each student's responsibility to schedule meetings and to inform student services of meeting dates.

Thesis Requirement—The thesis must represent a substantial piece of research equivalent to nine months of full-time effort and must be approved by the reading committee.

Qualification for the Ph.D. Program by Students Ready to Receive the Degree of Engineer—After completing the requirements for the Engineer degree, a student may request to be examined on the Engineer research work for the purpose of qualifying for the Ph.D. degree. If the request is granted, the student's thesis must have been approved by the reading committee and be available in its final form for inspection by the entire faculty at least two weeks prior to the scheduled date of the examination.

DOCTOR OF PHILOSOPHY

The Ph.D. degree is awarded after the completion of a minimum of 135 units of graduate work as well as satisfactory completion of any additional University requirements and the following departmental requirements. Completion of an M.S. degree is not a prerequisite for beginning, pursuing, or completing doctoral work.

Unit and Course Requirements—A minimum of 135 completed units, including a minimum of 45 units of lecture course work, is required for the Ph.D. degree. The following courses are required: 300, 310A, 340, 345, and 355, plus two courses in the 440, 450, or 460 series. These must be taken at Stanford, and any petition to substitute another graduate-level course for any of these core courses must be approved by the chair. The remaining lecture courses may be chosen from graduate-level science and engineering lecture courses in any department and, by petition to the chair, from upper-division undergraduate lecture courses in the sciences and engineering. 3 units of 699 may be included in the required 45 units of lecture courses. Additionally, 1, 2, or 3 units of seminar courses such as 459 may be substituted for up to 3 units of the lecture course work requirement, but not for any of the specified CHEMENG courses above. All proposals for Ph.D. course work must be approved by the student's adviser and the department chair. Students admitted to Ph.D. candidacy should enroll each quarter in the 500 series, 600, and 699 as appropriate and as study list unit limits permit. Predoctoral students have the option of petitioning for a M.S. degree program to be added to their graduate record. When the petition is approved, students may apply for M.S. degree conferral once the requirements for that degree have been fulfilled (see the "Master of Science" section above). The M.S. degree must be awarded within the University's time limit for completion of a master's degree.

Minimum Grade Requirement—Any course intended to satisfy the Ph.D. degree requirements must be taken for a letter grade, if offered. An overall grade point average (GPA) of 3.0 must be maintained for these courses.

Qualifying Examination—To be advanced to candidacy for the Ph.D. degree, the student must pass both parts of the qualifying examination. The first part is held at the beginning of Spring Quarter, or the third quarter of study, and the first-year student is asked to make an oral presentation to the faculty of a critical review of a published paper. This preliminary examination, in addition to performance in courses and during research rotations, is the basis for determining whether or not a first-year student may be allowed to choose a research adviser and to begin doctoral research work immediately. Failure in this first part of the qualifying examination leads to termination of a student's study towards the Ph.D. degree; however, the student may continue to work toward an M.S. degree (see "Master of Science" section above). It also precludes any financial aid beyond that already awarded. Students who pass the preliminary examination take the second part of the qualifying examination at the beginning of their second year, or the fifth quarter. This second examination before the faculty is an oral presentation and defense of their current research work. Students who pass both examinations must promptly submit Application for Candidacy for Doctoral Degree forms approved by their research advisers and at the same time establish and meet with their doctoral dissertation reading committees.

Reading Committee Requirement—All Ph.D. candidates are required to assemble reading committees and to have an initial committee meeting by the end of their seventh quarter. Reading committee meetings are not examinations; they are intended to be discussion sessions, to help focus and guide the dissertation project. Following the initial committee meeting, additional meetings must take place no less than once per year until all the requirements for the Ph.D. degree are satisfied. The department encourages students to take advantage of the benefits of more frequent meetings with their entire reading committee as a group. It is the student's responsibility to schedule committee meetings and to report the meeting dates to the student services manager.

Teaching Requirement—Teaching experience is considered an essential component of doctoral training. All Ph.D. candidates, regardless of the source of their financial support, are required to assist in the teaching of a minimum of two chemical engineering courses.

Dissertation and Oral Defense Requirements—A dissertation based on a successful investigation of a fundamental problem in chemical engineering is required. Within approximately five calendar years after enrolling in the department, students are expected to have fulfilled all the requirements for this degree, including the completion of dissertations approved by their research advisers. Upon adviser approval, copies of the final draft of a dissertation must be distributed to each reading committee member. No sooner than three weeks after this distribution, students may schedule University oral examinations. The examination is a dissertation defense, based on the candidate's dissertation research, and is in the form of a public seminar followed by a private examination by the faculty on the student's oral examination committee. Satisfactory performance in the oral examination and acceptance of an approved dissertation by Graduate Degree Progress, Office of the University Registrar, leads to Ph.D. degree conferral.

PH.D. MINOR

A Ph.D. minor is a program outside a student's Ph.D. department. The University's general requirements for the Ph.D. minor are specified in the "Graduate Degrees" section of this bulletin. An application for a Ph.D. minor must be approved by both the major and minor departments.

A student desiring a Ph.D. minor in Chemical Engineering must have a minor program adviser who is a regular Chemical Engineering faculty member. At a minimum, this adviser must be a member of the student's reading committee for the doctoral dissertation, and the entire reading committee must meet at least once and at least one year prior to the scheduling of the student's oral examination. The department strongly prefers that regular reading committee meetings start in the second year of graduate study. In addition, the minor adviser must be a member of the student's University oral examination committee.

The Ph.D. minor program must include at least 20 units of graduate-level lecture courses (that is, courses numbered at the 200 level or above), but may not include in the 20-unit minimum any 1-2 unit courses in Chemical Engineering. The list of courses must form a coherent program and must be approved by the minor program adviser and the chair of the department. All courses for the minor must be taken for a letter grade, and a GPA of at least 3.0 earned for these courses.

RESEARCH ACTIVITIES

Research investigations are currently being carried out in the following fields: applied statistical mechanics, biocatalysis, bioengineering, colloid science, computational materials science, electronic materials, hydrodynamic stability, kinetics and catalysis, Newtonian and non-Newtonian fluid mechanics, polymer science, rheo-optics of polymeric systems, and surface and interface science. Additional information may be found at http://cheme.stanford.edu.

FELLOWSHIPS AND ASSISTANTSHIPS

Fellowships are awarded each year, primarily to Ph.D. students. Fellowships for incoming students are awarded in the spring prior to matriculation at the beginning of the following academic year. Current students are encouraged to apply for external, competitive fellowships and may obtain information about various awarding agencies from faculty advisers and student services.

Assistantships are paid positions for graduate students that, in addition to a salary, provide the benefit of a tuition allocation. Individual faculty appoint students to research assistantships; the department chair appoints doctoral students to teaching assistantships. Contact student services for further information.

FURTHER INFORMATION

More information about the department can be found at http://chemeng.stanford.edu. Current Stanford students interested in pursuing advanced work in Chemical Engineering are encouraged to contact student services; admission is by approval of an internal petition. All other students should go to http://gradadmissions.stanford.edu/ for additional guidelines regarding application requirements and processes.

GRADUATE COURSES IN BIOLOGICAL INTERDISCIPLINARY SCIENCES AND ENGINEERING

The Department of Chemical Engineering offers opportunities for students to pursue course work in interdisciplinary biosciences which include the chemical, physical, mathematical, and engineering sciences. These include CHEMENG 281 (formerly 288), 283 (formerly 289), 355, 450, and 454. In addition, students seeking a broad introduction to current topics in the interdisciplinary biosciences and engineering should consider CHEMENG 459, Frontiers in Interdisciplinary Biosciences, which covers emerging technologies and other subject matter at the intersection of engineering and biology ranging from molecular to complex systems; see http://biox.stanford.edu. Students are encouraged to review course offerings in all departments of the School of Engineering.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations for undergraduates (8 units maximum).

PRIMARILY FOR UNDERGRADUATES

CHEMENG 10. The Chemical Engineering Profession—Open to all undergraduates. Professionals present career paths and post-graduation opportunities open to Chemical Engineering graduates. Possible topics: preparing for graduate school (M.S. and Ph.D. in law, business, medicine, and other engineering fields); and opportunities in areas such as energy technologies, electronics production, soft and hard materials, and biotechnology.

1 unit, Aut (Swartz, J; Wang, C; Jaramillo, T)

CHEMENG 20. Introduction to Chemical Engineering—(Same as ENGR 20.) Overview of chemical engineering through discussion and engineering analysis of physical and chemical processes. Topics: overall staged separations, material and energy balances, concepts of rate processes, energy and mass transport, and kinetics of chemical reactions. Applications of these concepts to areas of current technological importance: biotechnology, production of chemicals, materials processing, and purification. Prerequisite: CHEM 31. GER:DB-EngrAppSci
3 units, Spr (Robertson, C)

CHEMENG 25. Biotechnology—(Same as ENGR 25.) Interplay among biology, technology, and society. Topics include biological fundamentals, genetic engineering, protein production, pharmaceuticals, antibodies, plant biotechnology, vaccines, transgenic animals, and stem cells. The role of intellectual property, business, government regulations, and ethics in biotechnology. GER:DB-EngrAppSci
3 units, Spr (Wang, C)

CHEMENG 60Q. Environmental Regulation and Policy—Stanford Introductory Seminar. Preference to sophomores. How environmental policy is formulated in the U.S. How and what type of scientific research is incorporated into decisions. How to determine acceptable risk, the public's right to know of chemical hazards, waste disposal and clean manufacturing, brownfield redevelopment, and new source review regulations. The proper use of science and engineering including media presentation and misrepresentation, public scientific and technical literacy, and emotional reactions. Alternative models to formulation of environmental policy. Political and economic forces, and stakeholder discussions. GER:DB-EngrAppSci
3 units, Aut (Robertson, C; Libicki, S)

CHEMENG 70Q. Masters of Disaster—Stanford Introductory Seminar. Preference to sophomores. For students interested in science, engineering, politics, and the law. Learn from past disasters to avoid future ones. How disasters can be tracked to failures in the design process. The roles of engineers, artisans, politicians, lawyers, and scientists in the design of products. Failure as rooted in oversight in adhering to the design process. Student teams analyze real disasters and design new products presumably free from the potential for disastrous outcomes. GER:DB-EngrAppSci
3 units, Aut (Robertson, C; Moalli, J)

CHEMENG 80Q. Art, Chemistry, and Madness: The Science of Art Materials—Stanford Introductory Seminar. Preference to sophomores. Chemistry of natural and synthetic pigments in five historical palettes: earth (paleolithic), classical (Egyptian, Greco-Roman), medieval European (Middle Ages), Renaissance (old masters), and synthetic (contemporary). Composite nature of paints using scanning electron microscopy images; analytical techniques used in art conservation, restoration, and determination of provenance; and inherent health hazards. Paintings as mechanical structures. Hands-on topics include stretching canvas, applying gesso grounds, grinding pigments, preparing egg tempera paint, bamboo and quill pens, gilding and illumination, and papermaking. GER:DB-EngrAppSci
3 units, Spr (Frank, C; Loesch-Frank, S)

CHEMENG 100. Chemical Process Modeling, Dynamics, and Control—Mathematical methods applied to engineering problems using chemical engineering examples. The development of mathematical models to describe chemical process dynamic behavior. Analytical and computer simulation techniques for the solution of ordinary differential equations. Dynamic behavior of linear first- and second-order systems. Introduction to process control. Dynamics and stability of controlled systems. Prerequisites: CHEMENG 20 or ENGR 20; CME 102 or MATH 53.
3 units, Aut (Hwang, L)

CHEMENG 110. Equilibrium Thermodynamics—Thermodynamic properties, equations of state, properties of non-ideal systems including mixtures, and phase and chemical equilibria. Prerequisite: CHEM 171 or equivalent.
3 units, Win (Bao, Z)

CHEMENG 120A. Fluid Mechanics—The flow of isothermal fluids from a momentum transport viewpoint. Continuum hypothesis, scalar and vector fields, fluid statics, non-Newtonian fluids, shell momentum balances, equations of motion and the Navier-Stokes equations, creeping and potential flow, parallel and nearly parallel flows, time-dependent parallel flows, boundary layer theory and separation, introduction to drag correlations. Prerequisites: junior in Chemical Engineering or consent of instructor; 100 and CME 102 or equivalent.
4 units, Win (Fuller, G)

CHEMENG 120B. Energy and Mass Transport—General diffusive transport, heat transport by conduction, Fourier's law, conduction in composites with analogies to electrical circuits, advection-diffusion equations, forced convection, boundary layer heat transport via forced convection in laminar flow, forced convection correlations, free convection, free convection boundary layers, free convection correlations and application to geophysical flows, melting and heat transfer at interfaces, radiation, diffusive transport of mass for dilute and non-dilute transfer, mass and heat transport analogies, mass transport with bulk chemical reaction, mass transport with interfacial chemical reaction, evaporation. Prerequisite 120A or consent of instructor.
4 units, Spr (Spakowitz, A)

CHEMENG 130. Separation Processes—Analysis and design of equilibrium and non-equilibrium separation processes. Possible examples: distillation, liquid-liquid extraction, flash distillation, electrophoresis, centrifugation, membrane separations, chromatography, and reaction-assisted separation processes.
3 units, Spr (Jaramillo, T)

CHEMENG 140. Microelectronics Processing Technology—(Same as 240.) The chemistry and transport of microelectronics device fabrication. Introduction to solid state materials and electronic devices. Chemical processes including crystal growth, chemical vapor deposition, etching, oxidation, doping, diffusion, metallization, and plasma processing with emphasis on chemical, kinetic, and transport considerations. Recommended: CHEM 33, 171, and PHYSICS 55.
3 units, Spr (Bao, Z)

CHEMENG 150. Biochemical Engineering—Systems-level combination of chemical engineering concepts with biological principles. The production of protein pharmaceuticals as a paradigm to explore quantitative biochemistry and cellular physiology, the elemental stoichiometry of metabolism, recombinant DNA technology, synthetic biology and metabolic engineering, fermentation development and control, product isolation and purification, protein folding and formulation, and biobusiness and regulatory issues. Prerequisite: CHEMENG 181 (formerly 188) or BIOSCI 41 or equivalent.
3 units, Aut (Swartz, J)

CHEMENG 160. Polymer Science and Engineering—(Same as 260.) Interrelationships among molecular structure, morphology, and mechanical behavior of polymers. Topics include amorphous and semicrystalline polymers, glass transitions, rubber elasticity, linear viscoelasticity, and rheology. Applications of polymers in biomedical devices and microelectronics. Recommended: CHEM 33 and 171, or equivalent.
3 units, Win (Hwang, L)

CHEMENG 170. Kinetics and Reactor Design—Chemical kinetics, elementary reactions, mechanisms, rate-limiting steps, and quasi-steady state approximations. Ideal isothermal and non-isothermal reactors; design principles. Steady state and unsteady state operation of reactors; conversion and limitations of thermodynamic equilibrium. Enzymes and heterogeneous catalysis and catalytic reaction mechanisms. Prerequisites: 110, 120A, 120B.
3 units, Aut (Bent, S)

CHEMENG 174. Environmental Microbiology I—(Same as 274, CEE 274A) Basics of microbiology and biochemistry. The biochemical and biophysical principles of biochemical reactions, energetics, and mechanisms of energy conservation. Diversity of microbial catabolism, flow of organic matter in nature: the carbon cycle, and biogeochemical cycles. Bacterial physiology, phylogeny, and the ecology of microbes in soil and marine sediments, bacterial adhesion, and biofilm formation. Microbes in the degradation of pollutants. Prerequisites: CHEM 33, 35, and BIOSCI 41, CHEMENG 181 (formerly 188), or equivalents.
3 units, Aut (Spormann, A), Sum (Sepulveda-Torres, L)

CHEMENG 180. Chemical Engineering Plant Design—Open to seniors in chemical engineering or by consent of instructor. Application of chemical engineering principles to the design of practical plants for the manufacture of chemicals and related materials. Topics: flow-sheet development from a conceptual design, equipment design for distillation, chemical reactions, heat transfer, pumping, and compression; estimation of capital expenditures and production costs; plant construction.
3 units, Spr (Pavone, A)

CHEMENG 181. Biochemistry I—(Same as 281, BIOSCI 188/288, CHEM 181. CHEM and CHEMENG offerings formerly listed as 188/288.) Chemistry of major families of biomolecules including proteins, nucleic acids, carbohydrates, lipids, and cofactors. Structural and mechanistic analysis of properties of proteins including molecular recognition, catalysis, signal transduction, membrane transport, and harvesting of energy from light. Molecular evolution. Pre- or corequisites: CHEM 131; and CHEM 135 or 171. GER: DB-NatSci
3 units, Aut (Staff)

CHEMENG 183. Biochemistry II—(Same as 283, BIOSCI 189/289, CHEM 183. CHEM and CHEMENG offerings formerly listed as 189/289.) Metabolism. Glycolysis, gluconeogenesis, citric acid cycle, oxidative phosphorylation, pentose phosphate pathway, glycogen metabolism, fatty acid metabolism, protein degradation and amino acid catabolism, protein translation and amino acid biosynthesis, nucleotide biosynthesis, DNA replication, recombination and repair, lipid and steroid biosynthesis. Medical consequences of impaired metabolism. Therapeutic intervention of metabolism. Prerequisite: BIOSCI 188/288 or CHEM 181 or CHEMENG 181/281 (formerly 188/288). GER: DB-NatSci
3 units, Win (Khosla, C)

CHEMENG 185A. Chemical Engineering Laboratory A—Experimental aspects of chemical engineering science emphasizing development of communication skills. Experiments illustrating lecture subjects conducted by student groups. Prerequisites: 120A,B. Corequisite: 170. WIM
4 units, Aut (Frank, C; Hwang, L)

CHEMENG 185B. Chemical Engineering Laboratory B—Methods and techniques of biochemical engineering. Emphasis is on team organization, communication skills, experimental design, and project execution. Presentations, experiments, and demonstrations of biotechnology designed for high school students. Prerequisite: BIOSCI 41, CHEMENG 181 (formerly 188), or equivalent.
4 units, Win (Wang, C; Hwang, L)

CHEMENG 190. Undergraduate Research in Chemical Engineering—Laboratory or theoretical work for undergraduates under the supervision of a faculty member. Research in one of the graduate research groups or other special projects in the undergraduate chemical engineering lab. Students should consult advisers for information on available projects.
1-6 units, Aut, Win, Spr, Sum (Staff)

CHEMENG 190H. Undergraduate Honors Research in Chemical Engineering—For department approved Chemical Engineering B.S. with honors majors who have obtained faculty approval for a research proposal. Research for at least 3 quarters, concluding thesis, and oral presentation of work. May be repeated for credit.
2-5 units, Aut, Win, Spr, Sum (Staff)

PRIMARILY FOR GRADUATE STUDENTS

CHEMENG 240. Microelectronics Processing Technology—(Same as 140; see 140.)
3 units, Spr (Bao, Z)

CHEMENG 260. Polymer Science and Engineering—(Same as 160; see 160.)
3 units, Win (Hwang, L)

CHEMENG 274. Environmental Microbiology I—(Same as 174, CEE 274A; see 174.)
3 units, Aut (Spormann, A), Sum (Sepulveda-Torres, L)

CHEMENG 281. Biochemistry I—(Same as 181, BIOSCI 188/288, CHEM 181; see 181.)
3 units, Aut (Staff)

CHEMENG 283. Biochemistry II—(Same as 183, BIOSCI 189/289, CHEM 183; see 183.)
3 units, Win (Khosla, C)

CHEMENG 300. Applied Mathematics in the Chemical and Biological Sciences—(Same as CME 330.) Mathematical solution methods via applied problems including chemical reaction sequences, mass and heat transfer in chemical reactors, quantum mechanics, fluid mechanics of reacting systems, and chromatography. Topics include generalized vector space theory, linear operator theory with eigenvalue methods, phase plane methods, perturbation theory (regular and singular), solution of parabolic and elliptic partial differential equations, and transform methods (Laplace and Fourier). Prerequisites: CME 102/ENGR 155A and CME 104/ENGR 155B, or equivalents.
3 units, Aut (Shaqfeh, E)

CHEMENG 310. Microscale Transport in Chemical Engineering—Transport phenomena on small-length scales appropriate to applications in microfluidics, complex fluids, and biology. The basic equations of mass, momentum, and energy, derived for incompressible fluids and simplified to the slow-flow limit. Topics: solution techniques utilizing expansions of harmonic and Green's functions; singularity solutions; flows involving rigid particles and fluid droplets; applications to suspensions; lubrication theory for flows in confined geometries; slender body theory; and capillarity and wetting. Prerequisites: 120A,B, 300, or equivalents.
3 units, Win (Fuller, G)

CHEMENG 340. Molecular Thermodynamics—Statistical mechanics; ensembles, partition functions, and distribution functions. Applications to imperfect gases, liquid theory, and defects and heat capacity of solids; statistical mechanics of phase equilibria, and phase diagrams; and the Ising model, intermolecular forces and molecular simulation.
3 units, Aut (Spakowitz, A)

CHEMENG 345. Fundamentals and Applications of Spectroscopy—Development of theoretical approaches to spectroscopy, including spectroscopic transitions, transition probabilities, and selection rules. Application to photon and electron spectroscopies of the gas and solid phases. Topics: rotational spectroscopy; infrared and Raman vibrational spectroscopies; fluorescence spectroscopy; Auger, x-ray and ultraviolet photoelectron spectroscopies. Prerequisite: CHEM 271 or course in quantum mechanics.
3 units, Win (Jaramillo, T)

CHEMENG 355. Advanced Biochemical Engineering—(Same as BIOE 355.) Combines biological knowledge and methods with quantitative engineering principles. Quantitative review of biochemistry and metabolism; recombinant DNA technology and synthetic biology (metabolic engineering). The production of protein pharaceuticals as a paradigm for the application of chemical engineering principles to advanced process development within the framework of current business and regulatory requirements. Prerequisite: CHEMENG 181 (formerly 188) or BIOSCI 41, or equivalent.
3 units, Spr (Swartz, J)

CHEMENG 442. Structure and Reactivity of Solid Surfaces—The structure of solid surfaces including experimental methods for determining the structure of single crystal surfaces. The adsorption of molecules on these surfaces including the thermodynamics of adsorption processes, surface diffusion, and surface reactions. Molecular structure of adsorbates. Current topics in surface structure and reactivity, including systems for heterogeneous catalysis and electronic materials.

3 units, Spr (Bent, S), not given next year

CHEMENG 444. Quantum Simulations of Molecules and Materials—Quantum atomistic simulations to predict atomic structure, properties, reaction mechanisms, and kinetics. Review of quantum mechanics. Quantum chemical theory and electronic structure methods including Hartree Fock, configuration interaction, many body perturbation theory, and density functional theory. Property calculations: energy, forces, structure, and electronic and vibrational spectra. Student designed simulation projects involve applications to semiconductor processing, surface science, biochemistry, catalysis, polymers, environmental chemistry, and combustion. Prerequisite: quantum mechanics.

3 units, Aut (Musgrave, C)

CHEMENG 450. Advances in Biotechnology—Guest academic and industrial speakers. Latest developments in fields such as bioenergy, green process technology, production of industrial chemicals from renewable resources, protein pharmaceutical production, industrial enzyme production, stem cell applications, medical diagnostics, and medical imaging. Biotechnology ethics, business and patenting issues, and entrepreneurship in biotechnology. Prerequisite: BIOSCI 41 or CHEMENG 181 or equivalent.

3 units, Spr (Hwang, L: Swartz, J)

CHEMENG 454. Synthetic Biology and Metabolic Engineering—(Same as BIOE 454.) Principles for the design and optimization of new biological systems. Development of new enzymes, metabolic pathways, other metabolic systems, and communication systems among organisms. Example applications include the production of central metabolites, amino acids, pharmaceutical proteins, and isoprenoids. Economic challenges and quantitative assessment of metabolic performance. Pre- or corequisite: CHEMENG 355 or equivalent.

3 units, alternate years, not given this year (Swartz, J)

CHEMENG 456. Metabolic Biochemistry of Microorganisms—(Same as CEE 274B.) Microbial metabolism, biochemical and metabolic principles, unity and diversity of metabolic pathways, evolution of enzymes and metabolic pathways, microbial degradation of natural and anthropogenic organic compounds, predicting biodegradation, and metabolic origin of life.

3 units, Win (Spormann, A), alternate years, not given next year

CHEMENG 457. Microbial Ecology and Evolution—(Same as CEE 274C.) Structure/function relationship of microbial communities; metabolic and ecological basis of interactions in microbial communities; microbial ecology and population biology in natural and human host systems; and evolution of microbial life. Prerequisite: CEE 274A, CHEMENG 281 (formerly 288), or equivalent.

3 units, alternate years, not given this year (Spormann, A)

CHEMENG 459. Frontiers in Interdisciplinary Biosciences—(Same as BIOC 459, BIOE 459, BIOSCI 459, CHEM 459, PSYCH 459. Cross-listed in departments in the schools of H&S, Engineering, and Medicine; students register through their affiliated department; otherwise register for CHEMENG 459.) For specialists and non-specialists. Sponsored by the Stanford BioX Program. Three seminars per quarter address scientific and technical themes related to interdisciplinary approaches in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and the world present breakthroughs and endeavors that cut across core disciplines. Pre-seminars introduce basic concepts and background for non-experts. Registered students attend all pre-seminars; others welcome. See http://www.stanford.edu/group/biox/courses/459.html. Recommended: basic mathematics, biology, chemistry, and physics.

1 unit, Aut, Win, Spr (Robertson, C)

CHEMENG 460. Polymer Surfaces and Interfaces—Principles of interfacial thermodynamics and polymer physics applied to polymer surfaces and interfaces. Treatments of intermolecular forces; conformational statistics of macromolecular structure; models for polymer dynamics; tethering of polymers at different interfaces; techniques for chemical modification of surfaces; methods for physical characterization of polymer surfaces and interfaces. Applications in adhesion and biocompatibility. Prerequisite: exposure to principles of polymer science or consent of instructor.

3 units, alternate years, not given this year

CHEMENG 461. Polymeric Materials in Medical Devices—Integrated approach to polymer synthesis, characterization, and processing for polymer properties of technological benefit in biomedical devices. Classes of materials include ultra high molecular weight polyethylene, silicone elastomers, block copolymer segmented polyurethanes, highly orientated nylon fibers, hydrogels, and biodegradable polymers. Applications include prosthetic orthopedic devices, ophthalmic devices, sutures, and drug delivery systems.

3 units, Win (Frank, C)

CHEMENG 464. Polymer Chemistry—Polymer material design, synthesis, characterization, and application. Topics include organic and kinetic aspects of polymerization, polymer characterization techniques, and structure and properties of bulk polymers for commercial applications and emerging technologies.

3 units, Aut (Bao, Z), not given next year

CHEMENG 466. Polymer Physics—Concepts and applications in the equilibrium and dynamic behavior of complex fluids. Topics include solution thermodynamics, scaling concepts, semiflexibility, characterization of polymer size (light scattering, osmotic pressure, size-exclusion chromatography, intrinsic viscosity), viscoelasticity, rheological measurements, polyelectrolytes, liquid crystals, biopolymers, and gels.

3 units, alternate years, not given this year

CHEMENG 468. Advanced Transport Topics in Complex Fluids and Biological Systems—Topics include: the theory of Brownian motion; slender body theory in Stokes flows; advection-dispersion theory and generalized Taylor dispersion; the molecular basis for complex fluid rheology; hindered diffusion and flow in porous media; heat and mass transfer in laminar boundary layers with reactions, adsorption, and desorption; drop deformation and breakup; and the hydrodynamic stability of laminar multiphase flows. Prerequisite: 310 or equivalent, or consent of instructor.

3 units, not given this year

CHEMENG 500. Special Topics in Protein Biotechnology—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Swartz, J)

CHEMENG 501. Special Topics in Semiconductor Processing—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Bent, S)

CHEMENG 502. Special Topics in Computational Materials Science—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Musgrave, C)

CHEMENG 503. Special Topics in Biocatalysis—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Khosla, C)

CHEMENG 504. Special Topics in Bioengineering—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Robertson, C)

CHEMENG 505. Special Topics in Microrheology—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Fuller, G)

CHEMENG 507. Special Topics in Polymer Physics and Molecular Assemblies—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Frank, C)

CHEMENG 510. Special Topics in Transport Mechanics—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Shaqfeh, E)

CHEMENG 513. Special Topics in Functional Organic Materials for Electronic and Optical Devices—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Bao, Z)

CHEMENG 514. Special Topics in Biopolymer Physics—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Spakowitz, A)

CHEMENG 515. Special Topics in Molecular and Systems Biology—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Wang, C)

CHEMENG 516. Special Topics in Energy and Catalysis—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Jaramillo, T)

CHEMENG 517. Special Topics in Microbial Physiology and Metabolism—Recent developments and current research. May be repeated for credit. Prerequisite: graduate standing and consent of instructor.

1 unit, Aut, Win, Spr, Sum (Spormann, A)

CHEMENG 600. Graduate Research in Chemical Engineering—Laboratory and theoretical work leading to partial fulfillment of requirements for an advanced degree.

1-12 units, Aut, Win, Spr, Sum (Staff)

CHEMENG 699. Colloquium—Weekly lectures by experts from academia and industry in the field of chemical engineering.

1 unit, Aut, Win, Spr (Spakowitz, A)

CIVIL AND ENVIRONMENTAL ENGINEERING

Emeriti: (Professors) C. Allin Cornell, James Douglas, John W. Fondahl, Joseph B. Franzini, James M. Gere, En Y. Hsu, Helmut Krawinkler, Paul Kruger, Gilbert M. Masters,* Perry L. McCarty,* Henry W. Parker, George A. Parks, Haresh C. Shah, Robert L. Street,* Paul M. Teicholz

Chair: Richard G. Luthy

Associate Chair: Gregory G. Deierlein

Professors: Ronaldo I. Borja, Craig S. Criddle (on leave Autumn, Winter), Gregory G. Deierlein, Martin A. Fischer, Mark Z. Jacobson, Anne S. Kiremidjian, Peter K. Kitanidis, Jeffrey R. Koseff, Kincho H. Law, James O. Leckie, Raymond E. Levitt, Richard G. Luthy, Stephen G. Monismith, Leonard Ortolano, Alfred M. Spormann, Clyde B. Tatum

Associate Professors: Sarah L. Billington, David L. Freyberg, Lynn M. Hildemann, Eduardo Miranda, Azadeh Tabazadeh

Assistant Professors: Jack W. Baker, Alexandria B. Boehm, Jennifer Davis, Oliver B. Fringer, John R. Haymaker

Professor (Research): Martin Reinhard

Courtesy Professors: Peter M. Pinsky, David D. Pollard, Stephen H. Schneider, George S. Springer

Courtesy Assistant Professor: Margot G. Gerritsen

Lecturers: John H. Barton II, Cathrine D. Blake, Stan Christensen, Allan Daly, Derek Fong, Renate Fruchter, Robert R. Groves, Andrew G. Hudacek, Brad A. Jacobson, Matthew Johnson, Glenn Katz, Nelson A. Koen Cohen, Royal Kopperud, Mark R. Kroll, John Kunz, Brian Lee, Michael T. Lin, Ryan J. Orr, Alexander P. Robertson, Mark Sarkisian, Patti J. Walters

Acting Assistant Professors: Robert A. Canales, Michael D. Lepech

Consulting Professors: James E. Cloern, Russell G. Clough, Eric Elsesser, Angelos N. Findikakis, Amatzia Genin, Robert F. Hickey, Michael C. Kavanaugh, Michael E. London, Francis L. Ludwig, Douglas M. MacKay, Martin W. McCann, Jr., Richard L. Meehan, Paul K. Meyer, Piotr D. Moncarz, Wayne R. Ott, Ingo Pinnau, Harry E. Ridgway, Benedict R. Schwegler, Jr., Avram S. Tucker, Michael W. Walton

Consulting Associate Professors: Olaf A. Cirpka, Edward S. Gross, Charles S. Han, Thomas L. Holzer, Lisa V. Lucas, Colin Ong, Joel N. Swisher, Jie Wang, James M. Williams, Jane Woodward

Consulting Assistant Professors: Cristina L. Archer, William J. Behrman, Calvin K. Kam, Neil E. Klepeis, Gloria T. Lau, Michael L. MacWilliams

Shimizu Visiting Professor: Luis F. Alarcon

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* Recalled to active duty.

Department Offices: Yang/Yamazaki Enviro and Energy Building, room 314

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Web Site: http://cee.stanford.edu

Courses in Civil and Environmental Engineering have the subject code CEE. For a complete list of subject codes, see Appendix.

The primary mission of Civil and Environmental Engineering (CEE) at Stanford is the execution of basic and applied research that advances the civil and environmental engineering professions, the education of future academic and industry leaders, and the preparation of students for careers in professional practice. Civil and environmental engineers work to sustain the natural environment while creating and maintaining the built environment. Civil and environmental engineers are essential to providing the necessities of human life, including water, air, shelter, the infrastructure, energy, and food, increasingly in more efficient and renewable ways.

The department focus is on the theme of engineering for sustainability, including three focus areas: the built environment, environmental and water studies, and atmosphere and energy. The built environment includes creating processes, techniques, materials, and monitoring technologies for planning, design, construction and operation of environmentally sensitive, economically efficient, performance-based built systems, and managing associated risks from natural and man-made hazards. Built environment research and teaching is conducted primarily within the programs of Construction Engineering and Management, Design-Construction Integration, and Structural Engineering and Geomechanics. The water environment includes creating plans, policies, science-based assessment models and engineered systems to manage water in ways that protect human health, promote human welfare, and provide freshwater and coastal ecosystem services. Water environment research and teaching is conducted primarily within the programs of Environmental Engineering and Sciences and Environmental Fluid Mechanics and Hydrology. Atmosphere and Energy includes studying fundamental energy and atmospheric engineering and science, assessing energy-use effects on atmospheric processes and air quality, and analyzing and designing energy-efficient generation and use systems with minimal environmental impact.

UNDERGRADUATE PROGRAM

The undergraduate Civil Engineering major provides a pre-professional program balancing the fundamentals common to many special fields of civil engineering with a field of study in Environmental and Water Studies or Structures and Construction. The undergraduate Environmental Engineering major offers a more focused program in Environmental and Water Studies. Laboratory facilities are available to students in building energy, construction, environmental engineering and science, experimental stress analysis, fluid mechanics, structural and earthquake engineering, and advanced sensing technologies. The department hosts the School of Engineering pre-approved majors in Architectural Design and Atmosphere/Energy; see requirements in the “School of Engineering” section of this bulletin.

At least one year of graduate study is recommended for professional practice. Students who contemplate advanced study at Stanford should discuss their plans with their advisers in the junior year. The coterminal B.S.-M.S. program should be considered by students who want an integrated five-year program; applications are considered once a year near the beginning of Winter Quarter.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

BACHELOR OF SCIENCE

The B.S. in Civil Engineering and the B.S. in Environmental Engineering are ABET accredited programs, which place high priority on integrating research with engineering education. Four major objectives structure both degree programs:

1. To provide an understanding of engineering principles and the analytical, problem solving, design, and communication skills to continue succeeding and learning in diverse careers.
2. To prepare for successful engineering practice with a longer term perspective that takes into account new tools such as advanced information technology and biotechnology, and increasingly complex professional and societal expectations.
3. To prepare for possible graduate study in engineering or other professional fields.
4. To develop the awareness, background, and skills necessary to become responsible citizens and leaders in service to society.

Students who major in Civil Engineering or in Environmental Engineering must complete the appropriate requirements for the B.S. degree listed under Undergraduate Programs in the “School of Engineering” section of this bulletin. Each student has elective units, which may be used in any way the student desires, including additional studies in Civil and Environmental Engineering or any other school or department in the university. Because the undergraduate engineering curriculum provides breadth of study, students who intend to enter professional practice in civil or environmental engineering should plan to obtain their professional education at the graduate level.

A number of undergraduate programs at Stanford may be of interest to students seeking to specialize in environmental studies. In addition to the two majors offered in the department, students should examine related programs such as Earth Systems, Geological and Environmental Sciences, Urban Studies, and Human Biology.

HONORS PROGRAM

This program leads to a B.S. with honors for undergraduates majoring in Civil Engineering or in Environmental Engineering. It is designed to encourage qualified students to undertake a more intensive study of civil and environmental engineering than is required for the normal majors through a substantial, independent research project.

The program involves an in-depth research study in an area proposed to and agreed to by a Department of Civil and Environmental Engineering faculty adviser and completion of a thesis of high quality. A written proposal for the research to be undertaken must be submitted and approved by the faculty advisor in the fourth quarter prior to graduation. At the time of application, the student must have an overall grade point average (GPA) of at least 3.3 for course work at Stanford; this GPA must be maintained to graduation. The thesis is supervised by a CEE faculty adviser and must involve input from the School of Engineering writing program by means of ENGR 202S or its equivalent. The written thesis must be approved by the thesis adviser. Students are encouraged to present their results in a seminar for faculty and students. Up to 10 units of CEE 199H, Undergraduate Honors Research in Civil and Environmental Engineering, may be taken to support the research and writing (not to duplicate ENGR 202S). These units are beyond the normal Civil Engineering or Environmental Engineering major program requirements.

MINOR IN CIVIL ENGINEERING OR ENVIRONMENTAL ENGINEERING

The department offers minor programs in Civil Engineering and in Environmental Engineering. Departmental expertise and undergraduate course offerings are available in the areas of architectural design, construction engineering, construction management, structural/geotechnical engineering, environmental engineering and science, environmental fluid mechanics and hydrology, and atmosphere/energy. The courses required for the minors typically have prerequisites. Minors are not ABET-accredited programs. Further details on minors are provided in the “School of Engineering” section of this Bulletin.

GRADUATE PROGRAMS

The Department of Civil and Environmental Engineering (CEE), in collaboration with other departments, offers seven graduate degrees structured in three degree programs described below. The Atmosphere and Energy Program offers degrees with that designation. The Built Environment Program offers degrees with four designations: Construction Engineering and Management, Design/Construction Integration, Geomechanics, and Structural Engineering. The Environmental and Water Studies Program offers degrees with two designations: Environmental Engineering and Science, and Environmental Fluid Mechanics and Hydrology and Atmosphere/Energy. The final portion of this section describes University and departmental requirements for graduate degrees.

Research work and instruction under the three programs are carried out in these facilities: Building Energy Laboratory; Environmental Engineering and Science Laboratory; Environmental Fluid Mechanics Laboratory (EFML); Geotechnical Engineering Laboratory; Structural Engineering Laboratory; and water quality control research and teaching laboratories. The John A. Blume Earthquake Engineering Center conducts research on earthquake engineering including advanced sensing and control, innovative materials, and risk hazard assessment. Research and advanced global teamwork education is conducted in the Project Based Learning (PBL) Laboratory. In collaboration with the Department of Computer Science, the Center for Integrated Facility Engineering (CIFE) employs advanced CAD, artificial intelligence, communications concepts, and information management to integrate participants in the facility development process and to support design and construction automation. The Collaboratory for Research on Global Projects (CRGP) is a multi-school, multi-university research program aimed at improving the performance of global engineering and construction projects, with a special focus on sustainable infrastructure in developing countries.

PROGRAMS OF STUDY

ATMOSPHERE/ENERGY

Energy and Atmosphere are linked in two primary ways. First, fossil-fuel derived energy use contributes to air pollution and climate change. Second, atmospheric winds and solar radiation are major sources of renewable energy. Because atmospheric problems can be mitigated best by increasing the efficiency with which energy is used, optimizing the use of natural energy resources, and understanding the effects of energy technologies on the atmosphere, the areas of Energy and Atmosphere are naturally coupled together.

Students in this program receive a transcript designation of Atmosphere/Energy. Courses include those in energy resources, indoor and outdoor air pollution, energy efficient buildings, climate change, renewable energy, weather and storm systems, energy technologies in developing countries, energy systems, and air quality management.

Current research in the program includes projects on wind energy distribution and statistics, indoor exposure to air pollutants, the effects of a hydrogen economy on atmospheric pollution and climate, measurements of particulate matter and vehicle exhaust, hydrogen and other fuel generation by bacteria, numerical modeling of the effects of vehicles and power plants on climate, numerical weather prediction, improving the energy efficiency of buildings, improving the links between wind farms and the transmission grid, and studying the effects of aerosol particles on UV radiation and climate, among others.

Within the department, the program links to studies of water quality, environmental biotechnology, environmental fluid mechanics, sustainable construction, green buildings, and risk management. Outside the department, it links to Earth Systems, Management Science and Engineering, Mechanical Engineering, Energy Resources Engineering, Urban Studies, Aeronautics and Astronautics, and Biological Sciences, among others. In addition, the program has natural connections with the Woods Institute for the Environment, the Interdisciplinary Graduate Program in Environment and Resources (IPER), and the Global Climate and Energy Program (GCEP).

CONSTRUCTION ENGINEERING AND MANAGEMENT

The Construction Engineering and Management (CEM) program prepares technically qualified students for responsible engineering and management roles in all phases of the development of major constructed facilities. It emphasizes management techniques useful in organizing, planning, and controlling the activities of diverse specialists working within the unique project environment of the construction industry, and it covers construction engineering aspects of heavy, industrial and building construction. The CEM concentration offers courses in: building systems, construction administration, construction law, project finance, accounting, real estate development, structural design, HVAC design and construction, equipment and methods, estimating, international construction, labor relations, managing human resources, planning and control techniques, productivity improvement, and project and company organizations. Additional related course work is available from other programs within the department, from other engineering departments, and from other schools in the University such as Earth Sciences and the Graduate School of Business.

Students with undergraduate degrees in chemical, electrical, mechanical, mining, and petroleum engineering, or in architecture who do not wish to satisfy the undergraduate prerequisite courses for the M.S. in Civil and Environmental Engineering, Sustainable Design and Construction field of study, have the option of meeting the same graduate course requirements as the above and obtaining the M.S. in Engineering, Construction Engineering and Management field of study. The CEM program allows students substantial flexibility to tailor their program of study for careers with general contractors, specialty contractors, real estate or infrastructure developers or facility owners and operators.

DESIGN-CONSTRUCTION INTEGRATION

The Design-Construction Integration (DCI) program prepares students for multidisciplinary collaborative teamwork in an integrated design and construction process. The program extends a student's design or construction background with core courses in each of these areas and develops the background needed to understand the concerns and expertise of the many project stakeholders. It includes a comprehensive project-based learning experience. The field of study in Design-Construction Integration is open to applicants with backgrounds in engineering and science. Applicants should also have a background in the planning, design, or construction of facilities by virtue of work experience and/or their undergraduate education. Knowledge in subjects from the traditional areas of civil engineering is necessary for students to receive the degree and to satisfy prerequisite requirements for some of the required graduate courses. Students with an undergraduate degree in civil engineering, and who expect to pursue careers with design or construction firms that emphasize design-build, EPC, or turnkey projects should consider DCI.

STRUCTURAL ENGINEERING AND GEOMECHANICS

The Structural Engineering and Geomechanics (SEG) program encompasses teaching and research programs in structural design and analysis, structural materials, earthquake engineering and structural dynamics, advanced sensing and structural health monitoring, risk and reliability analysis, computational science and engineering, and geotechnical engineering including geomechanics. The SEG programs prepare students for industrial or academic careers. Students can balance engineering fundamentals with modern computational and experimental methods to customize programs to launch careers as consultants on large and small projects, designers, and engineering analysts.

Structural design and analysis focuses on the conceptual design of structural systems and on computational methods for predicting the static and dynamic, linear and nonlinear responses of structures. Structural materials research and teaching focuses on the design and analysis of high-performance materials and materials targeting a reduced environmental impact.

Earthquake engineering and structural dynamics addresses earthquake phenomena, ground shaking, and the behavior, analysis, and design of structures under seismic and other dynamic forces. The John A. Blume Earthquake Engineering Center conducts advanced analytical and experimental research in earthquake engineering and houses static and dynamic testing equipment including two shaking tables. Reliability and risk analysis focuses on advanced methods for structural safety evaluation and design, including methods for loss estimation from damage and failures of structures and lifeline systems. Computational science and engineering emphasizes the application of modern computing methods to structural engineering and geomechanics and encompasses numerical, structural, and geotechnical analysis, including finite element analysis and boundary element methods. The geomechanics program focuses on the application of the principles of applied mechanics to problems involving geologic materials and includes theoretical soil and rock mechanics, computational methods, and analysis and design of foundations and earth structures.

ENVIRONMENTAL AND WATER STUDIES

Environmental and water studies include environmental engineering and science, environmental fluid mechanics, environmental planning, and hydrology. Course offerings permit intensive study in a single area or interrelated study between areas. Programs are flexible to foster interaction among students and encourage the development of individual programs. The Stanford laboratories for water quality control and environmental fluid mechanics are well equipped for advanced research and instruction.

Courses from other programs and departments complement these course offerings. Examples include Computer Science (numerical methods), Geological and Environmental Sciences (geostatistics, hydrogeology), Mechanical Engineering (applied math, experimental methods, fluid mechanics, heat transfer), Energy Resources Engineering (reservoir engineering, well-test analysis), and Statistics (probability and statistics). The major areas of specialization in the two programs, environmental engineering and science, and environmental fluid mechanics and hydrology, are described below. Admissions to these programs are handled separately; prospective students should indicate their preference on their application.

ENVIRONMENTAL ENGINEERING AND SCIENCE

The Environmental Engineering and Science (EES) program emphasizes the chemical and biological processes involved in water quality engineering, pollution treatment, remediation, and environmental protection. Course offerings include: the biological, chemical, and engineering aspects of water supply; the movement and fate of pollutants in surface and ground waters, soil, and the atmosphere; hazardous substance control; molecular environmental biotechnology; and water and air pollution. Companion courses in the Environmental Fluid Mechanics and Hydrology Program (EFMH) include environmental planning and impact assessment, and environmental fluid mechanics, hydrology, and transport modeling.

ENVIRONMENTAL FLUID MECHANICS AND HYDROLOGY

The Environmental Fluid Mechanics and Hydrology (EFMH) program focuses on understanding the physical processes controlling the movement of mass, energy, and momentum in the water environment and the atmosphere. The program also considers environmental and institutional issues involved in planning water resources development projects. Environmental fluid mechanics courses address: experimental methods; fluid transport and mixing processes; the fluid mechanics of stratified flows; natural flows in coastal waters, estuaries, lakes, and open channels; and turbulence and its modeling. Hydrology courses consider flow and transport in porous media, stochastic methods in both surface and subsurface hydrology, and watershed hydrology and modeling. Atmosphere courses deal with climate, weather, storms and air pollution and their modeling. Planning courses emphasize environmental policy implementation and sustainable water resources development. The research of this group is focused in the Environmental Fluid Mechanics Laboratory, which includes the P. A. McCuen Environmental Computer Center.

DEGREE REQUIREMENTS

The University requirements governing the M.S., Engineer, and Ph.D. are described in the "Graduate Degrees" section of this bulletin.

Admission—Applications require online submission of the application form and statement of purpose, followed by three letters of recommendation, results of the General Section of the Graduate Record Examination, and transcripts of courses taken at colleges and universities. See http://gradadmissions.stanford.edu/. Policies for each of the department's programs are available by referring to http://cee.stanford.edu.

Successful applicants are advised as to the degree and program for which they are admitted. If students wish to shift from one CEE program to another after being accepted, an application for the intradepartmental change must be filed within the department; they will then be advised whether the change is possible. If, after enrollment at Stanford, students wish to continue toward a degree beyond the one for which they were originally admitted, a written application must be made to the Department of Civil and Environmental Engineering.

Financial Assistance—The department maintains a continuing program of financial aid for graduate students. Applications for financial aid and assistantships should be filed by December 12, 2007; it is important that Graduate Record Examination scores be available at that time. Applicants not requesting financial assistance have until March 13, 2008 for the online submission.

Teaching assistantships carry a salary for as much as one-half time work to assist with course offerings during the academic year. Up to half-time research assistantships also are available. Engineer and Ph.D. candidates may be able to use research results as a basis for the thesis or dissertation. Assistantships and other basic support may be supplemented by fellowship and scholarship awards or loans. Continued support is generally provided for further study toward the Engineer or Ph.D. degree based on the student's performance, the availability of research funds, and requisite staffing of current projects.

MASTER OF SCIENCE

The following programs are available leading to the M.S. degree in Civil and Environmental Engineering: Atmosphere/Energy, Construction Engineering and Management, Design/Construction Integration, Environmental Engineering and Science, Environmental Fluid Mechanics and Hydrology, Geomechanics, and Structural Engineering.

Students admitted to graduate study with a B.S. in Civil Engineering, or equivalent, from an accredited curriculum can satisfy the requirements for the M.S. degree in Civil and Environmental Engineering by completing a minimum of 45 units beyond the B.S. All 45 units must be taken at Stanford. A minimum 2.75 grade point average (GPA) is required for candidates to be recommended for the M.S. degree. No thesis is required.

The program of study must be approved by the faculty of the department and should include at least 45 units of courses in engineering, mathematics, science, and related fields unless it can be shown that other work is pertinent to the student's objectives. Additional program area requirements are available from the department's student services office (Terman M-42).

Candidates for the M.S. in Civil and Environmental Engineering who do not have a B.S. in Civil Engineering may, in addition to the above, be required to complete those undergraduate courses deemed important to their graduate programs. In such cases, more than three quarters is often required to obtain the degree. Students may, with the approval of their academic adviser, select a program that satisfies the requirements for the M.S. in Engineering. Forms required for the degree may be secured from the department's office of student services.

ENGINEER

A student with an M.S. in Civil Engineering may satisfy the requirements of the degree of Engineer in Civil and Environmental Engineering by completing 45 unduplicated course work and research units for the degree and minimum residency of 90 total units. Engineer candidates must submit an acceptable thesis (12 to 15 units) and maintain a minimum GPA of 3.0. The program of study must be approved by a faculty member in the department.

This degree is recommended for those desiring additional graduate education, especially those planning a career in professional practice. The thesis normally should be started in the first quarter of graduate study after the M.S. degree. Programs are offered in the fields of specialization mentioned for the M.S. degree. The Engineer thesis topic, for students who will continue study toward a CEE Ph.D., must be significantly different from their doctoral research.

DOCTOR OF PHILOSOPHY

The Ph.D. is offered under the general regulations of the University as set forth in the "Graduate Degrees" section of this bulletin. This degree is recommended for those who expect to engage in a professional career in research, teaching, or technical work of an advanced nature. The Ph.D. program requires a total of 135 units of graduate study, at least 90 units of which must be at Stanford. Up to 45 units of graduate study can be represented by the M.S. program described above. Students must maintain a minimum GPA of 3.0 in post-M.S. course work. All candidates for the Ph.D. degree are required to complete CEE 200 in conjunction with a one-quarter teaching assistantship/course assistantship to gain training and instructional experience. Further information on Ph.D. requirements and regulations is found in the department handbook.

The program of study is arranged by the prospective candidate at the beginning of the second year with the advice of a faculty committee whose members are nearest in the field of interest to that of the student. The chair of the committee serves as the student's interim adviser until such time as a member of the faculty has agreed to direct the dissertation research. Insofar as possible, the program of study is adapted to the interests and needs of the student within the framework of the requirements of the department and the University.

By the end of the second year of graduate study (or by the end of the first year for students who enroll at Stanford with an M.S.), the student is expected to pass the department's General Qualifying Examination (GQE) to be admitted to candidacy for the doctoral degree. The purpose of the GQE is to ensure that the student is adequately prepared to undertake doctoral research and has a well planned research topic. The exam may take the form of (1) a written and/or oral general examination of the candidate's major field, (2) a presentation and defense of the candidate's doctoral research dissertation proposal, or (3) a combination research proposal and general examination. The GQE is administered by an advisory committee consisting of at least three Stanford faculty members, including a chair who is a faculty member in Civil and Environmental Engineering. All members are normally on the Stanford Academic Council. A petition for appointment of one advisory committee member who is not on the Academic Council may be made if the proposed person contributes an area of expertise that is not readily available from the faculty. Such petitions are subject to approval by the department chair. When the primary research adviser is not a member of the CEE Academic Council faculty the committee must consist of four examiners, with two members from the CEE department.

PH.D. MINOR

A Ph.D. minor is a program outside a major department. Requirements for a minor are established by the minor department. Acceptance of the minor as part of the total Ph.D. program is determined by the major department. Application for the Ph.D. minor must be approved by both the major and the minor department, and the minor department must be represented at the University oral examination.

A student desiring a Ph.D. minor in Civil and Environmental Engineering (CEE) must have a minor program adviser who is a regular CEE faculty member in the program of the designated subfield. This adviser must be a member of the student's University oral examination committee and the reading committee for the doctoral dissertation.

The program must include at least 20 units of graduate-level course work (that is, courses numbered 200 or above, excluding special studies and thesis) in CEE completed at Stanford University. The list of courses must form a coherent program and must be approved by the minor program adviser and the CEE chair. A minimum GPA of 3.0 must be achieved in these courses.

HONORS COOPERATIVE PROGRAM

Some of the department's graduate students participate in the Honors Cooperative Program (HCP), which makes it possible for academically qualified engineers and scientists in industry to be part-time graduate students in Civil and Environmental Engineering while continuing professional employment. Prospective HCP students follow the same admissions process and must meet the same admissions requirements as full-time graduate students. For more information regarding the Honors Cooperative Program, see the "School of Engineering" section of this bulletin.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations for undergraduates (8 units maximum).

UNDERGRADUATE

CEE 31. Accessing Architecture Through Drawing—Preference to Architectural Design and CEE majors; others by consent of instructor. Drawing architecture to probe the intricacies and subtleties that characterize contemporary buildings. How to dissect buildings and appreciate the formal elements of a building, including scale, shape, proportion, colors and materials, and the problem solving reflected in the design. Students construct conventional architectural drawings, such as plans, elevations, and perspectives. Limited enrollment.

4 units, Win (Barton, J)

CEE 31Q. Accessing Architecture through Drawing—Stanford Introductory Seminar. Preference to sophomores. Drawing architecture provides a deeper understanding of the intricacies and subtleties that characterize contemporary buildings. How to dissect buildings and appreciate the formal elements of a building, including scale, shape, proportion, colors and materials, and the problem solving reflected in the design. Students construct conventional architectural drawings, such as plans, elevations, and perspectives. Limited enrollment. GER:DB-EngrAppSci

4 units, Aut (Walters, P)

CEE 46Q. Fail Your Way to Success—Stanford Introductory Seminar. Preference to sophomores. How to turn failures into successes; cases include minor personal failures and devastating engineering disasters. How personalities and willingness to take risks influence the way students approach problems. Field trips, case studies, and guest speakers applied to students' day-to-day interactions and future careers. Goal is to redefine what it means to fail. GER:DB-EngrAppSci

3 units, Spr (Clough, R)

CEE 48N. Design Organizations to Execute Global Projects—Stanford Introductory Seminar. Preference to freshmen. Confusion, misunderstanding, and conflict among multinational team members on global projects can cause significant delays and cost overruns. Challenges in carrying out global projects; theory, methods, and tools to enhance global project outcomes. Opportunities to participate in ongoing research in the Collaboratory for Research on Global Projects involving faculty from multiple Stanford departments and schools; see http://crgp.stanford.edu. Student teams model and simulate crosscultural teams engaged in global projects.

4 units, Win (Levitt, R)

CEE 63. Weather and Storms—(Graduate students register for 263C.) Daily and severe weather and global climate. Topics: structure and composition of the atmosphere, fog and cloud formation, rainfall, local winds, wind energy, global circulation, jet streams, high and low pressure systems, inversions, el Niño, la Niña, atmosphere/ocean interactions, fronts, cyclones, thunderstorms, lightning, tornadoes, hurricanes, pollutant transport, global climate and atmospheric optics. GER: DB-NatSci

3 units, Aut (Jacobson, M)

CEE 64. Air Pollution: From Urban Smog to Global Change—(Graduate students register for 263D.) Survey of urban- through global-scale air pollution. Topics: the evolution of the Earth's atmosphere, indoor air pollution, urban smog formation, history of discovery of atmosphere chemicals, visibility, acid rain, the greenhouse effect, historical climate, global warming, stratospheric ozone reduction, Antarctic ozone destruction, air pollution transport across political boundaries, the effects of air pollution on ultraviolet radiation, and impacts of energy systems on the atmosphere. GER: DB-NatSci

3 units, Win (Jacobson, M)

CEE 70. Environmental Science and Technology—Introduction to environmental quality and the technical background necessary for understanding environmental issues, controlling environmental degradation, and preserving air and water quality. Material balance concepts for tracking substances in the environmental and engineering systems. GER:DB-EngrAppSci

3 units, Spr (Kopperud, R)

CEE 100. Managing Sustainable Building Projects—Managing the life cycle of buildings from the owner, designer, and contractor perspectives emphasizing sustainability goals; methods to define, communicate, coordinate, and manage multidisciplinary project objectives including scope, quality, life cycle cost and value, schedule, safety, energy, and social concerns; roles, responsibilities, and risks for project participants; virtual design and construction methods for product, organization, and process modeling; lifecycle assessment methods; individual writing assignment related to a real world project. GER:DB-EngrAppSci

4 units, Spr (Fischer, M)

CEE 101A. Mechanics of Materials—Introduction to beam and column theory. Normal stress and strain in beams under various loading conditions; shear stress and shear flow; deflections of determinate and indeterminate beams; analysis of column buckling; structural loads in design; strength and serviceability criteria. Lab experiments. Prerequisites: ENGR 14. GER:DB-EngrAppSci

4 units, Win (Baker, J)

CEE 101B. Mechanics of Fluids—Physical properties of fluids and their effect on flow behavior; equations of motion for incompressible ideal flow, including the special case of hydrostatics; continuity, energy, and momentum principles; control volume analysis; laminar and turbulent flows; internal and external flows in specific engineering applications including pipes, open channels, estuaries, and wind turbines. Prerequisites: PHYSICS 41 (formerly 53), MATH 51. GER:DB-EngrAppSci
4 units, Spr (Koseff, J)

CEE 101C. Geotechnical Engineering—Introduction to the principles of soil mechanics. Soil classification, shear strength and stress-strain behavior of soils, consolidation theory, analysis and design of earth retaining structures, introduction to shallow and deep foundation design, slope stability. Lab projects. Prerequisite: ENGR 14. Recommended: 101A. GER:DB-EngrAppSci
3-4 units, Aut (Borja, R)

CEE 101D. Computations in Civil and Environmental Engineering—(Graduate students register for 201D.) Computational and visualization methods in the design and analysis of civil and environmental engineering systems. Focus is on applications of MATLAB. How to develop a more lucid and better organized programming style.
3 units, Aut (Kitanidis, P)

CEE 102. Legal Aspects of Engineering and Construction—(Graduate students register for 202.) Introduction to the U.S. legal system as it applies to civil engineering and construction. Fundamental concepts of contract and tort law, claims, risk management, business formation and licensing, agency, insurance and bonding, and real property.
3-4 units, Win (London, M; Groves, R; Tucker, A)

CEE 110. Building Information Modeling—(Graduate students register for 210.) Creation, management, and application of building information models. Process and tools available for creating 2D and 3D computer representations of building components and geometries. Organizing and operating on models to produce architectural views and construction documents, renderings and animations, and interface with analysis tools. Lab exercises, class projects. Limited enrollment.
4 units, Aut (Katz, G)

CEE 111. Multidisciplinary Modeling and Analysis—(Graduate students register for 211.) Computer modeling, visualization, analysis, and graphical communication of building projects. Use of 3D models in laser scanning, rendering, animation, daylight, energy, cost, structural, lighting analysis, and computer controlled fabrication. Underlying 3D computer representations, and analysis tools and their applications. Guest lectures, lab exercises, class project. Prerequisite: 110 or CAD experience. GER:DB-EngrAppSci
4 units, Spr (Haymaker, J)

CEE 115. Goals and Methods of Sustainable Building Projects—(Graduate students register for 215.) Goals related to sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and economic and social sustainability. Methods to integrate these goals and enhance the economic, ecological, and equitable value of building projects. Industry and academic rating systems, project case studies, guest lecturers, and group project.
3 units, Win (Haymaker, J)

CEE 122A. Computer Integrated Architecture/Engineering/Construction (A/E/C)—(Graduate students register for 222A; undergraduates serve as apprentices.) Crossdisciplinary, collaborative, geographically distributed, project-based, teamwork environment. Round table A/E/C panel discussions, lectures, and labs on collaborative technologies provide a global perspective of the A/E/C industry and cutting edge information technologies. Students exercise theoretical discipline knowledge in architecture, structural, engineering, construction management, and the information technologies in a multidisciplinary context focusing on the concept development phase of a comprehensive building project. May be repeated for credit.
3 units, Win (Fruchter, R)

CEE 122B. Computer Integrated A/E/C—(Graduate students register for 222B; undergraduates serve as apprentices.) Comprehensive team project, including project development and documentation, and final project presentation of product and process. Design and construction alternatives are subject to examination by rapid computational prototyping, concurrent multidisciplinary evaluation, and trade-off analysis. Prerequisite 122A/222A.
2 units, Spr (Fruchter, R)

CEE 124. Sustainable Development Studio—(Graduate students register for 224A.) Project-based. Sustainable design, development, use and evolution of buildings; connections of building systems to broader resource systems. Areas include architecture, structure, materials, energy, water, air, landscape, and food. Projects use a cradle-to-cradle approach focusing on technical and biological nutrient cycles and information and knowledge generation and organization. May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

CEE 130. Architectural Design: 3-D Modeling, Methodology, and Process—Preference to Architectural Design majors; others by consent of instructor. Projects investigate conceptual approaches to the design of key architectural elements, such as wall and roof. Functional and structural considerations. Focus is on constructing 3-D models in a range of materials; 3-D computer modeling. Students keep a graphic account of the evolution of their design process. Final project entails design of a simple structure. Limited enrollment. Pre- or corequisite: 31 or 31Q.
4 units, Aut (Barton, J), Win (Walters, P; Katz, G)

CEE 131. Architectural Design Process—Preference to Architectural Design and CEE majors; others by consent of instructor. Issues in the architectural profession including programming, site analysis, design process, and professional practice concerns. Building/landscape design case study project using architectural graphics and models. Limited enrollment.
4 units, not given this year

CEE 131A. Introduction to the Design Professions—Seminar. Paths to careers that contribute to the design and construction of the built environment, including architecture, landscape architrecture, project management, construction management, civil engineering, urban planning, and sustainability coordination. Guest lecturers present their work, background, roles and relationships to the other disciplines. Field trips, written and oral presentations, and four Wednesday evening lectures of the Spring Architecture and Landscape Architecture series.
2 units, Spr (Blake, C)

CEE 132. Interplay of Architecture and Engineering—(Graduate students register for CEE 232.) The range of requirements that drive a building's design including architecture, engineering, constructability, building codes, and budget. Case studies illustrate how structural and mechanical systems are integrated into building types including residential, office, commercial, and retail. In-class studio work.
4 units, not given this year

CEE 134A. Site and Space—Preference to Architectural Design and CEE majors; others by consent of instructor. Intermediate architectural studio. The design of small buildings. Emphasis is on design, form, space making, context; and structure; attention to program and sustainability. Limited enrollment. May be repeated for credit. Prerequisites: 31 or 31Q, and 130.
4 units, not given this year

CEE 135A. Parametrics: Applications in Architecture and Product Design—Precedents in architecture and product design; methods for modeling, prototyping, and fabrication. How to combine design intentions and digital logics with physical and material constraints. Students develop a case study and small design projects using a parametric approach at the scales of architecture and product.
4 units, Spr (Staff)

CEE 136. Green Architecture—(Same as CEE 236.) Preference to Architectural Design and CEE majors; others by consent of instructor. An architectural design studio exploring the Stanford Green Dorm project. Initial sessions develop a working definition of sustainable design and strategies for greening the built environment in preparation for design studio work. Enrollment limited to 14. Prerequisites: 31 or 31Q, and 110 and 130. GER:DB-EngrAppSci

4 units, Win (Jacobson, B)

CEE 137A. Form and Structure—Preference to Architectural Design and CEE majors; others by consent of instructor. Intermediate architectural studio. The integration of structure, form, site, and program. Emphasis is on developing a schematic design in the context of site topography and structural systems. Limited enrollment. Prerequisites: 31 or 31Q, and 130.

4 units, not given this year

CEE 137B. Intermediate Architecture Studio—How structural systems influence the final form of a building. Studio design project focus is on a building of intermediate complexity. Taught by guest architects. Prerequisites: 31 or 31Q, and 110 and 130.

5 units, Spr (Lee, B; Sarkisian, M)

CEE 138A. Contemporary Architecture: Materials, Structures, and Innovations—Structural and material bases for contemporary architecture; its roots in modern innovations. Recent technological developments; new materials and structural expressions. Sources include specific buildings and construction techniques. How to think critically about design strategies, material properties, and structural techniques.

3 units, Aut (Johnson, M)

CEE 139. Design Portfolio Methods—Students present designs completed in other studio courses to communicate design intentions and other aspects of their work. Instruction in photography; preparation of a design portfolio; and short essays that characterize portfolio contents. Oral presentation workshops offered through the Center for Teaching and Learning. Limited enrollment with preference to students in CEE, Urban Studies, and Art. Prerequisites: two Art or Architecture studio courses, or consent of instructor.

3 units, Spr (Barton, J)

CEE 140. Field Surveying Laboratory—(Graduate students register for 225.) Friday afternoon laboratory provides practical surveying experience. Additional morning classes to prepare for the afternoon sessions. Hands-on operation of common traditional field survey tools ; introduction to the newest generation of digital measuring, positioning, and mapping tools. Emphasis is on the concept of using the data collected in the field as the basis for subsequent engineering and economic decisions. GER:DB-EngrAppSci

3 units, Spr (Staff)

CEE 142A. Creating Sustainable Development—(Graduate students register for 242A.) How the built environment influences the way people interact with each other in communities. Case studies. How tradeoffs among economic, ecological, and social benefits can be managed. Frameworks for managing stakeholder processes including negotiating multiparty processes. Group project. Enrollment limited to 50.

3 units, Win (Christensen, S)

CEE 143. Integrated Concurrent Engineering—(Graduate students register for 243.) Computer-based models in building design and construction. Virtual design and construction (VDC): the use of multidisciplinary performance models of design-construction projects, including the product (facilities), work processes, organization of the design-construction-operation team, and economic impact (model of both cost and value of capital investments) to support business objectives. Opportunity for 4-day mini-internship at an A/E/C company over Spring break. Prerequisite for undergraduates: 100 or consent of instructor. Recommended for graduate students: 241, 242.

3-4 units, Win (Kunz, J)

CEE 147. Cases in Personality, Leadership, and Negotiation—(Graduate students register for 247.) Case studies target personality issues, risk willingness, and life skills essential for real world success. Failures, successes, and risk willingness in individual and group tasks based on the professor's experience as small business owner and construction engineer. Required full afternoon field trips to local sites. Application downloaded from coursework must be submitted before first class; mandatory first class attendance. No auditors.

3 units, Spr (Clough, R)

CEE 151. Negotiation—(Graduate students register for 251; same as ME 207, MS&E 285.) Negotiation styles and processes to help students conduct and review negotiations. Workshop format integrating intellectual and experiential learning. Exercises, live and field examples, individual and small group reviews. Application required before first day of class; see http://www.stanford.edu/class/msande285/. Enrollment limited to 50.

3 units, Spr (Christensen, S)

CEE 154. Cases in Estimating Costs—(Graduate students register for 254.) Students participate in bidding contests requiring cost determination in competitive markets. Monetary forces driving the construction industry as general principles applicable to any competitive business. Cases based on professor's experience as small business owner and construction engineer. Required full afternoon field trips to local sites. Mandatory first class attendance. GER:DB-EngrAppSci

3 units, Aut (Clough, R)

CEE 156. Building Systems—(Graduate students register for 256.) Design concepts, options for increased sustainability, integration issues, construction materials, and installation operations for heating, ventilating, and air conditioning systems. Overview of other building systems. GER:DB-EngrAppSci

4 units, Spr (Daly, A)

CEE 159. Career Skills Seminar—(Graduate students register for 259.) Factors required for successful careers. Guest speakers. Case studies. No auditors.

2 units, Aut (Clough, R)

CEE 160. Mechanics of Fluids Laboratory—Lab experiments/demonstrations illustrate conservation principles and flows of real fluids. Corequisite: 101B.

2 units, Spr (Monismith, S)

CEE 161A. Rivers, Streams, and Canals—(Graduate students register for 264A.) The movement of water through natural and engineered channels, streams, and rivers. Equations and theory (mass, momentum, and energy equations) for steady and unsteady descriptions of the flow. Design of flood-control and canal systems. Flow controls such as weirs and sluice gates; gradually varied flow; Saint-Venant equations and flood waves; and method of characteristics. Open channel flow laboratory experiments: controls such as weirs and gates, gradually varied flow, and waves. Students taking lab section register for 4 units. Prerequisites: 101B, 160. GER:DB-EngrAppSci

3-4 units, Aut (Fong, D)

CEE 161S. Atmosphere and Global Environmental Change—(Graduate students register for 261S; same as GEOPHYS 161/261.) Topics include atmospheric chemistry and physics, solar dimming, the greenhouse model, cooling and warming components of climate, and the recovery of stratospheric ozone in a changing atmosphere. Prerequisites: MATH 51 and CHEM 31, or equivalents.

3 units, Aut (Tabazadeh, A)

CEE 161T. Aerosols, Clouds, and Climate Change—(Graduate students register for 261T; same as GEOPHYS 136/236.) Natural and manmade aerosol particles in the Earth's atmosphere. Coupling interactions between aerosol and cloud particles and how such interactions influence the climate and atmospheric composition. Term project. Prerequisites: MATH 51 and CHEM 31, or equivalents.

3 units, Win (Tabazadeh, A)

CEE 164. Introduction to Physical Oceanography—(Graduate students register for 262D; same as EARTHSYS 164.) The dynamic basis of oceanography. Topics: physical environment; conservation equations for salt, heat, and momentum; geostrophic flows; wind-driven flows; the Gulf Stream; equatorial dynamics and ENSO; thermohaline circulation of the deep oceans; and tides. Prerequisite: PHYSICS 41 (formerly 53). GER: DB-NatSci

4 units, Spr (Hench, J)

CEE 166A. Watersheds and Wetlands—(Graduate students register for 266A.) Introduction to the occurrence and movement of water in the natural environment and its role in creating and maintaining terrestrial, wetland, and aquatic habitat. Hydrologic processes, including precipitation, evaporation, transpiration, snowmelt, infiltration, subsurface flow, runoff, and streamflow. Rivers and lakes, springs and swamps. Emphasis is on observation and measurement, data analysis, modeling, and prediction. Prerequisite: 101B or equivalent. GER:DB-EngrAppSci

3 units, Aut (Freyberg, D)

CEE 166B. Floods and Droughts, Dams and Aqueducts—(Graduate students register for 266B.) Sociotechnical systems associated with human use of water as a resource and the hazards posed by too much or too little water. Potable and non-potable water use and conservation. Irrigation, hydroelectric power generation, rural and urban water supply systems, storm water management, flood damage mitigation, and water law and institutions. Emphasis is on engineering design. Prerequisite: 166A or equivalent. GER:DB-EngrAppSci

3 units, Win (Freyberg, D)

CEE 166D. Water Resources and Water Hazards Field Trips—(Graduate students register for 266D.) Introduction to water use and water hazards via weekly field trips to local and regional water resources facilities (dams, reservoirs, fish ladders and hatcheries, pumping plants, aqueducts, hydropower plants, and irrigation systems) and flood damage mitigation facilities (storm water detention ponds, channel modifications, flood control dams, and reservoirs). Each trip preceded by an orientation lecture.

2 units, Win (Freyberg, D)

CEE 169. Environmental and Water Resources Engineering Design—Application of fluid mechanics, hydrology, water resources, environmental sciences, and engineering economy fundamentals to the design of a system addressing a complex problem of water in the natural and constructed environment. Problem changes each year, generally drawn from a challenge confronting the University or a local community. Student teams prepare proposals, progress reports, oral presentations, and a final design report. Prerequisite: senior in Civil Engineering or Environmental Engineering; 166B.

5 units, Spr (Freyberg, D), alternate years, not given next year

CEE 171. Environmental Planning Methods—For juniors and seniors. Use of microeconomics and mathematical optimization theory in the design of environmental regulatory programs; tradeoffs between equity and efficiency in designing regulations; techniques for predicting visual, noise, and traffic impacts in environmental impact assessments. Prerequisites: MATH 51. Recommended: 70. GER:DB-EngrAppSci

3 units, Win (Ortolano, L)

CEE 171Y. Environmental Policy Design and Implementation in the U.S. and Asia—In Singapore, September 17-21, 2007. Preference to Environmental Engineering and M.S. students. How policy instruments and their effects are influenced by administrative and legal structures and by interplay among participants such as regulators, polluters, and nongovernmental organizations. Prerequisite: consent of instructor.

2 units, Aut (Ortolano, L), offered once only

CEE 172. Air Quality Management—Quantitative introduction to the engineering methods used to study and seek solutions to current air quality problems. Topics: global atmospheric changes, urban sources of air pollution, indoor air quality problems, design and efficiencies of pollution control devices, and engineering strategies for managing air quality. Prerequisites: 70, MATH 51. GER:DB-EngrAppSci

3 units, Win (Hildemann, L), Sum (Kopperud, R)

CEE 172A. Indoor Air Quality—(Graduate students register for 278C.) Factors affecting the levels of air pollutants in the built indoor environment. The influence of ventilation, office equipment, floor coverings, furnishings, cleaning practices, and human activities on air quality including carbon dioxide, VOCs, resuspended dust, and airborne molds and fungi. Recommended: 172 or 278A.

2-3 units, Spr (Hildemann, L), alternate years, not given next year

CEE 173A. Energy Resources—(Graduate students register for 207A; same as EARTHSYS 103.) Oil, natural gas, coal, nuclear, hydro, solar, geothermal, biomass, wind, and ocean energy resources in terms of supply, distribution, recovery and conversion, environmental impacts, economics, policy, and technology. The opportunities for energy efficiency, electric power basics, the changing role of electric utilities, transportation basics, and energy use in developing countries. Field trips. Recommended: CEE 70. GER:DB-EngrAppSci

4-5 units, Aut (Woodward, J)

CEE 175A. The California Coast: Science, Policy, and Law—(Graduate students register for 275A; same as EARTHSYS 175/275, LAW 514.) Interdisciplinary. The legal, science, and policy dimensions of managing California's coastal resources. Coastal land use and marine resource decision making. The physics, chemistry, and biology of the coastal zone, tools for exploring data from the coastal ocean, and the institutional framework that shapes public and private decision making. Field work: how experts from different disciplines work to resolve coastal policy questions.

3-4 units, Win (Boehm, A; Caldwell, M; Sivas, D)

CEE 176A. Energy Efficient Buildings—Analysis and design. Thermal analysis of building envelope, heating and cooling requirements, HVAC, and building integrated PV systems. Emphasis is on residential passive solar design and solar water heating. Lab. GER:DB-EngrAppSci

3-4 units, Win (Masters, G)

CEE 176B. Electric Power: Renewables and Efficiency—Renewable and efficient electric power systems emphasizing analysis and sizing of photovoltaic arrays and wind turbines. Basic electric power generation, transmission and distribution, distributed generation, combined heat and power, fuel cells. End use demand, including lighting and motors. Lab. GER:DB-EngrAppSci

3-4 units, Spr (Masters, G)

CEE 176F. Energy Systems Field Trips—(Graduate students register for 276F.) Energy resources and policies in use and under development in China. 12-day field trip to China during Spring Break 2008. One unit for seminar and readings; one unit for field trip. Prerequisite: consent of instructor for field trip.

1-2 units, Win (Woodward, J), offered occasionally

CEE 177. Aquatic Chemistry and Biology—Undergraduate-level introduction to the chemical and biological processes in the aqueous environment. Basic aqueous equilibria; the structure, behavior, and fate of major classes of chemicals that dissolve in water; redox reactions; the biochemistry of aquatic microbial life; and biogeochemical processes that govern the fate of nutrients and metals in the environment and in engineered systems. Prerequisite: CHEM 31. GER:DB-EngrAppSci

4 units, Aut (Yeung, C)

CEE 177S. Design for a Sustainable World—(Graduate students register for 277S.) Technology-based problems faced by developing communities worldwide. Student groups partner with organizations abroad to work on concept, feasibility, design, implementation, and evaluation phases of various projects. Past projects include a water and health initiative, a green school design, seismic safety, and medical device. Admission based on written application and interview. See http://esw.stanford.edu for application.

1-5 units, Aut (Robertson, A), Win (Staff), Spr (Schneider, L)

CEE 178. Introduction to Human Exposure Analysis—(Graduate students register for 276.) Scientific and engineering issues involved in quantifying human exposure to toxic chemicals in the environment. Pollutant behavior, inhalation exposure, dermal exposure, and assessment tools. Overview of the complexities, uncertainties, and physical, chemical, and biological issues relevant to risk assessment. Lab projects. Recommended: MATH 51. GER:DB-EngrAppSci

3 units, Spr (Canales, R), Sum (Staff)

CEE 179A. Water Chemistry Laboratory—(Graduate students register for 273A.) Laboratory application of techniques for the analysis of natural and contaminated waters, emphasizing instrumental techniques.

3 units, Win (Robertson, A)

CEE 179C. Environmental Engineering Design—Application of engineering fundamentals including environmental engineering, hydrology, and engineering economy to a design problem. 2005-06 project was green water for a green dorm. Enrollment limited; preference to seniors in Civil and Environmental Engineering.

5 units, not given this year

CEE 180. Structural Analysis—Analysis of beams, trusses, frames; method of indeterminate analysis by consistent displacement, least work, superposition equations, moment distribution. Introduction to matrix methods and computer methods of structural analysis. Prerequisite: 101A and ENGR 14. GER:DB-EngrAppSci

4 units, Spr (Kiremidjian, A)

CEE 181. Design of Steel Structures—Concepts of the design of steel structures with a load and resistance factor design (LRFD) approach; types of loading; structural systems; design of tension members, compression members, beams, beam-columns, and connections; and design of trusses and frames. Prerequisite: 180. GER:DB-EngrAppSci

4 units, Aut (Law, K)

CEE 182. Design of Reinforced Concrete Structures—Properties of concrete and reinforcing steel; behavior of structural elements subject to bending moments, shear forces, torsion, axial loads, and combined actions; design of beams, slabs, columns and footings; strength design and serviceability requirements; design of simple structural systems for buildings. Prerequisite: 180. GER:DB-EngrAppSci

4 units, Win (Staff)

CEE 183. Integrated Building Design—Studio format. Design concepts for building systems from schematic design through construction, taking into account sustainable engineering issues. Design exercises culminating in the design of a building project, emphasizing structural systems and materials and integration with architecture, construction, and building mechanical systems. Prerequisites: CEE 180, 181, 182; civil engineering major; architectural design majors require consent of instructor.

4 units, Spr (Deierlein, G)

CEE 195A. Fundamentals of Structural Geology—(Same as GES 111A.) Techniques for structural mapping; using differential geometry to characterize structures; dimensional analysis and scaling relations; kinematics of deformation and flow; measurement and analysis of stress. Sources include field and laboratory data integrated with conceptual and mechanical models. Models of tectonic processes are constructed and solutions visualized using MATLAB. Prerequisites: GES 1, MATH 51, 52. GER: DB-NatSci

3 units, Aut (Pollard, D)

CEE 195B. Fundamentals of Structural Geology—(Same as GES 111B.) Continuation of GES 111A/CEE 195A. Conservation of mass and momentum in a deformable continuum; linear elastic deformation and elastic properties of rock; brittle deformation including fracture and faulting; linear viscous flow including folding and magma dynamics; model development and methodology. Sources include field and laboratory data integrated with conceptual and mechanical models. Models of tectonic processes are constructed and solutions visualized using MATLAB. Prerequisite: GES 111A/CEE 195B.

3 units, Win (Pollard, D)

CEE 196. Engineering Geology Practice—(Same as GES 115.) The application of geologic fundamentals to the planning and design of civil engineering projects. Field exercises and case studies emphasize the impact of site geology on the planning, design, and construction of civil works such as buildings, foundations, transportation facilities, excavations, tunnels and underground storage space, and water supply facilities. Topics: Quaternary history and tectonics, formation and physical properties of surficial deposits, site investigation techniques, geologic hazards, and professional ethics. Prerequisite: GES 1 or consent of instructor. GER: DB-NatSci

3 units, Spr (Pollard, D)

CEE 198. Directed Reading or Special Studies in Civil Engineering—Written report or oral presentation required. Students must obtain a faculty sponsor.

2-3 units, Aut, Win, Spr, Sum (Staff)

CEE 199. Undergraduate Research in Civil and Environmental Engineering—Written report or oral presentation required. Students must obtain a faculty sponsor.

2-3 units, Aut, Win, Spr, Sum (Staff)

CEE 199A. Special Projects in Architecture—Faculty-directed study or internship. May be repeated for credit. Prerequisite: consent of instructor.

1-4 units, Aut, Win, Spr (Staff)

CEE 199B. Directed Studies in Architecture—Projects may include studio-mentoring activities, directed reading and writing on topics in the history and theory of architectural design, or investigations into design methodologies.

1-4 units, Aut, Win, Spr (Staff)

CEE 199H. Undergraduate Honors Thesis—For students who have declared the Civil Engineering B.S. honors major and have obtained approval of a topic for research under the guidance of a CEE faculty adviser. Letter grade only. Written thesis or oral presentation required.

2-3 units, Aut, Win, Spr, Sum (Staff)

PRIMARILY FOR GRADUATE STUDENTS

CEE 200A,B,C. Teaching of Civil and Environmental Engineering—Required of CEE Ph.D. students. Strategies for effective teaching and introduction to engineering pedagogy. Topics: problem solving techniques and learning styles, individual and group instruction, the role of TAs, balancing other demands, grading. Teaching exercises. Register for quarter of teaching assistantship.

1 unit, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

CEE 201D. Computations in Civil and Environmental Engineering—(Undergraduates register for 101D; see 101D.)

3 units, Aut (Kitanidis, P)

CEE 202. Legal Aspects of Engineering and Construction—(Undergraduates register for 102; see 102.)

3-4 units, Win (London, M; Groves, R; Tucker, A)

CEE 203. Probabilistic Models in Civil Engineering—Introduction to probability modeling and statistical analysis in civil engineering. Emphasis is on the practical issues of model selection, interpretation, and calibration. Application of common probability models used in civil engineering including Poisson processes and extreme value distributions. Parameter estimation. Linear regression.

3-4 units, Aut (Baker, J)

CEE 204. Structural Reliability—Procedures for evaluating the safety of structural components and systems. First-and second-order estimates of failure probabilities of engineered systems. Sensitivity of failure probabilities to assumed parameter values. Measures of the relative importance of random variables. Reliability of systems with multiple failure modes. Reliability updating. Simulation methods and variance reduction techniques. Prerequisite: 203 or equivalent.

3-4 units, Spr (Baker, J)

CEE 205. Structural Materials Testing and Simulation—Hands-on laboratory experience with fabrication, computer simulation, and experimental testing of material and small-scale structural components. Comparison of innovative and traditional structural materials. Behavior and application of high-performance fiber reinforced concrete materials for new design, fiber-reinforced polymeric materials for structural retrofits and fracture in metals and polymers.

3-4 units, Spr (Billington, S)

CEE 207A. Energy Resources—(Undergraduates register for 173A; see 173A; same as EARTHSYS 103.)

4-5 units, Aut (Woodward, J)

CEE 210. Building Information Modeling—(Undergraduates register for 110; see 110.)

4 units, Aut (Katz, G)

CEE 211. Multidisciplinary Modeling and Analysis—(Undergraduates register for 111; see 111.)

4 units, Spr (Haymaker, J)

CEE 215. Goals and Methods of Sustainable Building Projects—(Undergraduates register for 115; see 115.)

3 units, Win (Haymaker, J)

CEE 222A. Computer Integrated Architecture/Engineering/Construction (A/E/C)—(Undergraduates register for 122A; see 122A.)

3 units, Win (Fruchter, R)

CEE 222B. Computer Integrated A/E/C—(Undergraduates register for 122B; see 122B.)

2 units, Spr (Fruchter, R)

CEE 223A. Design and Construction of Steel Structures—Using a 15-story steel building project, students analyze the implications of design decisions on the fabrication and erection of steel structures. Emphasis is on integration of design and construction of different types of steel structures. The implications on structural performance, cost and construction schedule, and evaluation of design alternatives. Economic considerations. Other topics include planning for lead times, floor systems and lateral load resisting systems, composite floor systems, innovative lateral load resisting systems, economics of steel structures, design and construction of steel connections, implication of design decisions related to welding and bolting. Prerequisite: 181 or equivalent.

3 units, Aut (Miranda, E)

CEE 223B. Design and Construction of Concrete Structures—Implications of design decisions in the structural performance, cost, and construction schedule of concrete structures. Emphasis is on integration of design and construction of concrete structures and on economic considerations. Reinforced concrete and pre-stressed concrete structures. Evaluation of design alternatives. Economic considerations in the selection of floor systems and lateral resisting systems for buildings. Design and construction of beams, one way slabs, post-tensioned slabs, structural walls, coupled structural walls. Design and construction of precast and post-tensioned elements, and of connections in precast elements. Prerequisite: 182 or equivalent.

3 units, Win (Miranda, E)

CEE 224A. Sustainable Development Studio—(Undergraduates register for 124; see 124.)

1-5 units, Aut, Win, Spr (Staff)

CEE 225. Field Surveying Laboratory—(Undergraduates register for 140; see 140.)

3 units, Spr (Staff)

CEE 232. Interplay of Architecture and Engineering—(Undergraduates register for 132; see 132.)

4 units, not given this year

CEE 236. Green Architecture—(Undergraduates register for 136; see 136.)

4 units, Win (Jacobson, B)

CEE 240. Design and Management of Construction Operations—Designing on-site construction processes including: goals, roles, responsibilities, performance metrics; inputs/outputs; labor and capital intensive construction methods, task assignments and crew instructions, safety management and site supervision, and productivity measurement; value stream modeling, materials management, daily and weekly progress, and financial reports; site operations and management; observation methods for field operations; construction process modeling and simulation methods; and digital models for planning and executing site operations. Field and computer lab work. Prerequisite: 100 or equivalent or consent of instructor. Recommended corequisite: 241.

3 units, Aut (Fischer, M)

CEE 241. Managing Fabrication and Construction—Methods to manage the physical production of construction projects; design, analysis, and optimization of the fabricate-assemble process including performance metrics. Project management techniques and production system design including: push versus pull methods; master scheduling and look-ahead scheduling; scope, cost, and schedule control; earned value analysis; critical path method; location-based scheduling; 4D modeling; workflow; trade coordination; methods to understand uncertainty and reduce process variability; and supply chain systems including made-to-stock, engineered-to-order, and made-to-order. Prerequisite: 100 or consent of instructor. Recommended corequisite: 240.

3 units, Aut (Fischer, M)

CEE 242. Organization Design for Projects and Companies—Introduction to organizational behavior. Information-processing theory of organizational design for projects and companies and computer-based organizational analysis tools. Groups of 12 students practice running problem-focused meetings. Case studies focus on facility/product design and construction/manufacturing organizations; concepts are applicable to project-focused teams and companies in all industries.

3 units, Win (Levitt, R)

CEE 242A. Creating Sustainable Development—(Undergraduates register for 142A; see 142A.)

3 units, Win (Christensen, S)

CEE 243. Integrated Concurrent Engineering—(Undergraduates register for 143; see 143.)

3-4 units, Win (Kunz, J)

CEE 244. Fundamentals of Construction Accounting and Finance—Concepts of financial accounting and economics emphasizing the construction industry. Financial statements, accounting concepts, project accounting methods, and the nature of project costs. Case study of major construction contractor. Ownership structure, working capital, and the sources and uses of funds.

2 units, Aut (Tucker, A; Meyer, P)

CEE 245A. Global Project Seminar—Issues related to large, complex, global development projects including infrastructure development, urban and rural development, and the development of new cities. Guest speakers. May be repeated for credit.

3 units, not given this year

CEE 245B. Global Projects: An Institutional Perspective—(Same as SOC 216B.) The multifaceted challenges of global projects that involve participants from multiple societal systems through the lens of institutional theory. Sources include sociology, economics, development and engineering literatures.

1-2 units, not given this year

CEE 245C. Project Finance—Public and private sources of finance for large, complex, capital-intensive projects in developed and developing countries. Benefits and disadvantages, major participants, risk sharing, and challenges of project finance in emerging markets. Financial, economic, political, cultural, and technological elements that affect project structures, processes, and outcomes. Case studies.

1-5 units, Win (Orr, R)

CEE 246. Managing Engineering and Construction Companies—Management of design and construction companies in the architecture-engineering-construction industry. Focus is on management of risks inherent in the A/E/C industry: developing business strategies and organizations to cope with cyclical demand, alternative contracting approaches, managing receivables and cash flow, administration of human resources, safety, quality, insurance, and bonding. Students play different management roles in a computer simulation of a construction company. Prerequisites: introductory accounting course such as ENGR 60, CEE 246A, or MS&E 140.
4 units, Spr (Levitt, R)

CEE 246A. Engineering Economy Primer—Satisfies the engineering economy prerequisite for 246 or 248. Application of engineering economy concepts and principles to the construction industry. Equivalence concept; interest formulas; value of money across time; present value, annual cash flow, internal rate of return and benefit-cost methods; retirement and replacement; depreciation; capital budgeting; and sensitivity and risk analysis. Construction finance concepts, loans, mortgages, and construction pro formas.
2 units, Aut (Koen Cohen, N)

CEE 247. Cases in Personality, Leadership, and Negotiation—(Undergraduates register for 147; see 147.)
3 units, Spr (Clough, R)

CEE 248. Real Estate Development—Critical activities and key participants. Topics: conceptual and feasibility studies, market perspectives, the public roles, steps for project approval, project finance, contracting and construction, property management, and sales. Group projects focus on actual developments now in the planning stage. Enrollment limited to 24; priority to graduate majors in the department's CEM and GSB programs. Prerequisites: 241, 246A or equivalent, ENGR 60.
3 units, Spr (Kroll, M)

CEE 249. Labor and Industrial Relations: Negotiations, Strikes, and Dispute Resolution—Labor/management negotiations, content of a labor agreement, strikes, dispute resolution, contemporary issues affecting labor and management, and union versus open shop competitiveness in the marketplace. Case studies; presentations by union leaders, legal experts, and contractor principals. Simulated negotiation session with union officials and role play in an arbitration hearing.
2 units, Win (Walton, M)

CEE 251. Negotiation—(Undergraduates register for 151; see 151; same as ME 207, MS&E 285.)
3 units, Spr (Christensen, S)

CEE 252. Technical Fundamentals of Sustainable Construction—Construction methods, resources, and field operations for modeling, planning, estimating, and providing technical support for sustainable construction operations. Earthwork and drainage construction; concrete and structural steel construction; and building energy systems. Engineering fundamentals for design and construction; permanent materials and equipment required; construction methods, resources, and operations; acceptance criteria (safety, sustainability, quality, schedule, cost); and integration and modeling. Analysis of visual and written descriptions of the construction resources and operations; group assignments.
4 units, Win (Tatum, C)

CEE 254. Cases in Estimating Costs—(Undergraduates register for 154; see 154.)
3 units, Aut (Clough, R)

CEE 256. Building Systems—(Undergraduates register for 156; see 156.)
4 units, Spr (Daly, A)

CEE 258. Donald R. Watson Seminar in Construction Engineering and Management—Required of graduate students in the CEM program; other students including undergraduates welcome. Weekly discussions with speakers from industry and government. Students interact with industry representatives in small group discussions at dinner after class. May be repeated for credit.
1 unit, Aut (Clough, R), Win (Tatum, C)

CEE 259. Career Skills Seminar—(Undergraduates register for 159; see 159.)
2 units, Aut (Clough, R)

CEE 259A,B,C. Construction Problems—Group-selected problems in construction techniques, equipment, or management; preparation of oral and written reports. Guest specialists from the construction industry. See 299 for individual studies. Prerequisites: graduate standing in CEM program and consent of instructor.
1-3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

CEE 260A. Physical Hydrogeology—(Same as GES 230.) Theory of underground water occurrence and flow, analysis of field data and aquifer tests, geologic groundwater environments, solution of field problems, groundwater modeling. Introduction to groundwater contaminant transport and unsaturated flow. Lab. Prerequisite: elementary calculus.
4 units, Aut (Gorelick, S)

CEE 260B. Surface and Near-Surface Hydrologic Response—(Same as GES 237.) Quantitative review of process-based hydrology and geomorphology. Introduction to finite-difference and finite-element methods of numerical analysis. Topics: biometeorology, unsaturated and saturated subsurface fluid flow, overland and open channel flow, and physically-based simulation of coupled surface and near-surface hydrologic response. Links hydrogeology, soil physics, and surface water hydrology.
3 units, Aut (Loague, K)

CEE 260C. Contaminant Hydrogeology—(Same as GES 231.) For earth scientists and engineers. Environmental and water resource problems involving contaminated groundwater. The processes affecting contaminant migration through porous media including interactions between dissolved substances and solid media. Conceptual and quantitative treatment of advective-dispersive transport with reacting solutes. Predictive models of contaminant behavior controlled by local equilibrium and kinetics. Modern methods of contaminant transport simulation and optimal aquifer remediation. Prerequisite: GES 230 or CEE 260A or equivalent.
4 units, Spr (Staff)

CEE 261S. Atmosphere and Global Environmental Change—(Undergraduates register for 161S; see 161S; same as GEOPHYS 161/261.)
3 units, Aut (Tabazadeh, A)

CEE 261T. Aerosols, Clouds, and Climate Change—(Undergraduates register for 161T; see 161T; same as GEOPHYS 136/236.)
3 units, Win (Tabazadeh, A)

CEE 261U. Atmospheric Heterogeneous Processes—(Same as GEOPHYS 263.) Atmospheric physicochemical processes occurring in heterogeneous mediums. Topics include oxidation and catalytic chemistry in the aqueous phase, adsorption isotherms and chemistry on surfaces, and thermodynamics of colloid formation and precipitation processes in particles. Term project.
3 units, Spr (Tabazadeh, A)

CEE 262A. Hydrodynamics—The flow of incompressible viscous fluid; emphasis is on developing an understanding of fluid dynamics that can be applied to environmental flows. Topics: kinematics of fluid flow; equations of mass and momentum conservation (including density variations); some exact solutions to the Navier-Stokes equations; appropriate analysis of fluid flows including Stokes flows, potential flows, and laminar boundary layers; and an introduction to the effects of rotation and stratification through scaling analysis of fluid flows. Prerequisites: 101B or consent of instructor; and some knowledge of vector calculus and differential equations.
3-4 units, Aut (Fringer, O)

CEE 262B. Transport and Mixing in Surface Water Flows—Application of fluid mechanics to problems of pollutant transport and mixing in the water environment. Mathematical models of advection, diffusion, and dispersion. Application of theory to problems of transport and mixing in rivers, estuaries, and lakes and reservoirs. Recommended: 262A and CME 102 (formerly ENGR 155A), or equivalents.
3-4 units, Win (Monismith, S)

CEE 262C. Modeling and Simulation for Civil and Environmental Engineers—Mathematical and computational methods for modeling and simulation, and the use of Matlab for topics including predator-prey problems, buckling, transport and mixing, wave modeling, flow reactors, and traffic flow. Prerequisites: CME 102 and 104, or equivalents.
3 units, Spr (Fringer, O)

CEE 262D. Introduction to Physical Oceanography—(Undergraduates register for 164; see 164; same as EARTHSYS 164.)
4 units, Spr (Hench, J)

CEE 262E. Lakes and Reservoirs—Physics and water quality dynamics in lakes and reservoirs. Implementation of physical and biogeochemical processes in 1-D models. Prerequisite: 262B.
2 units, Spr (Fong, D)

CEE 263A. Air Pollution Modeling—The numerical modeling of urban, regional, and global air pollution focusing on gas chemistry and radiative transfer. Stratospheric, free-tropospheric, and urban chemistry. Methods for solving stiff systems of chemical ordinary differential, including the multistep implicit-explicit method, Gear's method with sparse-matrix techniques, and the family method. Numerical methods of solving radiative transfer, coagulation, condensation, and chemical equilibrium problems. Project involves developing a basic chemical ordinary differential equation solver. Prerequisite: CS 106A or equivalent.
3-4 units, Spr (Jacobson, M)

CEE 263B. Numerical Weather Prediction—Numerical weather prediction. Continuity equations for air and water vapor, the thermodynamic energy equation, and momentum equations derived for the atmosphere. Numerical methods of solving partial differential equations, including finite-difference, finite-element, semi-Lagrangian, and pseudospectral methods. Time-stepping schemes: the forward-Euler, backward-Euler, Crank-Nicolson, Heun, Matsuno, leapfrog, and Adams-Bashforth schemes. Boundary-layer turbulence parameterizations, soil moisture, and cloud modeling. Project developing a basic weather prediction model. Prerequisite: CS 106A or equivalent.
3-4 units, not given this year

CEE 263C. Weather and Storms—(Undergraduates register for 63; see 63.)
3 units, Aut (Jacobson, M)

CEE 263D. Air Pollution: From Urban Smog to Global Change—(Undergraduates register for 64; see 64)
3 units, Win (Jacobson, M)

CEE 264A. Rivers, Streams, and Canals—(Undergraduates register for 161A; see 161A)
3-4 units, Aut (Fong, D)

CEE 265A. Sustainable Water Resources Development—Alternative criteria for judging the sustainability of projects. Application of criteria to evaluate sustainability of water resources projects in several countries. Case studies illustrate the role of political, social, economic, and environmental factors in decision making. Evaluation of benefit-cost analysis and environmental impact assessment as techniques for enhancing the sustainability of future projects. Limited enrollment. Prerequisite: graduate standing in Environmental and Water Studies, or consent of instructor.
3 units, Aut (Ortolano, L)

CEE 265C. Water Resources Management—Principles of surface and ground water resources management in the context of water scarcity and hydrologic uncertainty. Topics include reservoir, river basin, and aquifer management, conjunctive use of surface and ground water, wastewater reuse, and demand management. Technical, economic, social, and political elements of water management.
3 units, Aut (Findikakis, A)

CEE 265D. Water and Sanitation in Developing Countries—Economic, social, political, and technical aspects of sustainable water supply and sanitation service provision in developing countries. Case studies from Asia, Africa, and Latin America. Service pricing, alternative institutional structures including privatization, and the role of consumer demand and community participation in the planning process. Environmental and public health considerations, and strategies for serving low-income households. Limited enrollment. Prerequisite: consent of instructor.
3 units, Win (Davis, J)

CEE 266A. Watersheds and Wetlands—(Undergraduates register for 166A; see 166A.)
3 units, Aut (Freyberg, D)

CEE 266B. Floods and Droughts, Dams and Aqueducts—(Undergraduates register for 166B; see 166B.)
3 units, Win (Freyberg, D)

CEE 266C. Advanced Topics in Hydrology and Water Resources—Graduate seminar. Focus is on one or more hydrologic processes or water resources systems. Topics vary based on student and instructor interest. Examples include freshwater wetland hydrology, watershed-scale hydrologic modeling, renaturalization of stream channels, reservoir sediment management, and dam removal. Enrollment limited. Prerequisites: 266A,B, or equivalents. Recommended: 260A or equivalent.
3 units, alternate years, not given this year

CEE 266D. Water Resources and Water Hazards Field Trips—(Undergraduates register for 166D; see 166D.)
2 units, Win (Freyberg, D)

CEE 268. Groundwater Flow—Flow and mass transport in porous media through analytical techniques. Applications of potential flow theory to practical groundwater problems: flow to and from wells, rivers, lakes, drainage ditches; flow through and under dams; streamline tracing; capture zones of wells; and mixing schemes for in-situ remediation. Prerequisites: calculus and introductory fluid mechanics.
3 units, Win (Kitanidis, P)

CEE 269. Environmental Fluid Mechanics and Hydrology Seminar—Problems in all branches of water resources. Talks by visitors, faculty, and students. May be repeated for credit.
1 unit, Spr (Jacobson, M)

CEE 270. Movement and Fate of Organic Contaminants in Waters—Transport of chemical constituents in surface and groundwater including advection, dispersion, sorption, interphase mass transfer, and transformation; impacts on water quality. Emphasis is on physicochemical processes and the behavior of hazardous waste contaminants. Prerequisites: undergraduate chemistry and calculus. Recommended: 101B.
3 units, Aut (Luthy, R), Sum (Robertson, A)

CEE 271A. Physical and Chemical Treatment Processes—Physical and chemical unit operations for water treatment, emphasizing process combinations for drinking water supply. Application of the principles of chemistry, rate processes, fluid dynamics, and process engineering to define and solve water treatment problems by flocculation, sedimentation, filtration, disinfection, oxidation, aeration, and adsorption. Investigative paper on water supply and treatment. Prerequisites: 101B, 270. Recommended: 273.
3 units, Win (Luthy, R)

CEE 271B. Environmental Biotechnology—Stoichiometry, kinetics, and thermodynamics of microbial processes for the transformation of environmental contaminants. Design of dispersed growth and biofilm-based processes. Applications include treatment of municipal and industrial waste waters, detoxification of hazardous chemicals, and groundwater remediation. Prerequisites: 270; 177 or 274A or equivalents.
4 units, Win (Staff)

CEE 272. Coastal Contaminants—Coastal pollution and its effects on ecosystems and human health. The sources, fate, and transport of human pathogens and nutrients. Background on coastal ecosystems and coastal transport phenomena including tides, waves, and cross shelf transport. Introduction to time series analysis with MATLAB. Undergraduates require consent of instructor.

3-4 units, Aut (Boehm, A)

CEE 273. Aquatic Chemistry—Chemical principles and their application to the analysis and solution of problems in aqueous geochemistry (temperatures near 25° C and atmospheric pressure). Emphasis is on natural water systems and the solution of specific chemical problems in water purification technology and water pollution control. Prerequisites: CHEM 31 and 33, or equivalents.

3 units, Aut (Leckie, J)

CEE 273A. Water Chemistry Laboratory—(Undergraduates register for 179A; see 179A.)

3 units, Win (Robertson, A)

CEE 273C. Introduction to Membrane Technology for Water/Wastewater Treatment—Membrane separation processes focusing on their use for water and wastewater purification. Topics will include membrane types and materials; transport across and rejection by membranes; membrane fouling, cleaning and degradation; and design and operation of membrane systems.

1 unit, Spr (Leckie, J)

CEE 274A. Environmental Microbiology I—(Same as CHEMENG 174/274.) Basics of microbiology and biochemistry. The biochemical and biophysical principles of biochemical reactions, energetics, and mechanisms of energy conservation. Diversity of microbial catabolism, flow of organic matter in nature: the carbon cycle, and biogeochemical cycles. Bacterial physiology, phylogeny, and the ecology of microbes in soil and marine sediments, bacterial adhesion, and biofilm formation. Microbes in the degradation of pollutants. Prerequisites: CHEM 33, 35, and BIOSCI 41, or equivalents.

3 units, Aut (Spormann, A), Sum (Sepulveda-Torres, L)

CEE 274B. Metabolic Biochemistry of Microorganisms—(Same as CHEMENG 456.) Microbial metabolism, biochemical and metabolic principles, unity and diversity of metabolic pathways, evolution of enzymes and metabolic pathways, microbial degradation of natural and anthropogenic organic compounds, predicting biodegradation, and metabolic origin of life.

3 units, Win (Spormann, A), alternate years, not given next year

CEE 274C. Microbial Ecology and Evolution—(Same as CHEMENG 457.) Structure/function relationship of microbial communities; metabolic and ecological basis of interactions in microbial communities; microbial ecology and population biology in natural and human host systems; and evolution of microbial life. Prerequisite: CEE 274A, CHEMENG 281 (formerly 288), or equivalent.

3 units, alternate years, not given this year

CEE 274D. Pathogens and Disinfection—Introduction to epidemiology, major pathogens and infectious diseases, the immune system, movement and survival of pathogens in the environment, transfer of virulence and antibiotic resistance genes, and pathogen control, with an emphasis on public health engineering measures (disinfection). Prerequisite: 274A.

3 units, Spr (Criddle, C), alternate years, not given next year

CEE 274E. Pathogens in the Environment—Sources, fates, movement, and ecology of waterborne pathogens in the natural environment and disinfection systems; epidemiology and microbial risk assessment. No microbiology background required; undergraduates may enroll with consent of instructor.

3 units, not given this year

CEE 274P. Environmental Health Microbiology Lab—Microbiology skills including culture-, microscope-, and molecular-based detection techniques. Focus is on standard and EPA-approved methods to enumerate and isolate organisms used to assess risk of enteric illnesses, such as coliforms, enterococci, and coliphage, in drinking and recreational waters including lakes, streams, and coastal waters. Student project to assess the microbial water quality of a natural water. Limited enrollment; priority to CEE graduate students.

3-4 units, Spr (Boehm, A)

CEE 274S. Hopkins Microbiology Course—Four-week, intensive. The interplay between molecular, physiological, ecological, evolutionary, and geochemical processes that constitute, cause, and maintain microbial diversity. How to isolate key microorganisms driving marine biological and geochemical diversity, interpret culture-independent molecular characterization of microbial species, and predict causes and consequences. Laboratory component: what constitutes physiological and metabolic microbial diversity; how evolutionary and ecological processes diversify individual cells into physiologically heterogeneous populations; and the principles of interactions between individuals, their population, and other biological entities in a dynamically changing microbial ecosystem. Prerequisites: CEE 274A,B, or equivalents.

9-12 units, Sum (Spormann, A)

CEE 275A. The California Coast: Science, Policy, and Law—(Undergraduates register for 175A; see 175A; same as EARTHSYS 175/275, LAW 514.)

3-4 units, Win (Boehm, A; Caldwell, M; Sivas, D)

CEE 276. Introduction to Human Exposure Analysis—(Undergraduates register for 178; see 178.)

3 units, Spr (Canales, R), Sum (Staff)

CEE 276F. Energy Systems Field Trips—(Undergraduates register for 176F; see 176F.)

1-2 units, Win (Woodward, J), offered occasionally

CEE 277A. Teaching Science Literacy for a Sustainable Society—Teaching science to nontechnical audiences emphasizing technologies and science for the sustainable use of water. Guest lecturers. Learning styles, and the role of engineers and scientists in K-12 and media communication. Students develop teaching modules to be used in educational settings involving nontechnical audiences.

2-4 units, Win (Reinhard, M)

CEE 277B. Knowledge Systems in Engineering and Management for Sustainable Development—Knowledge frameworks and systems dealing with large amounts of complex information from crossdisciplinary collaborative activities in sustainable development. Topics include: domain information and knowledge representation and processing; knowledge management and integration in engineering and management domains; access to information for problem solving, planning, and decision making; knowledge management for environmentally friendly manufacturing and business activities; systematic assessment in management and engineering; and the use of IT and the Internet for collaboration and learning.

3 units, Spr, Sum (Wang, J)

CEE 277S. Design for a Sustainable World—(Undergraduates register for 177S; see 177S.)

1-5 units, Aut (Robertson, A), Win (Staff), Spr (Schneider, L)

CEE 278A. Air Pollution Physics and Chemistry—The sources and health effects of pollutants. The influence of meteorology on pollution: atmospheric energy balance, temperature profiles, stability classes, inversion layers, turbulence. Atmospheric diffusion equations, downwind dispersion of emissions from point and line sources. Tropospheric chemistry: mechanisms for ozone formation, photochemical reactions, radical chain mechanisms, heterogeneous chemical reactions. Prerequisites: MATH 51, CHEM 31, or equivalents. Recommended: 101B, 273 or CHEM 135, or equivalents.

3 units, Aut (Hildemann, L)

CEE 278B. Atmospheric Aerosols—The characterization of atmospheric particulate matter: size distributions, chemical composition, health effects. Atmospheric diffusion and transport of particles: removal by convection, impaction, gravitational settling. Effect of aerosols on visibility: light scattering and absorption, reduction of visual range. Mechanics influencing ambient size distributions: Brownian coagulation, laminar shear flow, homogeneous nucleation, heterogeneous condensation. Prerequisite: MATH 51, or equivalent. Recommended: 101B or equivalent.

3 units, alternate years, not given this year

CEE 278C. Indoor Air Quality—(Undergraduates register for 172A; see 172A.)

2-3 units, Spr (Hildemann, L), alternate years, not given next year

CEE 279. Environmental Engineering Seminar—Current research, practice, and thinking in environmental engineering and science. Attendance at seminars is self-directed, and may be accrued throughout the school year.

1 unit, Spr (Hildemann, L)

CEE 280. Advanced Structural Analysis—Theoretical development and computer implementation of direct stiffness method of structural analysis; virtual work principles; computation of element stiffness matrices and load vectors; direct assembly procedures; equation solution techniques. Analysis of two- and three-dimensional truss and frame structures, thermal loads, and substructuring and condensation techniques for large systems. Practical modeling techniques and programming assignments. Introduction to nonlinear analysis concepts. Prerequisites: elementary structural analysis and matrix algebra.

3-4 units, Aut (Deierlein, G)

CEE 281. Finite Element Methods in Structural Engineering—Finite element formulation and implementation of frame, solid, plate, and shell elements for numerical methods. Modeling of structural systems, statics and dynamics, structural analysis. Prerequisites: 280, 283.

4 units, Spr (Law, K)

CEE 282. Nonlinear Structural Analysis—Introduction to methods of geometric and material nonlinear analysis, emphasizing modeling approaches for framed structures. Large-displacement analysis, concentrated and distributed plasticity models, and nonlinear solution methods. Applications to frame stability and performance-based seismic design. Assignments emphasize computer implementation and applications. Prerequisites: 280, 286 or equivalent.

3-4 units, Win (Deierlein, G)

CEE 283. Structural Dynamics—Vibrations and dynamic response of simple structures under time dependent loads; dynamic analysis of single and multiple degrees of freedom systems; support motion; response spectra.

3-4 units, Aut (Law, K)

CEE 284. Computational Methods in Structural Dynamics—Methods of structural dynamics for discretized and continuous systems in free and forced vibration, modal analysis; numerical methods; introduction to nonlinear dynamics; advanced topics. Prerequisites: 280, 283.

3 units, not given this year

CEE 285. Behavior of Structural Systems for Buildings—Design concepts, performance criteria, loading, methods of design, types of structural systems, behavior under gravity and lateral loads, approximate methods of analysis, preliminary conceptual design, performance assessment, behavior of structural elements. Prerequisites: courses in design of steel and reinforced concrete structures.

3-4 units, Win (Krawinkler, H)

CEE 286. Advanced Modeling and Design of Structural Concrete—Concepts and application of strut and tie modeling. Prestressed concrete for building and bridge design. Course project integrating computer simulation and physical experimentation of a structural concrete component.

3-4 units, Aut (Billington, S)

CEE 287. Earthquake Resistant Design and Construction—Evaluation, design, and construction of structures in seismic regions. Factors influencing earthquake ground motions, design spectra, design of linear and nonlinear single- and multiple-degree-of-freedom-system structures, design of structures to minimize damage, force-based and displacement-based design methods, capacity design, detailing and construction of steel and reinforced concrete structures, performance-based design, seismic isolation, and energy dissipation. Prerequisites: 283, 285. Recommended: 286, 288.

3 units, Spr (Miranda, E)

CEE 288. Earthquake Hazard and Risk Analysis—Earthquake phenomena, faulting, ground motion, study of past major earthquakes, effects of earthquakes on manmade structures, response spectra, Fourier spectra, soil effects on ground motion and structural damage, methods for structural damage evaluation, and formulation of performance-based earthquake engineering. Prerequisites: 203, 283.

3-4 units, Win (Kiremidjian, A)

CEE 289. Random Vibrations—Introduction to random processes. Correlation and power spectral density functions. Stochastic dynamic analysis of multi-degree-of-freedom structures subjected to stationary and non-stationary random excitations. Crossing rates, first-excursion probability, and distributions of peaks and extremes. Applications in earthquake, wind, and ocean engineering. Prerequisite: 203 or equivalent.

2 units, given next year

CEE 290. Structural Performance and Failures—Basic concepts in the definition of satisfactory structural performance; key elements in structural performance; types of failures, ranging from reduced serviceability to total collapse; failure sources and their root cause allocation, emphasizing design/construction process failures; failure prevention mechanisms; illustration with real life examples.

2 units, Spr (Moncarz, P)

CEE 293. Foundation Engineering—Types, characteristics, analysis, and design of shallow and deep foundations; rigid and flexible retaining walls; braced excavations; settlement of footings in sands and clays; slope stability analysis by method of slices including search algorithms for the critical slip surface. Special seminars by guest speakers; computing assignment. Prerequisite: 101C or equivalent.

3 units, Win (Staff)

CEE 294. Computational Geomechanics—Continuum and finite element formulations of steady-state and transient fluid conduction problems on geomechanics; elliptic, parabolic, and hyperbolic systems; variational inequality and free-boundary problems; three-dimensional consolidation theory; undrained condition, mesh locking, B-bar and strain projection methods; finite element formulations of multiphase dynamic problems. Computing assignments. Prerequisite: ME 335A or equivalent.

3 units, Spr (Borja, R)

CEE 295. Plasticity Modeling and Computation—Theory of plasticity; micromechanical basis; classical yield models; return-mapping algorithm; multi-surface and bounding surface models; material instabilities; localization and bifurcation. Prerequisite: ME 338A or equivalent.

3 units, alternate years, given next year

CEE 297. Issues in Geotechnical and Environmental Failures—Causes and consequences of the failure of buildings, earth structures, waste storage, and high hazard facilities in contact with the environment; technical, ethical, economic, legal, and business aspects; failure analysis and forensic problems; prevention, liability, and dispute management. Case histories including earthquake, flood, and hazardous waste facilities. Student observation, participation in active lawsuits where possible.

3 units, Spr (Meehan, R)

CEE 297G. Structural Geology and Rock Mechanics—(Same as GES 215A.) Quantitative field and laboratory data integrated with solutions to initial and boundary-value problems of continuum mechanics introduce tectonic processes in Earth's crust that lead to the development of geological structures including folds, faults, fractures and fabrics. Topics include:

techniques and tools for structural mapping; using differential geometry to characterize structures; dimensional analysis and scaling relations; kinematics of deformation and flow; traction and stress analysis. Data sets analyzed using MATLAB. Prerequisites: GES 1, MATH 53, MATLAB or equivalent.

3-5 units, Aut (Pollard, D)

CEE 297H. Structural Geology and Rock Mechanics—(Same as GES 215B.) Field equations for elastic solids and viscous fluids derived from conservation laws to develop mechanical models for tectonic processes and their structural products. Topics include: conservation of mass and momentum in a deformable continuum; linear elastic deformation and elastic properties of rock; brittle deformation including fracture and faulting; linear viscous flow including folding, model development, and methodology. Models constructed and solutions visualized using MATLAB. Prerequisite: GES 215A.

3-5 units, Win (Pollard, D)

CEE 298. Structural Engineering and Geomechanics Seminar—Recommended for all graduate students. Lectures on topics of current interest in professional practice and research.

1 unit, Win (Staff)

CEE 299. Independent Study in Civil Engineering—Directed study for graduate students on subjects of mutual interest to students and faculty. Student must obtain faculty sponsor.

1-5 units, Aut, Win, Spr, Sum (Staff)

CEE 299S. Independent Project in Civil and Environmental Engineering—Prerequisite: consent of instructor.

1-4 units, Aut, Win, Spr, Sum (Staff)

CEE 300. Thesis (Engineer Degree)—Research by Engineer candidates.

1-15 units, Aut, Win, Spr, Sum (Staff)

CEE 301. The Energy Seminar—(Same as ENERGY 301.) Interdisciplinary exploration of current energy challenges and opportunities, with talks by faculty, visitors, and students. May be repeated for credit.

1 unit, Aut, Win, Spr (Horne, R)

CEE 310. Post-Master's Seminar—For post-master's students to serve as orientation to the selection of a research topic.

1 unit, Aut, Win, Spr (Staff)

CEE 316. Research Methods in Facility Engineering—For CEE Ph.D. students. Facility planning, design, management, and operation. Research philosophy and methods. Experimental design: ethnography, case study, survey, classical experiment (natural, synthetic, or computational). Data analysis: ANOVA, regression, correlation. Introduction to modeling social systems. Publication strategies. Final project to develop and refine research proposal and publication plan.

3-4 units, given next year

CEE 320. Integrated Facility Engineering—Individual and group presentations on goals, research, and state-of-practice of virtual design and construction in support of integrated facility engineering, including objectives for the application and further development of virtual design and construction technologies. May be repeated for credit.

1 unit, Aut (Kunz, J; Fischer, M), Win, Spr (Kunz, J)

CEE 321. Formal Models for Design—Theories, methods, and formal systems to support the design of buildings. Academic and industrial frameworks to represent and manage the products, organizations, and processes of building projects. May be repeated for credit.

3 units, Aut (Haymaker, J)

CEE 333. Water Policy Colloquium—(Same as GES 333, IPER 333.) Student-organized interdisciplinary colloquium. Creation, implementation, and analysis of policy affecting the use and management of water resources. Weekly speakers from academia and local, state, national, and international agencies and organizations.

1 unit, Spr (Freyberg, D)

CEE 342. Computational Modeling of Organizations—For post-M.S. students interested in formal techniques for organization design. Computer simulations of organizations are used to conduct virtual experiments for developing organization theory or to analyze the performance of virtual organizations with different structures and decision support and communication technologies. Research on computational modeling and design of real-world organizations. Paper serves as a research proposal. Prerequisite: 242 or equivalent introductory organization design class.

4 units, given next year

CEE 362. Numerical Modeling of Subsurface Processes—Numerical modeling including: problem formulation, PDEs and weak formulations, and choice of boundary conditions; solution using the finite-element code COMSOL Multiphysics with a variety of solvers and pre- and postprocessing of data; and interpretation of results. Problems include: flow in saturated porous media with complex boundaries and heterogeneities; solute transport with common reaction models; effects of heterogeneity on dispersion, dilution, and mixing of solutes; variable-density flow and seawater intrusion; upscaling or coarsening of scale; and biofilm modeling. Enrollment limited to 5.

3-4 units, Spr (Kitanidis, P)

CEE 363A. Mechanics of Stratified Flows—The effects of density stratification on flows in the natural environment. Basic properties of linear internal waves in layered and continuous stratification. Flows established by internal waves. Internal hydraulics and gravity currents. Turbulence in stratified fluids. Prerequisites: 262A,B, CME 204.

3 units, alternate years, not given this year

CEE 363B. Geophysical Fluid Dynamics—(Formerly 364B.) Focus is on fluid dynamics of the ocean at scales where the influence of the earth's rotation is important. Topics include geostrophic and quasi-geostrophic flows, planetary waves, potential vorticity, the Rossby adjustment problem, effects of stratification, and flows on the sea plane. Hydrodynamic stability of rotating and stratified flows. Prerequisite: 363A.

3 units, Win (Fringer, O), alternate years, not given next year

CEE 363C. Ocean and Estuarine Modeling—Advanced topics in modeling for ocean and estuarine environments, including methods for shallow water, primitive, and nonhydrostatic equations on Cartesian, curvilinear, and unstructured finite-volume grid systems. Topics include free-surface methods, nonhydrostatic solvers, and advanced Eulerian and Lagrangian advection techniques. Focus is on existing techniques and code packages, and their methodologies, including POM, ROMS, TRIM, ELCOM, and SUNTANS. Prerequisites: CME 200, 206, or equivalents.

3 units, alternate years, not given this year

CEE 364Y. Advanced Topics in Coastal Oceanography—The dynamics and transport implications of features in estuaries and coastal oceans characterized by sharp gradients: fronts, interfaces, and layers. Analytic framework to describe the formation, maintenance, and dissipation of such features. Examples include tidal mixing fronts, buoyant plume fronts and tidal intrusions, biological thin layers, and axial convergent fronts. Second unit for students who give a presentation.

1-2 units, Spr (Stacey, M)

CEE 365A,B,C,D. Advanced Topics in Environmental Fluid Mechanics and Hydrology—Students must obtain a faculty sponsor.

2-6 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr,* **D:** *Sum (Staff)*

CEE 370A,B,C,D. Environmental Research—Introductory research experience for first-year Ph.D. students in the Environmental Engineering and Science program. 15-18 hours/week on research over three quarters. 370A requires written literature survey on a research topic; 370B requires oral presentation on experimental techniques and research progress; 370C requires written or oral presentation of preliminary doctoral research proposal. Students must obtain a faculty sponsor.

5-6 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr,* **D:** *Sum (Staff)*

CEE 371. Frontiers in Environmental Research—How to evaluate environmental research.

1-2 units, Aut, Win, Spr (Staff)

CEE 374A,B,C,D. Introduction to Physiology of Microbes in Biofilms—Diversification of biofilm populations, control of gene expression in biofilm environments, and evolution of novel genetic traits in biofilms.
1-6 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr,* **D:** *Sum (Spormann, A)*

CEE 374S. Advanced Topics in Microbial Pollution—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Boehm, A)

CEE 374T. Advanced Topics in Coastal Pollution—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Boehm, A)

CEE 374U. Advanced Topics in Submarine Groundwater Discharge—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Boehm, A)

CEE 374V. Advanced Topics in Microbial Source Tracking—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Boehm, A)

CEE 376. Organic Analyses in Environmental Sciences—Theory and practice of instrumental methods used in environmental engineering and sciences, emphasizing determination of organic substances by gas chromatography, mass spectrometry, and high pressure liquid chromatography. Interpretation of mass spectra adaptation of techniques to specific environmental matrices. Case studies. Prerequisite: consent of instructor.
2-3 units, not given this year

CEE 377. Research Proposal Writing in Environmental Engineering and Science—For first- and second-year post-master's students preparing for thesis defense. Students develop progress reports and agency-style research proposals, and present a proposal in oral form. Prerequisite: consent of thesis adviser.
1-3 units, Aut, Win, Spr, Sum (Staff)

CEE 381. Advanced Engineering Informatics
1-4 units, Aut, Win, Spr, Sum (Staff)

CEE 385. Performance-Based Earthquake Engineering—Historic developments and current approaches. Emphasis is on a second-generation performance-based methodology for assessing existing structures and designing new structures, and which facilitates stakeholder decision making. Hazard analysis, response simulation, damage, and loss estimation. Case study. Prerequisites: 282, 287, and 288.
3 units, given next year

CEE 398. Report on Civil Engineering Training—On-the-job training under the guidance of experienced, on-site supervisors; meets the requirements for Curricular Practical Training for students on F-1 visas. Students submit a concise report detailing work activities, problems worked on, and key results. Prerequisite: qualified offer of employment and consent of adviser as per I-Center procedures.
1 unit, Aut, Win, Spr, Sum (Staff)

CEE 399. Advanced Engineering Problems—Individual graduate work under the direction of a faculty member on a subject of mutual interest. Students must obtain faculty sponsor. May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

CEE 400. Thesis (Ph.D. Degree)—For students who have successfully completed the department general qualifying examination. Research and dissertation for the Ph.D. degree.
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program

GEOPHYS 162. Laboratory Methods in Geophysics
2-3 units, Win (Vanorio, T)

GEOPHYS 190. Near-Surface Geophysics
3 units, not given this year

OVERSEAS STUDIES

Courses approved for the Civil and Environmental Engineering major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies Office, 126 Sweet Hall.

AUSTRALIA

OSPAUSTL 10. Coral Reef Ecosystems
3 units, Aut (Hoegh-Guldberg, O; Ward, S; Arrigo, K; Anthony, K)

OSPAUSTL 20. Coastal Resource Management
3 units, Aut (Johnstone, R; Chiffings, T)

OSPAUSTL 30. Coastal Forest Ecosystems
3 units, Aut (Hall, J; Duke, N)

INSTITUTE FOR COMPUTATIONAL AND MATHEMATICAL ENGINEERING

Emeritus: (Professor) Joe Keller (Mathematics, Mechanical Engineering)
Director: Peter Glynn (Management Science and Engineering)
Director of Student Affairs: Walter Murray (Management Science and Engineering)
Professors: Stephen Boyd (Electrical Engineering), Gunnar Carlsson (Mathematics), Persi Diaconis (Mathematics, Statistics), David Donoho (Statistics), Charbel Farhat (Mechanical Engineering), Peter Glynn (Management Science and Engineering), Gene Golub (Computer Science), Leonidas Guibas (Computer Science), Pat Hanrahan (Computer Science, Electrical Engineering), Antony Jameson (Aeronautics and Astronautics), Sanjiva Lele (Mechanical Engineering, Aeronautics and Astronautics), Parviz Moin (Mechanical Engineering), Brad Osgood (Electrical Engineering), George Papanicolaou (Mathematics), Eric Shaqfeh (Chemical Engineering, Mechanical Engineering), Wing Wong (Statistics), Yinyu Ye (Management Science and Engineering)
Associate Professors: Juan Alonso (Aeronautics and Astronautics), Ronald Fedkiw (Computer Science), Ashish Goel (Management Science and Engineering), Charles Taylor (Bioengineering)
Assistant Professors: Eric Darve (Mechanical Engineering), Oliver Fringer (Civil and Environmental Engineering), Margot Gerritsen (Energy Resources Engineering), Adrian Lew (Mechanical Engineering), Doron Levy (Mathematics), Amin Saberi (Management Science and Engineering)
Professors (Research): Walter Murray (Management Science and Engineering), Michael A. Saunders (Management Science and Engineering)
Acting Assistant Professor: James Lambers (Energy Resources Engineering)
Consulting Professors: Sepandar Kamvar, Vadim Khayms, Pat Langley, Pat Miller, Andrew Pohorille
Web Site: http://icme.stanford.edu
Mail Code: 94305-4042
Phone: (650) 736-9038

Courses given in Computational and Mathematical Engineering have the subject code CME. For a complete list of subject codes, see Appendix.

The central research mission of the Institute for Computational and Mathematical Engineering (iCME) is to develop sophisticated algorithmic and mathematical tools that impact many applied disciplines. iCME leverages Stanford's strengths in engineering applications and the physical, biological, and information sciences to guide the development of modern methods for research and education in computational mathematics.

iCME's teaching mission is to provide courses for graduate students and undergraduates from all departments in the mathematical sciences focusing on theoretical work and its role in the solution of real problems, integrating numerical computation to facilitate application of mathematical techniques and theories. The institute identifies research areas that benefit from a multidisciplinary approach in which computational mathematics plays a key role such as discrete mathematics, including computational probability and combinatorial optimization, optimization, stochastics, and numerical solution of partial differential equations. Research applications include the physical sciences. business, medicine, and information science.

A strength of iCME is its multidisciplinary intellectual environment, with interaction among students and faculty with diverse backgrounds and expertise. iCME offers service courses for undergraduates and graduate students to fulfill departmental requirements, core courses for M.S. and Ph.D. students in Scientific Computing and Computational Mathematics, and specialized electives in various application areas.

GRADUATE PROGRAMS

University regulations governing the M.S. and Ph.D. degrees are described in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

The M.S. degree in Computational and Mathematical Engineering is intended as a terminal professional degree and does not lead to the Ph.D. program. Students interested in the doctoral program should apply directly to the Ph.D. program. Master's students who have maintained a minimum grade point average (GPA) of 3.5 are eligible to take the Ph.D. qualifying exam; those who pass this examination and secure a research adviser may continue into the Ph.D. program upon acceptance by the institute.

The master's program consists of 45 units of course work taken at Stanford. No thesis is required; however, students may become involved in research projects during the master's program, particularly to explore an interest in continuing to the doctoral program. Although there is no specific background requirement, significant exposure to mathematics and engineering course work is necessary for successful completion of the program.

Applications to the M.S. program and all required supporting documents must be received by January 8, 2008. See http://icme.stanford.edu/admissions/ for up-to-date information including departmental deadlines. See http://gradadmissions.stanford.edu for information and application materials. Applicants should take the Graduate Record Examination by October of the year the application is submitted. Contact the department for deadline information.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

REQUIREMENTS

A candidate is required to complete a program of 45 units of courses numbered 200 or above. At least 36 of these must be graded units, passed with a grade point average (GPA) of 3.0 (B) or better. Master's students interested in continuing to the doctoral program must maintain a 3.5 or better grade point average in the program.

Requirement 1—The following courses may be needed as prerequisites for other courses in the program: MATH 41, 42, 51, 52, 53, 103, 113; CME 100, 102, 104, 108, 200, 204, 302; CS 106A, 106X, 108, 205, 229; ENGR 62; STATS 116 or 202.

Requirement 2—Students must demonstrate breadth of knowledge in the field by completing the following core courses:

CME 302. Numerical Linear Algebra
CME 303. Partial Differential Equations of Applied Mathematics
CME 304. Numerical Optimization
CME 305. Discrete Mathematics and Algorithms
CME 306. Numerical Solution of Partial Differential Equations
CME 308. Stochastic Methods in Engineering

Courses in this area must be taken for letter grades. Deviations from the core curriculum must be justified in writing and approved by the student's iCME adviser and the chair of the iCME curriculum committee. Courses that are waived may not be counted towards the master's degree.

Requirement 3—12 units of electives in the eight application areas listed below must be completed. The elective course list represents automatically accepted electives within the program, and the list is expanded on a continuing basis; the elective part of the iCME program is meant to be broad and inclusive of relevant courses of comparable rigor to iCME courses. Courses outside this list can be accepted as electives subject to approval of the student's iCME adviser.

1. *Aeronautics and Astronautics:*
   AA 214A. Numerical Methods in Fluid Mechanics
   AA 214B. Numerical Computation of Compressible Flow
   AA 214C. Numerical Computation of Viscous Flow
   AA 215A,B. Advanced Computational Fluid Dynamics
   AA 218. Introduction to Symmetry Analysis
2. *Computational and Mathematical Engineering:*
   CME 208. Mathematical Programming and Combinatorial Optimization
   CME 212. Introduction to Large Scale Computing in Engineering
   CME 324. Advanced Methods in Matrix Computation
   CME 342. Parallel Methods in Numerical Analysis
   CME 349. Models and Algorithms for Nanotechnology
   CME 380. Constructing Scientific Simulation Codes
3. *Computer Science:*
   CS 205. Mathematical Methods for Robotics, Vision, and Graphics
   CS 221. Artificial Intelligence: Principles and Techniques
   CS 228. Probabilistic Models in Artificial Intelligence
   CS 229. Machine Learning
   CS 255. Introduction to Cryptography
   CS 261. Optimization and Algorithmic Paradigms
   CS 268. Geometric Algorithms
   CS 315A. Parallel Computer Architecture and Programming
   CS 340. Level Set Methods
   CS 348A. Computer Graphics: Geometric Modeling
   CS 364A. Algorithmic Game Theory
4. *Electrical Engineering:*
   EE 222. Applied Quantum Mechanics I
   EE 223. Applied Quantum Mechanics II
   EE 262. Two-Dimensional Imaging
   EE 278. Introduction to Statistical Signal Processing
   EE 292E. Analysis and Control of Markov Chains
   EE 363. Linear Dynamic Systems
   EE 364. Convex Optimization
   EE 376A. Information Theory
5. *Management Science and Engineering:*
   MS&E 220. Probabilistic Analysis
   MS&E 221. Stochastic Modeling
   MS&E 223. Simulation
   MS&E 251. Stochastic Decision Models
   MS&E 310. Linear Programming
   MS&E 313. Vector Space Optimization
   MS&E 316. Pricing Algorithms and the Internet
   MS&E 321. Stochastic Systems
   MS&E 322. Stochastic Calculus and Control
   MS&E 323. Stochastic Simulation
6. *Mechanical Engineering:*
   ME 335A,B,C. Finite Element Analysis
   ME 408. Spectral Methods in Computational Physics
   ME 412. Engineering Functional Analysis and Finite Elements
   ME 469A,B. Computational Methods in Fluid Mechanics
   ME 484. Computational Methods in Cardiovascular Bioengineering
7. *Statistics:*
   STATS 208. Introduction to the Bootstrap
   STATS 227. Statistical Computing
   STATS 237. Time Series Modeling and Forecasting
   STATS 250. Mathematical Finance

STATS 305. Introduction to Statistical Modeling
STATS 310A,B,C. Theory of Probability
STATS 324. Classical Multivariate and Random Matrix Theory
STATS 345. Computational Molecular Biology
STATS 362. Monte Carlo Sampling
STATS 366. Computational Biology

8. *Other:*
   CEE 281. Finite Element Structural Analysis
   ENGR 209A. Analysis and Control of Nonlinear Systems
   MATH 220B. Partial Differential Equations of Applied Mathematics
   MATH 220C. The Mathematics of Imaging
   MATH 236. Introduction to Stochastic Differential Equations
   MATH 237. Topics In Stochastic Analysis: Credit Risk

Requirement 4—9 units of focused graduate application electives, approved by the iCME graduate adviser, in the areas of engineering, mathematics, physical, biological, information and other quantitative sciences.

Requirement 5—3 units of an iCME graduate seminar or other approved seminar.

DOCTOR OF PHILOSOPHY

Applications to the Ph.D. program and all required supporting documents must be received by December 18, 2007. See http://icme.stanford.edu/admissions/ for up-to-date information. Prospective graduate students should see http://gradadmissions.stanford.edu for information and application materials. Applicants should take the Graduate Record Examination by October of the year the application is submitted.

Admission to the Ph.D. program does not imply that the student is a candidate for the Ph.D. degree. Advancement to candidacy requires superior academic achievement and passing the qualifying examination.

Requirements—

1. Complete a minimum of 135 units of residency at Stanford, including:
   a) 45 units from the master's program,
   b) 27 units of focused electives in an area planned with the student's Ph.D. adviser; 12 of these units should come from iCME specialized electives, CME 320-380
   c) 60 units of thesis research
   d) 3 units of free electives
2. Maintain a grade point average (GPA) of 3.5
3. Pass the qualifying examination administered by iCME
4. Complete an approved program of original research
5. Complete a written dissertation based on research
6. Pass the oral examination that is a defense of the dissertation research

PH.D. MINOR

For a minor in Computational and Mathematical Engineering (CME), a doctoral candidate must complete 20 unduplicated units in the program. These should include three iCME core courses and three iCME graduate electives at the 300 level or above. A maximum of two units can be taken as iCME seminar units. All courses, except the seminar courses, must be taken for a letter grade and passed with a grade of 'B' or better. Minor programs must receive approval from the iCME curriculum chair prior to completing any of the iCME graduate electives. Minor programs should be developed in close discussion between the student and their primary Ph.D. adviser.

FINANCIAL ASSISTANCE

The department awards a limited number of fellowships, course assistantships, and research assistantships to incoming graduate students. Applying for such assistance is part of submitting the application for admission to the program. Students are appointed for half-time assistantships which provides a tuition scholarship at the 8, 9, 10 unit rate during the academic year and a monthly stipend. Half-time appointments generally require 20 hours of work per week. Most course assistantships and research assistantships are awarded to students in the doctoral program in iCME. If the number of Ph.D. students is not sufficient to staff all course and research assistantship positions available, these positions may be open to master's students. However, master's students are not guaranteed financial assistance.

COURSES

CME 100. Vector Calculus for Engineers—(Same as ENGR 154.) Computation and visualization using MATLAB. Differential vector calculus: analytic geometry in space, functions of several variables, partial derivatives, gradient, unconstrained maxima and minima, Lagrange multipliers. Integral vector calculus: multiple integrals in Cartesian, cylindrical, and spherical coordinates, line integrals, scalar potential, surface integrals, Green's, divergence, and Stokes' theorems. Examples and applications drawn from various engineering fields. Prerequisites: MATH 41 and 42, or 10 units AP credit. GER:DB-Math

5 units, Aut (Khayms, V; Darve, E)

CME 102. Ordinary Differential Equations for Engineers—(Same as ENGR 155A.) Analytical and numerical methods for solving ordinary differential equations arising in engineering applications: Solution of initial and boundary value problems, series solutions, Laplace transforms, and non-linear equations; numerical methods for solving ordinary differential equations, accuracy of numerical methods, linear stability theory, finite differences. Introduction to MATLAB programming as a basic tool kit for computations. Problems from various engineering fields. Prerequisite: CME 100/ENGR 154 or MATH GER:DB-Math

5 units, Win (Darve, E)

CME 104. Linear Algebra and Partial Differential Equations for Engineers—(Same as ENGR 155B.) Linear algebra: matrix operations, systems of algebraic equations, Gaussian elimination, undertermined and overdetermined systems, coupled systems of ordinary differential equations, eigensystem analysis, normal modes. Fourier series with applications, partial differential equations arising in science and engineering, analytical solutions of partial differential equations. Numerical methods for solution of partial differential equations: iterative techniques, stability and convergence, time advancement, implicit methods, von Neumann stability analysis. Examples and applications from various engineering fields. Prerequisite: CME 102/ENGR 155A. GER:DB-Math

5 units, Spr (Khayms, V)

CME 106. Introduction to Probability and Statistics for Engineers—(Same as ENGR 155C.) Probability: random variables, independence, and conditional probability; discrete and continuous distributions, moments, distributions of several random variables. Topics in mathematical statistics: random sampling, point estimation, confidence intervals, hypothesis testing, non-parametric tests, regression and correlation analyses; applications in engineering, industrial manufacturing, medicine, biology, and other fields. Prerequisite: CME 100/ENGR154 or MATH 51. GER:DB-Math

3-4 units, Win, Sum (Khayms, V)

CME 108. Introduction to Scientific Computing—Numerical computation for mathematical, computational, and physical sciences and engineering: numerical solution of systems of algebraic equations, least squares, quadrature, minimization of a function, banded matrices, nonlinear equations, numerical solution of ordinary and partial differential equations; truncation error, numerical stability for time dependent problems, stiffness, boundary value problems. Prerequisites: CS106A or familiarity with MATLAB; MATH 51, 52, 53; inappropriate for students who have taken CME 102,104/ENGR 155A,B. GER:DB-EngrAppSci

3-4 units, Win (Staff), Sum (Lambers, J)

CME 110. Matrix Computations with Applications to Data Mining and IT—Basic matrix factorizations, numerical stability, updating/downdating procedures; data mining and knowledge discovery, application to information retrieval, text mining, search engines, character recognition, medical informatics, bioinformatics. Mathematical, numerical, and statistical techniques. Prerequisites: CS 106A; MATH 103 or 113; or equivalents.

3 units, not given this year

CME 200. Linear Algebra with Application to Engineering Computations—(Same as ME 300A.) Solving matrix-vector systems. Direct and iterative solvers for non-singular linear systems of equations; their accuracy, convergence properties, and computational efficiency. Under- and over-determined systems, and nonlinear systems of equations. Eigenvalues, eigenvectors, and singular values; their application to engineering problems. Concepts such as basis, linear independence, column space, null space, rank, norms and condition numbers, projections, and matrix properties. Recommended: familiarity with computer programming; mathematics background equivalent to MATH 103, 130.

3 units, Aut (Moin, P)

CME 204. Partial Differential Equations in Engineering—(Same as ME 300B.) Geometric interpretation of partial differential equations (PDEs) characteristics; solution of first order PDEs and classification of second-order PDEs; self-similarity; separation of variables as applied to parabolic, hyperbolic, and elliptic PDEs; special functions; eigenfunction expansions; the method of characteristics. If time permits, Fourier integrals and transforms, Laplace transforms. Prerequisite: CME 200/ME 300A, equivalent, or consent of instructor.

3 units, Win (Shaqfeh, E)

CME 206. Introduction to Numerical Methods for Engineering—(Same as ME 300C.) Numerical methods from a user's point of view. Lagrange interpolation, splines. Integration: trapezoid, Romberg, Gauss, adaptive quadrature; numerical solution of ordinary differential equations: explicit and implicit methods, multistep methods, Runge-Kutta and predictor-corrector methods, boundary value problems, eigenvalue problems; systems of differential equations, stiffness. Emphasis is on analysis of numerical methods for accuracy, stability, and convergence. Introduction to numerical solutions of partial differential equations; Von Neumann stability analysis; alternating direction implicit methods and nonlinear equations. Prerequisite: CME 200/ME 300A.

3 units, Spr (Moin, P)

CME 208. Mathematical Programming and Combinatorial Optimization—(Same as MS&E 112/212.) Combinatorial and mathematical programming (integer and non-linear) techniques for optimization. Topics: linear program duality and LP solvers; integer programming; combinatorial optimization problems on networks including minimum spanning trees, shortest paths, and network flows; matching and assignment problems; dynamic programming; linear approximations to convex programs; NP-completeness. Hands-on exercises. Prerequisites: CS 106A or X; ENGR 62 or MATH 103. GER:DB-EngrAppSci

3 units, Win (Saberi, A)

CME 210. Multiscale Methods in Engineering—Multigrid methods to solve partial differential equations including anisotropic and nonlinear equations; multilevel adaptive refinement; fast multipole methods based on Taylor expansions, Chebyshev polynomials, plane wave representation, and singular value decomposition; and wavelets for signal and image compression, Haar wavelets, splines, and multiscale representation of curves and surfaces. Prerequisites: numerical methods (iterative solution of linear equations, interpolation, partial differential equations), scientific programming language.

3 units, not given this year (Darve, E)

CME 211. Computer Programming in C++ for Earth Scientists and Engineers—(Same as ENERGY 211.) Computer programming methodology emphasizing modern software engineering principles: object-oriented design, decomposition, encapsulation, abstraction, and modularity. Fundamental data structures. Time and space complexity analysis. The basic facilities of the programming language C++. Numerical problems from various science and engineering applications.

3 units, Aut (Lambers, J)

CME 212. Introduction to Large-Scale Computing in Engineering—Advanced programming methodologies for solving fundamental engineering problems using algorithms with pervasive application across disciplines. Overview of computer systems from a programming perspective including processor architectures, memory hierarchies, machine arithmetic, performance tuning techniques. Algorithms include iterative, direct linear solvers, fft, and divide and conquer strategies for n-body problems. Software development; other practical UNIX tools including shell scripting (bash), vi/emacs, gcc, make, gdb, gprof, rcs, and latex. Prerequisites: CME 200/ME 300A, CME 211, and CS 106X or equivalent level of programming in C/C++.

3 units, Win (Lambers, J)

CME 215A. Advanced Computational Fluid Dynamics—(Same as AA 215A.) High resolution schemes for capturing shock waves and contact discontinuities; upwinding and artificial diffusion; LED and TVD concepts; alternative flow splittings; numerical shock structure. Discretization of Euler and Navier Stokes equations on unstructured meshes; the relationship between finite volume and finite element methods. Time discretization; explicit and implicit schemes; acceleration of steady state calculations; residual averaging; math grid preconditioning. Automatic design; inverse problems and aerodynamic shape optimization via adjoint methods. Pre- or corequisite: 214B or equivalent.

3 units, Win (Jameson, A)

CME 215B. Advanced Computational Fluid Dynamics—(Same as AA 215B.) High resolution schemes for capturing shock waves and contact discontinuities; upwinding and artificial diffusion; LED and TVD concepts; alternative flow splittings; numerical shock structure. Discretization of Euler and Navier Stokes equations on unstructured meshes; the relationship between finite volume and finite element methods. Time discretization; explicit and implicit schemes; acceleration of steady state calculations; residual averaging; math grid preconditioning. Automatic design; inverse problems and aerodynamic shape optimization via adjoint methods. Pre- or corequisite: 214B or equivalent.

3 units, Spr (Jameson, A)

CME 291. Master's Research—Students require faculty sponsor.

1-5 units, Aut, Win, Spr, Sum (Staff)

CME 300. Departmental Seminar Series—Required for first-year ICME Ph.D. students; recommended for first-year ICME M.S. students. Presentations about research at Stanford by faculty and researchers from Engineering, H&S, and organizations external to Stanford. May be repeated for credit.

1 unit, Aut, Win (Murray, W)

CME 302. Numerical Linear Algebra—First in a three quarter graduate sequence. Solution of systems of linear equations: direct methods, error analysis, structured matrices; iterative methods and least squares. Parallel techniques. Prerequisites: CME 108, MATH 103 or 113.

3 units, Aut (Golub, G)

CME 303. Partial Differential Equations of Applied Mathematics—(Same as MATH 220.) First-order partial differential equations, method of characteristics, weak solutions, conservation laws, hyperbolic equations, separation of variables, Fourier series, Kirchoff's formula, Huygen's principle, and hyperbolic systems. Prerequisite: foundation in multivariable calculus and ordinary differential equations.

3 units, Aut (Nolen, J)

CME 304. Numerical Optimization—(Same as MS&E 315.) Solution of nonlinear equations; unconstrained optimization; linear programming; quadratic programming; global optimization; general linearly and nonlinearly constrained optimization. Theory and algorithms to solve these problems. Prerequisite: background in analysis and numerical linear algebra.

3 units, Win (Murray, W)

CME 305. Discrete Mathematics and Algorithms—(Same as MS&E 316.) Topics: enumeration such as Cayley's theorem and Prufer codes, SDR, flows and cuts (deterministic and randomized algorithms), probabilistic methods and random graphs, asymptotics (NP-hardness and approximation algorithms). Topics illustrated with EE, CS, and bioinformatics applications. Prerequisites: MATH 51 or 103 or equivalents.

3 units, Win (Saberi, A)

CME 306. Numerical Solution of Partial Differential Equations—Hyperbolic partial differential equations: stability, convergence and qualitative properties; nonlinear hyperbolic equations and systems; combined solution methods from elliptic, parabolic, and hyperbolic problems. Examples include: Burgers equation, Euler equations for compressible flow, Navier-Stokes equations for incompressible flow. Prerequisites: CME 302, MATH 220A.

3 units, Spr (Farhat, C)

CME 308. Stochastic Methods in Engineering—Review of basic probability; Monte Carlo simulation; state space models and time series; parameter estimation, prediction, and filtering; Markov chains and processes; stochastic control; and stochastic differential equations. Examples from various engineering disciplines. Prerequisites: exposure to probability; background in real variables and analysis.

3 units, Spr (Glynn, P)

CME 324. Advanced Methods in Matrix Computation: Iterative Methods—Eigenvalue problems: perturbation theory, Lanczos method, Jacobi method. Parallel implementation. Singular value problems. Generalized eigenvalue problems. Polynomial equations. Prerequisite: CME 302.

3 units, not given this year

CME 326. Numerical Methods for Initial Boundary Value Problems—Initial boundary value problems are solved in different areas of engineering and science modeling phenomena, such as wave propagation and vibration, and fluid flow. Numerical techniques for such simulations in the context of applications. Emphasis is on stability and convergence theory for methods for hyperbolic and parabolic initial boundary value problems, and the development of efficient methods for these problems.

3 units, not given this year

CME 330. Applied Mathematics in the Chemical and Biological Sciences—(Same as CHEMENG 300.) Mathematical solution methods via applied problems including chemical reaction sequences, mass and heat transfer in chemical reactors, quantum mechanics, fluid mechanics of reacting systems, and chromotography. Topics include generalized vector space theory, linear operator theory with eigenvalue methods, phase plane methods, perturbation theory (regular and singular), solution of parabolic and elliptic partial differential equations, and transform methods (Laplace and Fourier). Prerequisites: CME 102/ENGR 155A and CME 104/ENGR 155B, or equivalents.

3 units, Aut (Shaqfeh, E)

CME 332. Computational Methods for Scientific Reasoning and Discovery—Computational approaches to representing, reasoning with, and inferring scientific knowledge. Formation of taxonomies, induction of descriptive laws, and construction of explanatory models. Examples include reconstructions from the history of physics and chemistry, and generation of new results in biology and Earth science. Methods to represent, use, and infer scientific knowledge. Prerequisites: familiarity with artificial intelligence and list processing; ability to think computationally in terms of knowledge structures and mechanisms that operate on them.

3 units, not given this year

CME 334. Advanced Methods in Numerical Optimization—(Same as MS&E 312.) Topics include interior-point methods, relaxation methods for nonlinear discrete optimization, sequential quadratic programming methods, optimal control and decomposition methods. Topic chosen in first class; different topics for individuals or groups possible. Individual or team projects. May be repeated for credit.

3 units, Aut (Murray, W)

CME 336. Linear and Conic Optimization with Applications—(Same as MS&E 314.) Linear, semidefinite, conic, and convex nonlinear optimization problems as generalizations of classical linear programming. Algorithms include the interior-point, barrier function, and cutting plane methods. Related convex analysis, including the separating hyperplane theorem, Farkas lemma, dual cones, optimality conditions, and conic inequalities. Complexity and/or computation efficiency analysis. Applications to combinatorial optimization, sensor network localization, support vector machine, and graph realization. Prerequisite: MS&E 211 or equivalent.

3 units, alternate years, not given this year

CME 337. Information Networks—(Same as MS&E 337.) Network structure of the Internet and the web. Modeling, scale-free graphs, small-world phenomenon. Algorithmic implications in searching and inter-domain routing; the effect of structure on performance. Game theoretic issues, routing games, and network creation games. Security issues, vulnerability, and robustness. Prerequisite: basic probability and graph theory.

3 units, Aut (Saberi, A), alternate years, not given next year

CME 338. Large-Scale Numerical Optimization—(Same as MS&E 318.) The main algorithms and software for constrained optimization emphasizing the sparse-matrix methods needed for their implementation. Iterative methods for linear equations and least squares. Interior methods. The simplex method. Factorization and updates. The reduced-gradient, augmented Lagrangian, and SQP methods. Recommended: MS&E 310, 311, 312, 314, or 315; CME 108 or 302.

3 units, Spr (Saunders, M)

CME 340. Computational Methods in Data Mining—Focus is on very large scale data mining. Topics include computational methods in supervised and unsupervised learning, association mining, and collaborative filtering. Individual or group applications-oriented programming project. 1 unit without project; 3 units requires final project. Prerequisites: statistics and linear algebra at the level of MATH 103 and STATS 116; programming at the level of CS 108. Recommended: machine learning at the level of CS 229 or STATS 202.

1-3 units, Win (Kamvar, S)

CME 342. Parallel Methods in Numerical Analysis—Emphasis is on techniques for obtaining maximum parallelism in numerical algorithms, especially those occurring when solving matrix problems and partial differential equations, and the subsequent mapping onto the computer. Implementation issues on parallel computers. Topics: parallel architecture, programming models, matrix computations, FFT, fast multiple methods, domain decomposition, and graph partitioning. Prerequisite: CME 302 or 200/ME300A, or consent of instructor. Recommended: differential equations and advanced programming language such as C or C++.

3 units, Spr (Staff)

CME 346A. Introduction to Molecular Simulations—(Same as ME 346A.) Algorithms of molecular simulations and underlying theories. Molecular dynamics, Monte Carlo, energy minimization, and transition path search algorithms. Classical dynamics in Hamiltonian and Lagrangian form. Elementary statistical mechanics: ensembles, Boltzmann's distribution, and free energy. Measure and control of temperature and stress in molecular systems. Length and time scale limits of simulation methods. Applications in solids, liquids, and biomolecules. Programming in Matlab.

3 units, Spr (Darve, E)

CME 352. Molecular Algorithms—Recent research in DNA and RNA based nanotechnology, mathematical models of DNA self-assembly, algorithmic techniques and stochastic analyses for efficient and robust DNA self-assembly, experimental advances in molecular motors and machines which use DNA migration/enzymes, and algorithmic issues in the design of molecular motors and machines. Prerequisite: consent of instructor.

3 units, Win (Goel, A)

CME 380. Constructing Scientific Simulation Codes—Practical methods for writing and combining software components to generate simulation applications. Practical methodologies for constructing simulation code applications. How to design, write, and combine software components to generate simulation applications. Steering: using a small driver language like Python to script or steer the progress of a code. Data models and formats: how data is represented and shared inside an application and its external representation on disk. Mixed language programming using C, C++, F77, F90, and Python. Rational software engineering including testing, configuration control, code generation and makefiles. Other technologies needed to create real world applications regardless of scientific discipline.
3 units, Spr (Miller, P)

CME 390. Curricular Practical Training—May be repeated three times for credit.
1 unit, Aut, Win, Spr, Sum (Staff)

CME 400. Ph.D. Research
1-15 units, Aut, Win, Spr, Sum (Staff)

CME 444. Computational Consulting—Advice by graduate students under supervision of ICME faculty. Weekly briefings with faculty adviser and associated faculty to discuss ongoing consultancy projects and evaluate solutions. May be repeated for credit.
1-3 units, Aut, Win, Spr, Sum (Gerritsen, M)

CME 500. Numerical Analysis and Computational and Mathematical Engineering Seminar—Weekly research lectures by experts from academia, national laboratories, industry, and doctoral students. May be repeated for credit.
1 unit, Aut, Win, Spr (Staff)

CME 510. Linear Algebra and Optimization Seminar—Recent developments in numerical linear algebra and numerical optimization. Guest speakers from other institutions and local industry. Goal is to bring together scientists from different theoretical and application fields to solve complex scientific computing problems. May be repeated for credit.
1 unit, Aut, Win (Golub, G)

COGNATE COURSES

See respective department listings for course descriptions. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

MATH 221. Mathematical Methods of Imaging
3 units, Spr (Papanicolaou, G)

MATH 236. Introduction to Stochastic Differential Equations
3 units, Win (Papanicolaou, G)

MATH 237. Stochastic Equations and Random Media
3 units, Spr (Papanicolaou, G)

MS&E 319. Approximation Algorithms
3 units (Saberi, A) alternate years, not given this year

COMPUTER SCIENCE

Emeriti: (Professors) Tom Binford, Edward Feigenbaum, Richard Fikes,* Donald E. Knuth,* John McCarthy,* Edward J. McCluskey, William F. Miller, Nils J. Nilsson, Vaughan Pratt,* Jeffrey D. Ullman,* Gio Weiderhold*
Chair: William J. Dally
Associate Chair for Education: Mehran Sahami
Professors: Alex Aiken, David Cheriton, William J. Dally, David Dill, Hector Garcia-Molina, Gene H. Golub, Leonidas J. Guibas, Patrick Hanrahan, John Hennessy, Mark A. Horowitz, Oussama Khatib, Daphne Koller, Monica Lam, Jean-Claude Latombe, Marc Levoy, Zohar Manna, John Mitchell, Rajeev Motwani, Yoav Shoham, Sebastian Thrun, Jennifer Widom, Terry Winograd
Associate Professors: Dan Boneh, Dawson Engler, Ronald P. Fedkiw, Michael Genesereth, Christopher Manning, David Mazieres, Nick McKeown, Serge A. Plotkin, Balaji Prabhakar, Mendel Rosenblum
Assistant Professors: Serafim Batzoglou, Gill Bejerano, Scott Klemmer, Vladlen Koltun, Christoforos Kozyrakis, Philip Levis, Andrew Ng, Tim Roughgarden
Professor (Research): John K. Salisbury
Professor (Teaching): Eric S. Roberts
Associate Professor (Teaching): Mehran Sahami
Courtesy Professors: Russ Altman, Bernd Girod, Teresa Meng, Mark Musen, Kunle Olukotun, Fouad A. Tobagi
Courtesy Associate Professors: Ashish Goel, Dan Jurafsky
Courtesy Assistant Professors: Ramesh Johari, Benjamin Van Roy
Lecturers: Gerald Cain, Nicholas J. Parlante, Robert Plummer, Patrick Young, Julie Zelenski
Consulting Professor: Gary Bradski
Consulting Assistant Professor: Federico Barbagli
Visiting Professor: Martin Abadi

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* Recalled to active duty.

Mail Code: 94305-9025
Phone: (650) 723-2273
Web Site: http:// www.cs.stanford.edu/

Courses given in Computer Science have the subject code CS. For a complete list of subject codes, see Appendix.

The Department of Computer Science (CS) operates and supports computing facilities for departmental education, research, and administration needs. All CS students have access to the departmental student machine, a two CPU Dell PowerEdge 2850 Xeon, as well as computer labs with public workstations located in the Gates Building. In addition, most students have access to systems located in their research areas.

Each research group in Computer Science has systems specific to its research needs. These systems include PCs, Macs, multi-CPU computer clusters, and file servers. Servers and workstations manufactured by SUN, Dell, and Apple are commonplace. Support for course work and instruction is provided on systems available through Information Technology Systems (ITS) and the School of Engineering (SoE).

UNDERGRADUATE PROGRAMS

The mission of Stanford's undergraduate program in Computer Science is to provide a foundation of mathematics, science, and engineering knowledge. Building on Stanford's core ideals of liberal education, the program combines fundamentals with practical experience in problem solving, programming, communication, and collaboration, allowing each student to realize his or her individual potential.

Graduates of the program are prepared to pursue graduate study at the highest academic level, or advance into leadership positions in industry. The program creates an atmosphere that promotes innovative thinking, values mutual respect and diversity, supports scholarship and research, instills ethical behavior, and cultivates lifelong learning.

The department offers both a major and a minor in Computer Science. The requirements for these programs are outlined in the "School of

Engineering" section of this bulletin and described in more detail in the *Handbook for Undergraduate Engineering Programs* published by the School of Engineering. The department has an honors program, which is described in the following section.

In addition to Computer Science itself, Stanford offers several interdisciplinary degrees with a substantial computer science component. The Computer Systems Engineering major (also in Engineering) allows the study of areas requiring a knowledge of both computer hardware and software, bridging the gap between traditional CS and Electrical Engineering majors. The Symbolic Systems major (in the School of Humanities and Sciences) offers an opportunity to explore computer science and its relation to linguistics, philosophy, and psychology. Finally, the Mathematical and Computational Sciences major (also Humanities and Sciences) allows students to explore computer science along with more mathematics, statistics, and operations research.

HONORS

The Department of Computer Science (CS) offers an honors program for undergraduates whose academic records and personal initiative indicate that they have the necessary skills to undertake high-quality research in computer science. Admission to the program is by application only. To apply for the honors program, students must be majoring in Computer Science, have a grade point average (GPA) of at least 3.6 in courses that count toward the major, and achieve senior standing (135 or more units) by the end of the academic year in which they apply. Coterminal master's students are eligible to apply as long as they have not already received their undergraduate degree. Beyond these requirements, students who apply for the honors program must also find a Computer Science faculty member who agrees to serve as the thesis adviser for the project. Thesis advisers must be members of Stanford's Academic Council.

Students who meet the eligibility requirements and wish to be considered for the honors program must submit a written application to the CS undergraduate program office by May 1 of the year preceding the honors work. The application must include a letter describing the research project, a letter of endorsement from the faculty sponsor, and a transcript of courses taken at Stanford. Each year, a faculty review committee selects the successful candidates for honors from the pool of qualified applicants.

In order to receive departmental honors, students admitted to the honors program must, in addition to satisfying the standard requirements for the undergraduate degree, do the following:

1. Complete at least 9 units of CS 191 or 191W under the direction of their project sponsor.
2. Attend a weekly honors seminar Winter and Spring quarters.
3. Complete an honors thesis deemed acceptable by the thesis adviser and at least one additional faculty member.
4. Present the thesis at a public colloquium sponsored by the department.
5. Maintain the 3.6 GPA required for admission to the honors program.

GRADUATE PROGRAMS

The University's basic requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

In general, the M.S. degree in Computer Science is intended as a terminal professional degree and does not lead to the Ph.D. degree. Most students planning to obtain the Ph.D. degree should apply directly for admission to the Ph.D. program. Some students, however, may wish to complete the master's program before deciding whether to pursue the Ph.D. To give such students a greater opportunity to become familiar with research, the department has instituted a program leading to a master's degree with distinction in research. This program is described in more detail in a subsequent section.

Applications for admission to the M.S. program, and all of the required supporting documents, must be received by December 11, 2007. Exceptions are made for applicants who are already students at Stanford and are applying to the coterminal program. Information on these deadlines is available from the department.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

REQUIREMENTS

A candidate is required to complete a program of 45 units. At least 36 of these must be graded units, passed with a grade point average (GPA) of 3.0 (B) or better. The 45 units may include no more than 21 units of courses from those listed below in Requirements 1 and 2. Thus, students needing to take more than seven of the courses listed in Requirements 1 and 2 actually complete more than 45 units of course work in this program. Only well-prepared students may expect to finish the program in one year; most complete the program in six quarters. Students hoping to complete the program with 45 units should already have a substantial background in computer science, including course work or experience equivalent to all of Requirement 1 and some of the courses in Requirement 2.

Requirement 1—The following courses may be needed as prerequisites for other courses in the program: CS 103A, B, or X, 106A, B, or X, 107, 108; MATH 103.

Requirement 2—Students must demonstrate breadth of knowledge in the field by completing the following courses:

1. Area A: Mathematical and Theoretical Foundations
   a) Required:
      1) Statistics (STATS 116 or MS&E 220 or CME 106)
      2) Algorithms (CS 161)
      3) Automata (CS 154)
   b) Choose one of:
      1) Numerical Analysis (CME 108 or 302)
      2) Logic (CS 156, 157, 258, or PHIL 251)
      3) Mathematical Methods (CS 205A)
2. Area B: Computer Systems
   a) Required: Architecture (EE 108B or 282)
   b) Choose two of:
      1) Operating Systems (CS 140)
      2) Compilers (CS 143)
      3) Introduction to Computer Networks (CS 244A or EE 284)
3. Area C: AI and Applications
   a) Choose two of the following, with at least one 200-level course:
      1) AI (CS 121 or 221)
      2) Databases (CS 145 or 245)
      3) Graphics (CS 148 or 248)

Individual specializations may narrow the set of choices in specific areas of the breadth requirement; see the individual specialization sheets at http://cs.stanford.edu/degrees/mscs/programsheets/ for details. Breadth courses are waived only if evidence is provided that similar or more advanced courses have been taken, either at Stanford or another institution. Courses that are waived rather than taken may not be counted toward the M.S. degree. Breadth courses may be taken on a satisfactory/no credit basis provided that a minimum of 36 graded units is presented within the 45-unit program.

Requirement 3—At least 1 but no more than 3 units of 500-level seminars must be taken.

Requirement 4—A program of 21 units in an area of specialization must be completed. All courses in this area must be taken for letter grades. Ten approved programs are listed below. Students may propose to the M.S. program committee other coherent programs that meet their goals and satisfy the basic requirements.

1. Artificial Intelligence
   a) at least four of: CS 223A, 223B, 224M, 224N, 224S, 224U, 226, 227, 228, 229
   b) a total of 21 units from category (a) and the following: CS 205A, 222, 225A, 225B, 227B, 256, 262, 270, 273A, 274, 275, 276, 277, 278, 279, 294A, 321, 327A, 328, 329, 374, 377,* 379*; ECON 286; EE 263, 376A; ENGR 205, 209A; LINGUIST 180; MS&E 251, 252, 339, 351, 352, 353; PSYCH 202, 205; STATS 202, 315A, 315B

2. Biocomputation
   a) at least four of: CS 262, 270, 272, 273A, 274, 278, 279
   b) a total of 21 units from category (a) and the following: CS 228, 229, 245, 261, 268, 275, 277, 345, 346, 365, 374; BIOC 218; BIOMEDIN 234; GENE 203, 211; SBIO 228
3. Computer and Network Security
   a) CS 155, 244A, 255
   b) at least three of: CS 240, 244B, 244C, 259, 261, 344, 365
   c) at least one additional course chosen from (b) and the following: CS 240E, 244E, 245, 295, 344B, 345, 347, 355, 361A; EE 384A, 384B, 384C, 384M, 384S
4. Database Systems
   a) CS 245
   b) at least two of: CS 345, 346, 347
   c) at least four additional courses from category (b) and the following: CS 240, 242, 243, 244A, 244B, 244C, 249A, 249B, 255, 262, 270, 271, 272, 276, 315A, 344, 374
5. Human-Computer Interaction
   a) CS 147, 247; MS&E 430
   b) at least two of: CS 148 or 248, 376, 377 (may be repeated for credit), 378, 447; COMM 207, 268, 269; EDUC 124; MUSIC 250A; SYMBSYS 145
   c) a total of 21 units from categories (a), (b), and the following: CS 221, 223B, 229, 242, 249A, 249B, 276, 448; COMM 272; LINGUIST 180; MS&E 234; ME 101, 115, 313, 314; PSYCH 205, 221, 252
6. Numerical Analysis/Scientific Computation
   a) CME 302, 306, 326
   b) at least two of: CS 205A; 205B; MS&E 121; MATH 131, 132, 220A, 220B, 220C; STATS 200
   c) at least two of: CS 223A, 327A, 328, 339; AA 214A, 214B; CME 324, 342; STATS 227
7. Real-World Computing
   a) at least two of: CS 223A, 223B, 248
   b) at least three of: CS 205A, 205B, 226, 249A, 249B, 262, 268, 277, 348A, 348B, 374; CME 302, 306, 326
   c) a total of 21 units from the above and from the following: CS 225A, 225B, 228, 229, 247, 270, 271, 272, 273A, 274, 294A, 327A, 328, 448; CME 324
8. Software Theory
   a) CS 242, 243, 256, 258
   b) at least one of: CS 244A, 245, 295, 343, 345
   c) at least one course from the following: CS 255, 259, 261, 268, 355, 356, 361A, 361B, 365
   d) at least one additional course chosen from (b), (c), and CS 346
9. Systems
   a) CS 240, 242
   b) at least three of: CS 243, 244A, 245, 248, 348B; EE 271
   c) at least two additional courses chosen from (b) and the following: CS 194, 240C, 240D, 240E, 240X, 244B, 244C, 244E, 249A, 249B, 255, 259, 262, 270, 271, 272, 276, 294S, 295, 315A, 315B, 343, 344, 344B, 344E, 345, 346, 347, 348A, 349, 374, 448; EE 384A, 384B, 384C, 384S, 384X, 384Y
10. Theoretical Computer Science
   a) CS 256, 258, 261 (361A, 361B, or 365 may be substituted for 261)
   b) at least four additional courses chosen from CS 228, 255, 259, 262, 268, 345, 355, 356, 357, 358, 359,* 361A, 361B, 364A, 364B, 365, 369,* 374; MS&E 310

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* With consent of specialization chair.

Requirement 5—Additional elective units must be technical courses (numbered 100 or above) related to the degree program and approved by the adviser. Elective courses may be taken on a satisfactory/no credit basis provided that a minimum of 36 graded units is presented within the 45-unit program.

MASTER OF SCIENCE WITH DISTINCTION IN RESEARCH

A student who wishes to pursue the M.S./CS with distinction in research must first identify a faculty adviser who agrees to supervise and support the research work. The research adviser must be a member of the Academic Council and must hold an appointment in Computer Science. The student and principal adviser must also identify another faculty member, who need not be in the Department of Computer Science, to serve as a secondary adviser and reader for the research report. In addition, the student must complete the following requirements beyond those for the regular M.S./CS degree:

1. *Research Experience:* the program must include significant research experience at the level of a half-time commitment over the course of three academic quarters. In any given quarter, the half-time research commitment may be satisfied by a 50 percent appointment to a departmentally supported research assistantship, 6 units of independent study (CS 393, 395, or 399), or a prorated combination of the two (such as a 25 percent research assistantship supplemented by 3 units of independent study). This research must be carried out under the direction of the primary or secondary adviser.
2. *Supervised Writing and Research:* in addition to the research experience outlined in the previous requirement, students must enroll in at least 3 units of independent research (CS 393, 395, or 399) under the direction of their primary or secondary adviser. These units should be closely related to the research described in the first requirement, but focused more directly on the preparation of the research report described in the next section. Note that the writing and research units described in parts (1) and (2) must be taken in addition to the 21 units required for the specialization, although they do count toward the 45 units required for the degree.
3. *Research Report:* students must complete a significant report describing their research and its conclusions. The research report represents work that is publishable in a journal or at a high-quality conference, although it is presumably longer and more expansive in scope than a typical conference paper. Two copies of the research report must be submitted to the Student Services office in the department three weeks before the beginning of the examination period in the student's final quarter. Both the primary and secondary adviser must approve the research report before the distinction-in-research designation can be conferred.

DOCTOR OF PHILOSOPHY

Applications to the Ph.D. program and all supporting documents must be submitted and received online by December 11, 2007. See http://cs.stanford.edu/wiki/admissions/ for complete information. Changes or updates to the admission process are posted in September and October, 2007. The following are general department requirements; contact the Computer Science Ph.D. administrator for details.

1. A student should plan and complete a coherent program of study covering the basic areas of computer science and related disciplines. The student's adviser has primary responsibility for the adequacy of the program, which is subject to review by the Ph.D. program committee.
2. Each student, to remain in the Ph.D. program, must satisfy the breadth requirement covering introductory-level graduate material in major areas of computer science. A student who fulfills six of thirteen exams in the breadth requirement may apply for candidacy prior to the second year in the program. The student must completely satisfy the breadth requirement by the end of nine quarters (excluding Summer Quarters), and must pass a qualifying exam in the general area of the expected dissertation.
3. As part of the training for the Ph.D., the student is required to complete at least 4 units (a unit is 10 hours per week for one quarter) as a course assistant or instructor for courses in Computer Science numbered 100 or above.
4. The most important requirement is the dissertation. After passing the required qualifying examination, each student must secure the agreement of a member of the department faculty to act as the dissertation adviser. In some cases, the dissertation adviser may be in another department.

5. The student must pass a University oral examination in the form of a defense of the dissertation. This is typically held after all or a substantial portion of the dissertation research has been completed.
6. The student is expected to demonstrate the ability to present scholarly material orally, both in the dissertation defense and by a lecture in a department seminar.
7. The dissertation must be accepted by a reading committee composed of the principal dissertation adviser, a second member from within the department, and a third member chosen from within the University. The principal adviser and at least one of the other committee members must be Academic Council members.

PH.D. MINOR

For a minor in Computer Science, a candidate must complete 20 unduplicated units of computer science course work numbered 200 or above. At least three of the courses must be master's core courses to provide breadth and one course numbered 300 or above to provide depth. One of the courses taken must include a significant programming project to demonstrate programming efficiency. All courses must be taken for a letter grade and passed with a grade 'B' or better. Applications for a minor in Computer Science are submitted at the same time as admission to candidacy.

TEACHING AND RESEARCH ASSISTANTSHIPS

Graduate student assistantships are available. Half-time assistants receive a tuition scholarship for 8, 9, or 10 units per quarter during the academic year, and in addition receive a monthly stipend.

Duties for half-time assistants during the academic year involve approximately 20 hours of work per week. Course assistants (CAs) help an instructor teach a course by conducting discussion sections, consulting with students, and grading examinations. Research assistants (RAs) help faculty and senior staff members with research in computer science. Most course and research assistantships are held by Ph.D. students. If there is an insufficient number of Ph.D. students to staff teaching and research assistantships, then these positions are open to master's students. However, master's students should not plan on being appointed to an assistantship.

Students with fellowships may have the opportunity to supplement their stipends by serving as graduate student assistants.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

GUIDE TO CHOOSING INTRODUCTORY COURSES

Students arriving at Stanford have widely differing backgrounds and goals, but most find that the ability to use computers effectively is beneficial to their education. The department offers many introductory courses to meet the needs of these students.

For students whose principal interest is an exposure to the fundamental ideas behind computer science and programming, CS 105 is the most appropriate course. It is intended for students in nontechnical disciplines who expect to make some use of computers, but who do not expect to go on to more advanced courses. CS 105 meets the General Education Disciplinary Breadth Requirement in Engineering and Applied Sciences and includes an introduction to programming and the use of modern Internet-based technologies. Students interested in learning to use the computer should consider CS 1C, Introduction to Computing at Stanford.

Students who intend to pursue a serious course of study in computer science may enter the program at a variety of levels, depending on their background. Students with little prior experience or those who wish to take more time to study the fundamentals of programming should take 106A followed by 106B. Students in 106A need not have prior programming experience. Students with significant prior exposure to programming or those who want an intensive introduction to the field should take 106X, which covers most of the material in 106A and B in a single quarter. CS106A uses Java as its programming language; CS106B and X use C++. No prior knowledge of these languages is assumed, and the prior programming experience required for 106X may be in any language. In all cases, students are encouraged to discuss their background with the instructors responsible for these courses.

After the introductory sequence, Computer Science majors and those who need a significant background in computer science for related majors in engineering should take 103, 107 and 108. CS 103 offers an introduction to the mathematical and theoretical foundations of computer science. CS 107 exposes students to a variety of programming paradigms that illustrate critical strategies used in systems development; 108 builds on this material, focusing on the development of large interactive programs based on the object-oriented programming paradigm.

In summary:
For exposure: 1C
For nontechnical use: 105
For scientific use: 106A
For a technical introduction: 106A
For significant use: 106A,B or 106X, along with 103, 107, and 108

NUMBERING SYSTEM

The first digit of a CS course number indicates its general level of sophistication:

1- 99	Service courses for nontechnical majors
100-199	Other service courses, basic undergraduate
200-299	Advanced undergraduate/beginning graduate
300-399	Advanced graduate
400-499	Experimental
500-599	Graduate seminars

The tens digit indicates the area of Computer Science it addresses:

00-09	Introductory, miscellaneous
10-19	Hardware Systems
20-29	Artificial Intelligence
30-39	Numerical Analysis
40-49	Software Systems
50-59	Mathematical Foundations of Computing
60-69	Analysis of Algorithms
70-79	Computational Biology and Interdisciplinary Topics
90-99	Independent Study and Practicum

NON-MAJOR

CS 1C. Introduction to Computing at Stanford—For those with limited experience with computers or who want to learn more about Stanford's computing environment. Basics including security breach precautions and media labs for class presentations. Computer labs and resources, email and printing, AFS space, and computer maintenance and security. One-hour lecture/demonstration in dormitory clusters prepared and administered weekly by the Resident Computer Coordinator (RCC). Final project. Not a programming course.

1 unit, Aut (Ly, J)

CS 2C. Intermediate Computing at Stanford—Continuation of 1C. Sound, image and video editing, and publishing media. Applications include: Audacity, Dreamweaver, Photoshop, and Powerpoint. One-hour lecture/demonstration in dormitory clusters prepared and administered weekly by the Resident Computer Coordinator (RCC). Final project. Not a programming course.

1 unit, Win (Ly, J)

CS 12N. The Coming Revolution in Computer Architecture—Stanford Introductory Seminar. Preference to freshmen. Classic architecture and technology trends that have driven its performance growth, and factors leading to the end of this growth; characteristics of technology that can be exploited for future growth and driving application areas; alternative organizations and programming systems that are candidates to replace the status quo. GER:DB-EngrAppSci

3 units, Spr (Dally, W)

CS 20N. The Role of Information Technology in Global Conflict Resolution—Stanford Introductory Seminar. Preference to freshmen. Larger aspects of the impact of the Internet such as war and peace. Online activities of peace NGOs. Group project to build a portal for NGO activities concerning the Israeli-Palestinian conflict. Web site design and group project management. GER:DB-EngrAppSci

3 units, Spr (Shoham, Y)

CS 26N. Motion Planning for Robots, Digital Actors, and Other Moving Objects—Stanford Introductory Seminar. Preference to freshmen. Motion planning theory and computational approaches. Intriguing algorithms, representations, and applications. Terminology and concepts for reading motion planning research literature. Problems may include: how a robot arm manipulates parts without colliding with its environment; how many maneuvers are required to park a car in a tight spot; how characters in computer games avoid running into obstacles; and how molecules change shapes to perform biological functions. GER:DB-EngrAppSci

3 units, Aut (Latombe, J)

CS 73N. Business on the Information Highways—Stanford Introductory Seminar. Preference to freshmen. The capabilities of the Internet and its services. Writing for the web. The effect on commerce, education, government, and health care. Technical and business alternatives. Who is hurt and who benefits from the changes? Participants develop web publications. GER:DB-EngrAppSci, Write-2

3 units, Spr (Wiederhold, G; Barr, A; Tessler, S)

CS 74N. Digital Dilemmas—Stanford Introductory Seminar. Preference to freshmen. Issues where policy decision making requires understanding computer and communications technology. Technology basics in non-technology terms. Topics include intellectual property, privacy, Internet neutrality, security and cryptography. Guest speakers. GER:DB-EngrAppSci

3 units, Aut (Dill, D)

UNDERGRADUATE

CS 103A. Discrete Mathematics for Computer Science—Mathematical foundations required for computer science. Topics: propositional and predicate logic, proof techniques, induction, recursion, combinatorics, and functions. Corequisite: 106A or X. GER:DB-Math

3 units, Aut, Win (Plummer, R)

CS 103B. Discrete Structures—Continuation of 103A. Topics: analysis of algorithms, recurrence relations, mathematical formulations of basic data models (sets, relations, linear models, trees and graphs), regular expressions, grammars, and finite automata. Corequisite: 106B or X. GER:DB-Math

3 units, Win, Spr (Sahami, M)

CS 103X. Discrete Structures (Accelerated)—Covers the material in 103A and B in a single quarter. The mathematical foundations of computer science. Introduction to set theory and logic, number theory, functions and relations, combinatorics, and graph theory. Prerequisite: background in mathematical formalism and mathematical proof. GER:DB-Math

3-4 units, Win (Koltun, V)

CS 105. Introduction to Computers—For non-technical majors. What computers are and how they work. Practical experience in programming. Construction of computer programs and basic design techniques. A survey of Internet technology and the basics of computer hardware. Students in technical fields and students looking to acquire programming skills should take 106A or 106X. Students with prior computer science experience at the level of 106 or above require consent of instructor. Prerequisite: minimal math skills. GER:DB-EngrAppSci

3-5 units, Aut, Spr (Young, P)

CS 106A. Programming Methodology—(Same as ENGR 70A.) Introduction to the engineering of computer applications emphasizing modern software engineering principles: object-oriented design, decomposition, encapsulation, abstraction, and testing. Uses the Java programming language. Emphasis is on good programming style and the built-in facilities of the Java language. No prior programming experience required. GER:DB-EngrAppSci

3-5 units, Aut (Sahami, M), Win, Spr (Young, P), Sum (Staff)

CS 106B. Programming Abstractions—(Same as ENGR 70B.) Abstraction and its relation to programming. Software engineering principles of data abstraction and modularity. Object-oriented programming, fundamental data structures (such as stacks, queues, sets) and data-directed design. Recursion and recursive data structures (linked lists, trees, graphs). Introduction to time and space complexity analysis. Uses the programming language C++ covering its basic facilities. Prerequisite: 106A or equivalent. GER:DB-EngrAppSci

3-5 units, Win (Zelenski, J), Spr, Sum (Staff)

CS 106X. Programming Abstractions (Accelerated)—(Same as ENGR 70X.) Intensive version of 106B for students with a strong programming background interested in a rigorous treatment of the topics at an accelerated pace. Additional advanced material and more challenging projects. Prerequisite: excellence in 106A or equivalent, or consent of instructor. GER:DB-EngrAppSci

3-5 units, Aut (Zelenski, J), Win (Cain, G)

CS 107. Programming Paradigms—Advanced memory management features of C and C++; the differences between imperative and object-oriented paradigms. The functional paradigm (using LISP) and concurrent programming (using C and C++). Brief survey of other modern languages such as Python, Objective C, and C#. GER:DB-EngrAppSci

3-5 units, Aut, Spr (Cain, G)

CS 107L. Programming Paradigms Laboratory—Advanced C++ topics beyond the scope of 107. Topics: advanced memory management; placement new; manual destruction; operator overloading; STL template containers; algorithms; iterators; single and multiple inheritance; class hierarchy design; and C++ pitfalls.

1 unit, Aut, Spr (Cain, G)

CS 108. Object-Oriented Systems Design—Software design and construction in the context of large OOP libraries. Taught in Java. Topics: OOP design, design patterns, testing, graphical user interface (GUI) OOP libraries, software engineering strategies, approaches to programming in teams. Prerequisite: 107. GER:DB-EngrAppSci

3-4 units, Aut, Win (Parlante, N)

CS 121. Introduction to Artificial Intelligence—(Only one of 121/221 counts towards any CS degree program.) Concepts, representations, and techniques used in building practical computational systems (agents) that appear to display artificial intelligence (AI), through the use of adaptive information processing algorithms. Topics: history of AI, reactive systems, heuristic search, planning, constraint satisfaction, knowledge representation and uncertain reasoning, machine learning, classification, applications to language, and vision. Prerequisites: 103B or X, and facility with differential calculus, vector algebra, and probability theory. GER:DB-EngrAppSci
3 units, Spr (Latombe, J), Sum (Staff)

CS 140. Operating Systems and Systems Programming—Operating systems design and implementation. Basic structure; synchronization and communication mechanisms; implementation of processes, process management, scheduling, and protection; memory organization and management, including virtual memory; I/O device management, secondary storage, and file systems. Prerequisite: 107. GER:DB-EngrAppSci
3-4 units, Aut (Mazieres, D), Win (Rosenblum, M)

CS 143. Compilers—Principles and practices for design and implementation of compilers and interpreters. Topics: lexical analysis; parsing theory; symbol tables; type systems; scope; semantic analysis; intermediate representations; runtime environments; code generation; and basic program analysis and optimization. Students construct a compiler for a simple object-oriented language during course programming projects. Prerequisites: 103B or X, and 107. GER:DB-EngrAppSci
3-4 units, Aut (Cain, G), Sum (Staff)

CS 144. Introduction to Computer Networking—Only one of 144 or 244A counts towards any CS degree program. Principles and practice. Structure and components of computer networks, packet switching, layered architectures. Applications: web/http, voice-over-IP, p2p file sharing and socket programming. Reliable transport: TCP/IP, reliable transfer, flow control, and congestion control. The network layer: names and addresses, routing. Local area networks: ethernet and switches. Wireless networks and network security. Prerequisite: 108 or equivalent. GER:DB-EngrAppSci
4 units, Spr (Levis, P; Mazieres, D)

CS 145. Introduction to Databases—Database design and use of database management systems for applications. The relational model, relational algebra, and SQL, the standard language for creating, querying, and modifying relational and object-relational databases. XML data including the query languages XPath and XQuery. UML database design, and relational design principles based on functional dependencies and normal forms. Other topics include indexes, views, transactions, authorization, integrity constraints, and triggers. Advanced topics from data warehousing, data mining, web data management, Datalog, data integration, data streams and continuous queries, and data-intensive web services. Prerequisites: 103B or X, and 107. GER:DB-EngrAppSci
3-4 units, Aut (Ullman, J)

CS 147. Introduction to Human-Computer Interaction Design—Usability and affordances, direct manipulation, systematic design methods, user conceptual models and interface metaphors, human cognitive and physical ergonomics, information and interactivity structures, and design tools and environments. Team project in interaction design. Prerequisite: 106A or equivalent background in programming.
3-4 units, Aut (Klemmer, S)

CS 148. Introductory Computer Graphics—(Only one of 148 or 248 counts towards any CS degree program.) For undergraduates; M.S. students and those interested in continuing in graphics, register for 248. Two- and three-dimensional computer graphics. Topics: input and display devices, scan conversion of geometric primitives, two- and three-dimensional transformations and clipping, windowing techniques, curves and curved surfaces, three-dimensional viewing and perspective, hidden surface removal, illumination and color models, OpenGL, and 3-D modeling tools. Emphasis is on practical skills in using graphics libraries and tools. Programming using C/C++ and OpenGL, with demos in SoftImage. Prerequisites: 107, MATH 103. GER:DB-EngrAppSci
3 units, Win (Hanrahan, P), Sum (Staff)

CS 154. Introduction to Automata and Complexity Theory—Regular sets: finite automata, regular expressions, equivalences among notations, methods of proving a language not to be regular. Context-free languages: grammars, pushdown automata, normal forms for grammars, proving languages non-context-free. Turing machines: equivalent forms, undecidability. Nondeterministic Turing machines: properties, the class NP, complete problems for NP, Cook's theorem, reducibilities among problems. Prerequisites: 103B or X. GER:DB-EngrAppSci
3-4 units, Aut (Dill, D), Spr (Motwani, R), Sum (Staff)

CS 154N. Introduction to NP Completeness—Turing machines: equivalent forms, undecidability. Nondeterministic Turing machines: properties, the class NP, complete problems for NP, Cook's theorem, reducibilities among problems. Students participate in approximately the last half of 154. Prerequisite: formal languages and automata as in first part of 154.
2 units, Aut (Dill, D), Spr (Motwani, R)

CS 155. Computer and Network Security—For seniors and first-year graduate students. Principles of computer systems security. Attack techniques and how to defend against them. Topics include: network attacks and defenses, operating system holes, application security (web, email, databases), viruses, social engineering attacks, privacy, and digital rights management. Course projects focus on building reliable code. Prerequisite: 140. Recommended: basic Unix. GER:DB-EngrAppSci
3 units, Spr (Boneh, D; Mitchell, J)

CS 156. Calculus of Computation—Decision procedures with applications to analyzing and developing robust software. Logic review. Propositional and first-order logic; induction. Verification: methods for proving correctness of sequential programs using first-order reasoning; need for decision procedures. Decision procedures: algorithms that decide the validity of logical formulas for common theories including SAT, equality, arithmetic, recursive data structures, and arrays. Combination theories and combination of decision procedures. Static analysis: algorithms for deducing program properties. Projects include writing verified programs. Prerequisites: 103, 106, or equivalents. GER:DB-EngrAppSci
3-4 units, Win (Manna, Z)

CS 157. Logic and Automated Reasoning—An elementary exposition from a computational point of view of propositional and predicate logic, axiomatic theories, and theories with equality and induction. Interpretations, models, validity, proof, strategies, and applications. Automated deduction: polarity, skolemization, unification, resolution, equality. Prerequisite: 103B or X. GER:DB-EngrAppSci
3 units, Aut (Genesereth, M)

CS 161. Design and Analysis of Algorithms—Efficient algorithms for sorting, searching, and selection. Algorithm analysis: worst and average case analysis. Recurrences and asymptotics. Data structures: balanced trees, heaps, hash tables. Algorithm design techniques: divide-and-conquer, dynamic programming, greedy algorithms, amortized analysis. Algorithms for fundamental graph problems such as depth-first search, connected components, topological sort, and shortest paths. Possible additional topics: network flow, string searching, parallel computation. Prerequisite: 103B or X; STATS 116. GER:DB-EngrAppSci
3-4 units, Aut (Plotkin, S), Win (Roughgarden, T), Sum (Staff)

CS 191. Senior Project—Restricted to Computer Science and Computer Systems Engineering students. Group or individual projects under faculty direction. Register using instructor's section number. A project can be either a significant software application or publishable research. Software application projects include substantial programming and modern user-interface technologies and are comparable in scale to shareware programs or commercial applications. Research projects may result in a paper publishable in an academic journal or presentable at a conference. Required public presentation of final application or research results.
1-6 units, Aut, Win, Spr, Sum (Staff)

CS 191W. Writing Intensive Senior Project—Restricted to Computer Science and Computer Systems Engineering students. Writing-intensive version of 191. Register using section number of an Academic Council member. WIM
3-6 units, Aut, Win, Spr (Staff)

CS 192. Programming Service Project—Restricted to Computer Science students. Appropriate academic credit (without financial support) is given for volunteer computer programming work of public benefit and educational value.

1-4 units, Aut, Win, Spr, Sum (Staff)

CS 193C. Client-Side Internet Technologies—Client-side technologies used to create web sites such as sophisticated Web 2.0 interfaces similar to Google maps. XHTML, CSS, JavaScript, document object model (DOM), AJAX, and Flash. Prerequisite: programming experience at the level of 106A.

3 units, Sum (Staff)

CS 193D. Professional Software Development with C++—Programming techniques and methodologies. Language concepts including object-oriented design, memory management, and the standard library. Modern software development concepts such as design patterns, test-driven development, extreme programming, and XML. Prerequisites: basic C++ or significant experience in C or Java.

3 units, not given this year

CS 193E. Mac OS X Cocoa Programming—Hands-on project using the Cocoa frameworks for the Mac OS X platform. The essentials of designing and implementing graphical applications using Cocoa tools and APIs. Topics include: object-oriented event-driven programming; Objective-C language; development tools such as Interface Builder, XCode, and debugging and profiling tools; APIs for the foundation and application kits; and the Quartz graphic system. Requirements: C language and programming experience at the level of 106B/X. Recommended: UNIX, object-oriented programming, and graphical toolkits.

3 units, Win (Staff)

CS 194. Software Project—Design, specification, coding, and testing of a significant team programming project under faculty supervision. Documentation includes a detailed proposal. Public demonstration of the project at the end of the quarter. Prerequisite: 108. WIM

3 units, Spr (Plummer, R)

CS 196. Microcomputer Consulting—Focus is on Macintosh and PC systems. Computer use, maintenance, and troubleshooting. Topics: hardware, operating systems, networking, security, troubleshooting, and consulting methodology focusing on Stanford's computing environment. Final project. Not a programming course. Prerequisite: 1C or equivalent.

2 units, Win, Spr (Ly, J)

CS 198. Teaching Computer Science—Students lead a discussion section of 106A while learning how to teach a programming language at the introductory level. Focus is on teaching skills, techniques, and course specifics. Application and interview required; see http://cs198.stanford.edu. Prerequisite: 106B or X.

4 units, Aut, Win, Spr (Sahami, M; Jachowski, M; Kim, I)

CS 199. Independent Work—Special study under faculty direction, usually leading to a written report. Letter grade; if not appropriate, enroll in 199P.

1-6 units, Aut, Win, Spr, Sum (Staff)

CS 199P. Independent Work

1-6 units, Aut, Win, Spr, Sum (Staff)

UNDERGRADUATE AND GRADUATE

CS 201. Computers, Ethics, and Social Responsibility—Primarily for majors entering computer-related fields. Ethical and social issues related to the development and use of computer technology. Ethical theory, and social, political, and legal considerations. Scenarios in problem areas: privacy, reliability and risks of complex systems, and responsibility of professionals for applications and consequences of their work. Prerequisite: 106B or X. GER:DB-EthicReas, WIM

3-4 units, Win (Johnson, M)

CS 202. Law for Computer Science Professionals—Intellectual property law as it relates to computer science including copyright registration, patents, and trade secrets; contract issues such as non-disclosure/non-compete agreements, license agreements, and works-made-for-hire; dispute resolution; and principles of business formation and ownership. Emphasis is on topics of current interest such as open source and the free software movement, peer-to-peer sharing, encryption, data mining, and spam.

1 unit, Aut (Hansen, D)

CS 205A. Mathematical Methods for Robotics, Vision, and Graphics—Continuous mathematics background necessary for research in robotics, vision, and graphics. Possible topics: linear algebra; the conjugate gradient method; ordinary and partial differential equations; vector and tensor calculus. Prerequisites: 106B or X; MATH 51 and 113; or equivalents.

3 units, Aut (Fedkiw, R)

CS 205B. Mathematical Methods for Fluids, Solids, and Interfaces—Numerical methods for simulation of problems involving solid mechanics and fluid dynamics. Focus is on practical tools needed for simulation, and continuous mathematics involving nonlinear hyperbolic partial differential equations. Possible topics: finite element method, highly deformable elastic bodies, plasticity, fracture, level set method, Burgers' equation, compressible and incompressible Navier-Stokes equations, smoke, water, fire, and solid-fluid coupling. Prerequisite: 205A or equivalent.

3 units, Spr (Fedkiw, R)

CS 221. Artificial Intelligence: Principles and Techniques—(Only one of 121 or 221 counts towards any CS degree program.) Topics: search, constraint satisfaction, knowledge representation, probabilistic models, machine learning, neural networks, vision, robotics, and natural language understanding. Prerequisites: 103B or X, 106B, or 106X, and exposure to probability. Recommended: 107 and facility with basic differential calculus.

3-4 units, Aut (Ng, A)

CS 222. Rational Agency and Intelligent Interaction—(Same as PHIL 358.) For advanced undergraduates, and M.S. and beginning Ph.D. students. Logic-based methods for knowledge representation, information change, and games in artificial intelligence and philosophy. Topics: knowledge, certainty, and belief; time and action; belief dynamics; preference and social choice; games; and desire and intention. Prerequisite: propositional and first-order logic. Recommended: modal logic; game theory.

3 units, Spr (Shoham, Y; vanBenthem, J)

CS 223A. Introduction to Robotics—Topics: robotics foundations in kinematics, dynamics, control, motion planning, trajectory generation, programming and design. Recommended: matrix algebra.

3 units, Win (Khatib, O)

CS 223B. Introduction to Computer Vision—Fundamental issues and techniques of computer vision. Image formation, edge detection and image segmentation, stereo, motion, shape representation, recognition.

3 units, Win (Kosecka, J)

CS 224M. Multi-Agent Systems—For advanced undergraduates, and M.S. and beginning Ph.D. students. Topics: logics of knowledge and belief, other logics of mental state, theories of belief change, multi-agent probabilities, essentials of game theory, social choice and mechanism design, multi-agent learning, communication. Applications discussed as appropriate, but emphasis is on conceptual matters and theoretical foundations. Prerequisites: basic probability theory and first-order logic.

3 units, Win (Shoham, Y)

CS 224N. Natural Language Processing—(Same as LINGUIST 280.) Methods for processing linguistic information and the underlying computational properties of natural languages. Syntactic and semantic processing from a linguistic and an algorithmic perspective. Focus is on modern quantitative techniques in NLP: using large corpora, statistical models for acquisition and interpretation, and representative systems. Prerequisites: CS 121/221 or LINGUIST 180, programming experience, familiarity with logic and probability.

3-4 units, Spr (Manning, C)

CS 224S. Speech Recognition and Synthesis—(Same as LINGUIST 281.) Automatic speech recognition, speech synthesis, and dialogue systems. Focus is on key algorithms including noisy channel model, hidden Markov models (HMMs), Viterbi decoding, N-gram language modeling, unit selection synthesis, and roles of linguistic knowledge. Prerequisite: programming experience. Recommended: CS 221 or 229.

2-4 units, not given this year

CS 224U. Natural Language Understanding—(Same as LINGUIST 188/288.) Machine understanding of human language. Computational semantics (determination of sense, event structure, thematic role, time, aspect, synonymy/meronymy, causation, compositional semantics, treatment of scopal operators), and computational pragmatics and discourse (coherence relations, anaphora resolution, information packaging, generation). Theoretical issues, online resources, and relevance to applications including question answering, summarization, and textual inference. Prerequisites: one of LINGUIST 180, CS 224N,S; and logic such as LINGUIST 130A or B, CS 157, or PHIL150).

2-4 units, Aut (Jurafsky, D; Manning, C)

CS 225A. Experimental Robotics—Hands-on. Topics: kinematic and dynamic control of motion, compliant motion and force control, sensor-based collision avoidance, motion planning, dynamic skills, and robot-human interfaces. Limited enrollment. Prerequisite: 223A.

3 units, Spr (Khatib, O)

CS 225B. Robot Programming Laboratory—For robotics and non-robotics students. Students program mobile robots to exhibit increasingly complex behavior (simple dead reckoning and reactivity, goal-directed motion, localization, complex tasks). Topics: motor control and sensor characteristics; sensor fusion, model construction, and robust estimation; control regimes (subsumption, potential fields); probabalistic methods, including Markov localization and particle filters. Student programmed robot contest. Programming is in C++ on Unix machines, done in teams. Prerequisite: programming at the level of 106B, 106X, 205, or equivalent.

3-4 units, Aut (Konolige, K)

CS 226. Statistical Techniques in Robotics—For students seeking to develop robust robot software and those interested in real-world applications of statistical theory. Probabilistic state estimation, Bayes filters, Kalman filters, information filters, and particle filters. Simultaneous localization and mapping techniques, and multi-robot sensor fusion. Markov techniques for making decisions under uncertainty, and probabilistic control algorithms and exploration.

3 units, not given this year

CS 227. Reasoning Methods in Artificial Intelligence—Technical presentation of algorithmic techniques for problem solving in AI. Combines formal algorithmic analysis with a description of recent applications. Topics: propositional satisfiability, constraint satisfaction, planning and scheduling, diagnosis and repair. Focus is on recent results. Prerequisites: familiarity with the basic notions in data structures and design and with techniques in the design and analysis of algorithms. Recommended: previous or concurrent course in AI.

3 units, not given this year

CS 227B. General Game Playing—A general game playing system accepts a formal description of a game to play it without human intervention or algorithms designed for specific games. Hands-on introduction to these systems and artificial intelligence techniques such as knowledge representation, reasoning, learning, and rational behavior. Students create GGP systems to compete with each other and in external competitions. Prerequisite: programming experience. Recommended: 103 or equivalent.

3 units, Spr (Genesereth, M)

CS 228. Structured Probabilistic Models: Principles and Techniques—Probabilistic modeling languages for representing complex domains, algorithms for reasoning and decision making using these representations, and learning these representations from data. Focus is on probabilistic graphic models, including Bayesian and Markov networks, extensions to temporal modeling such as hidden Markov models and dynamic Bayesian networks, and extensions to decision making such as influence diagrams. Topics: theoretical foundations and applications to domains including speech recognition, biological modeling and discovery, medical diagnosis, message encoding, vision, and robot motion planning. Prerequisites: basic probability theory and algorithm design and analysis.

3 units, Win (Koller, D)

CS 229. Machine Learning—Topics: statistical pattern recognition, linear and non-linear regression, non-parametric methods, exponential family, GLIMs, support vector machines, kernel methods, model/feature selection, learning theory, VC dimension, clustering, density estimation, EM, dimensionality reduction, ICA, PCA, reinforcement learning and adaptive control, Markov decision processes, approximate dynamic programming, and policy search. Prerequisites: linear algebra, and basic probability and statistics.

3 units, Aut (Ng, A)

CS 240. Advanced Topics in Operating Systems—Recent research. Classic and new papers. Topics: virtual memory management, synchronization and communication, file systems, protection and security, operating system extension techniques, fault tolerance, and the history and experience of systems programming. Prerequisite: 140 or equivalent.

3 units, Win (Mazieres, D), Spr (Engler, D)

CS 240C. Advanced Operating Systems Implementation—Operating system techniques for meeting the performance, security, flexibility, and robustness needs of demanding applications. Review of hardware/software interface and traditional operating system concepts. Recent operating systems research. Lab to apply concepts. Students work with a minimal operating system capable of running on standard PC hardware. Operating system written in C with some assembly. Prerequisite: 140 or consent of instructor.

3 units, not given this year

CS 240D. Distributed Storage Systems—File system implementation, low-level database storage techniques, and distributed programming. File system structures, journaling and logging, I/O system performance, RAID (redundant arrays of inexpensive disks), remote procedure call abstraction, and systems illustrating these concepts. File systems, distributed computing, replication and consistency, fault tolerance, and crash recovery. Programming assignments. Final project to build a functioning Unix file system. Prerequisites: C++ and familiarity with Unix; 140 or consent of instructor.

3 units, not given this year

CS 240E. Low Power Wireless System Software—The structure and implementation of software systems for low power embedded sensors; how to build software that can run unattended for years on small batteries. Topics: hardware trends, energy profiles, execution models, aggregation, storage, application requirements, allocation, power management, resource management, scheduling, time synchronization, programming models, software design, and fault tolerance. Students build working systems on TinyOS, a low-power embedded operation system.

3 units, not given this year

CS 240X. Advanced Operating Systems II—Same content as 240, with expanded topics focusing on more difficult and specialized papers. Recent topics in systems research.

3 units, not given this year

CS 242. Programming Languages—Central concepts in modern programming languages, impact on software development, language design trade-offs, and implementation considerations. Functional, imperative, and object-oriented paradigms. Formal semantic methods and program analysis. Modern type systems, higher order functions and closures, exceptions and continuations. Modularity, object-oriented languages, and concurrency. Runtime support for language features, interoperability, and security issues. Prerequisite: 107, or experience with Lisp, C, and an object-oriented language.

3 units, Aut (Mitchell, J)

CS 243. Advanced Compiling Techniques—The theoretical and practical aspects of building modem compilers. Topics: program optimizations including data flow analysis, instruction scheduling, register allocation, loop transforms for data locality and parallelism, interprocedural analysis, and garbage collection. Prerequisite: 143 or equivalent.

3-4 units, Win (Lam, M)

CS 244A. Introduction to Computer Networks—Only one of 144 or 244A counts towards any CS degree program. Packet switching; the Internet architecture; routing; router architecture; flow control algorithms; retransmission algorithms; congestion control, TCP/IP; detecting and recovering from errors; switching; Ethernet (wired and wireless) and local area networks; physical layers; clocking and synchronization. Assignments introduce network programming, including sockets, designing a router and implementing a transport layer. EE 284 is an alternate class, with less emphasis on programming; students may not take both EE 284 and CS 244A. Prerequisite: 140 or equivalent.

3-4 units, Win (McKeown, N)

CS 244B. Distributed Systems—Distributed operating systems and applications issues, emphasizing high-level protocols and distributed state sharing as the key technologies. Topics: distributed shared memory, object-oriented distributed system design, distributed directory services, atomic transactions and time synchronization, application-sufficient consistency, file access, process scheduling, process migration, and storage/communication abstractions on distribution, scale, robustness in the face of failure, and security. Prerequisite: 249A. Corequisite: 244A.

3 units, Spr (Cheriton, D)

CS 244C. Distributed Systems Project—Companion project option for 244B. Corequisite: 244B.

3-6 units, Spr (Cheriton,D)

CS 244E. Low Power Wireless Networking—Challenges of low power wireless networking protocols and applications. Topics: the OSI model, 802.11, Bluetooth, 802.15.4, Zigbee, 6lowpan, hardware considerations, traffic patterns, media access (CSMA, TDMA, RTS/CTS, idle listening), DSSS, UWB, radio propagation models, cross-layer interactions, flooding, dissemination, gossip, epidemics, probabilistic approaches, global versus local communication, and in-network processing. Students read papers and build working protocols on TinyOS, a low-power embedded operating system.

3 units, not given this year

CS 245. Database Systems Principles—File organization and access, buffer management, performance analysis, and storage management. Database system architecture, query optimization, transaction management, recovery, concurrency control. Reliability, protection, and integrity. Design and management issues. Prerequisites: 145, 161.

3 units, Win (Garcia-Molina, H)

CS 247. Human-Computer Interaction Design Studio—Project-based. Methods used in interaction design including needs analysis, user observation, idea sketching, concept generation, scenario building, storyboards, user character stereotypes, usability analysis, and market strategies. Prerequisites: 147 and 106A or equivalent background in programming.

3-4 units, Win (Winograd, T; Verplank, W)

CS 247L. Human Computer Interaction Technology Laboratory—Hands-on introduction to contemporary HCI technologies. Interaction design with Adobe Flash, mobile development, physical computing, and web applications. Corequisite: 247.

1 unit, Win (Winograd, T)

CS 248. Introduction to Computer Graphics—(Only one of 148 or 248 counts towards any CS degree program.) Input and display devices, scan conversion of geometric primitives, 2D and 3D geometric transformations, clipping and windowing, scene modeling and animation, algorithms for visible surface determination, local and global shading models, color, and real-time rendering methods. Written assignments and programming projects. Prerequisites: 108, MATH 103 or equivalent.

3-5 units, Aut (Akeley, K)

CS 249A. Object-Oriented Programming: A Modeling and Simulation Perspective—Large-scale software development approaches, encapsulation, use of inheritance and dynamic dispatch, design of interfaces and interface/implementation separation, exception handling, design patterns, minimalizing dependencies, and value-oriented programming. Role of programming conventions/style/restrictions in surviving object-oriented programming for class libraries, frameworks, and programming-in-the-large; general techniques for object-oriented programming. Prerequisites: C, C++, and programming methodology as developed in 106B or X, and 107 (107 may be taken concurrently). Recommended: 193D.

3 units, Aut (Cheriton, D)

CS 249B. Advanced Object-Oriented Programming—How to produce reasonable-cost, high quality software such as next-stage, large-scale systems that handle life-critical systems. Software process, people, practice, and audit: integrating invariant checks with production software; collection implementation; generic programming and templates; design of value types; named descriptions for large value types; memory management; controlling placement; locality and consumption; concurrency with modular object-oriented programming. Inheritance: when and why multiple inheritance naming, directories, manager, and other design patterns.

3 units, Win (Cheriton, D)

CS 255. Introduction to Cryptography—For advanced undergraduates and graduate students. Theory and practice of cryptographic techniques used in computer security. Topics: encryption (single and double key), digital signatures, pseudo-random bit generation, authentication, electronic commerce (anonymous cash, micropayments), key management, PKI, zero-knowledge protocols. Prerequisite: basic probability theory.

3 units, Win (Boneh, D)

CS 256. Formal Methods for Reactive Systems—Formal methods for specification, verification, and development of concurrent and reactive programs. Reactive systems: syntax and semantics, fairness requirements. Specification language: temporal formulas (state, future, and past) and omega-automata. Hierarchy of program properties: safety, guarantee, obligation, response, persistence, and reactivity. Invariant generation. Deductive verification of programs: verification diagrams and rules, completeness. Modularity. Parameterized programs. Algorithmic verification of finite-state programs (model checking). Prerequisite: 154, 156, 157, or equivalent.

3 units, Spr (Manna, Z)

CS 256L. Formal Methods for Reactive Systems Laboratory—Practical application of the specification and verification methods in 256. Individual projects include implementation of verification methods, verification case studies, or tool evaluation, depending on student preference.

2 units, Spr (Manna, Z)

CS 258. Introduction to Programming Language Theory—Syntactic, operational, and semantic issues in the mathematical analysis of programming languages. Type systems and non-context-free syntax. Universal algebra and algebraic data types. Operational semantics given by rewrite rules; confluence and termination. Denotational semantics and elementary domain theory for languages with higher-type functions and recursion. Treatment of side effects. Prerequisites: 154, 157 or PHIL 160A.

3 units, not given this year

CS 259. Topics in Theoretical Computer Science—Hands-on experience in formal methods to verify and evaluate the security of network protocols and other systems. Common security protocols and their properties including secrecy, authentication, key establishment, and fairness. Topics: standard formal models and tools used in security protocol analysis; their advantages and limitations. Fully automated, finite-state, model-checking techniques. Constraint solving, process algebras, protocol logics, probabilistic model checking, and game theory. Students select a protocol or secure system to analyze, specify it in the chosen model, use a formal analysis tool to verify its properties, and present findings.

3 units, Win (Mitchell, J)

CS 261. Optimization and Algorithmic Paradigms—Algorithms for network optimization: max-flow, min-cost flow, matching, assignment, and min-cut problems. Introduction to linear programming. Use of LP duality for design and analysis of algorithms. Approximation algorithms for NP-complete problems such as Steiner Trees, Traveling Salesman, and scheduling problems. Randomized algorithms. Introduction to online algorithms. Prerequisite: 161 or equivalent.
3 units, Win (Plotkin, S)

CS 262. Computational Genomics—(Same as BIOMEDIN 262.) Applications of computer science to genomics, and concepts in genomics from a computer science point of view. Topics: dynamic programming, sequence alignments, hidden Markov models, Gibbs sampling, and probabilistic context-free grammars. Applications of these tools to sequence analysis: comparative genomics, DNA sequencing and assembly, genomic annotation of repeats, genes, and regulatory sequences, microarrays and gene expression, phylogeny and molecular evolution, and RNA structure. Prerequisites: 161 or familiarity with basic algorithmic concepts. Recommended: basic knowledge of genetics.
3 units, Win (Batzoglou, S)

CS 268. Geometric Algorithms—Techniques for design and analysis of efficient geometric algorithms for objects in 2-, 3-, and higher dimensions. Topics: convexity, triangulations, sweeping, partitioning, and point location. Voronoi/Delaunay diagrams and their properties. Arrangements of curves and surfaces. Intersection and visibility problems. Geometric searching and optimization. Random sampling methods. Impact of numerical issues in geometric computation. Example applications to robotic motion planning, visibility preprocessing and rendering in graphics, model-based recognition in computer vision, and structural molecular biology. Prerequisite: discrete algorithms at the level of 161.
3 units, Spr (Staff)

CS 270. Introduction to Biomedical Informatics: Fundamental Methods—(Same as BIOMEDIN 210.) Methods for modeling biomedical systems and for making those models explicit in the context of building software systems. Emphasis is on intelligent systems for decision support. Topics: knowledge representation, controlled terminologies, ontologies, reusable problem solvers, and knowledge acquisition. Recommended: exposure to object-oriented systems, basic knowledge of biology.
3 units, Aut (Musen, M)

CS 271. Introduction to Biomedical Informatics: Biomedical Systems Engineering—(Same as BIOMEDIN 211.) Focus is on undertaking design and implementation of computational and information systems for life scientists and healthcare providers. Case studies illustrate what design factors lead to success or failure in building systems in complex biomedical environments. Topics: requirements analysis, workflow and organizational factors, functional specification, knowledge modeling, data heterogeneity, component-based architectures, human-computer interaction, and system evaluation. Prerequisite: 210, or consent of instructor.
3 units, Win (Das, A; Islam, R; Levy, M)

CS 272. Introduction to Biomedical Informatics Research Methodology—(Same as BIOE 212, BIOMEDIN 212, GENE 212.) Hands-on software building. Student teams conceive, design, specify, implement, evaluate, and report on a software project in the domain of biomedicine. Creating written proposals, peer review, providing status reports, and preparing final reports. Guest lectures from professional biomedical informatics systems builders on issues related to the process of project management. Software engineering basics. Prerequisites: 210, 211 or 214, or consent of instructor.
3 units, Aut (Altman, R; Cheng, B; Klein, T)

CS 273A. A Computational Tour of the Human Genome—(Same as BIOMEDIN 273A, DBIO 273A.) Genomes as the ultimate biological information medium, carrying instructions for every organism's development, life cycle, and reproduction. Bioinformatics perspective. Advances in biology resulting from sequencing of human and related organisms. Genome sequencing: technologies, assembly, personalized sequencing. Functional landscape: genes, regulatory modules, repeats, RNA genes. Genome evolution: processes, comparative genomics, ultraconservation, exaptation. Topics may include population genetics and personalized genomics, ancient DNA, and metagenomics. Prerequisities: computational biology at the level of 262, 274, or BIOC 218.
3 units, Aut (Batzoglou, S; Bejerano, G)

CS 274. Representations and Algorithms for Computational Molecular Biology—(Same as BIOE 214, BIOMEDIN 214, GENE 214.) Topics: algorithms for alignment of biological sequences and structures, computing with strings, phylogenetic tree construction, hidden Markov models, computing with networks of genes, basic structural computations on proteins, protein structure prediction, protein threading techniques, homology modeling, molecular dynamics and energy minimization, statistical analysis of 3D biological data, integration of data sources, knowledge representation and controlled terminologies for molecular biology, graphical display of biological data, and machine learning (clustering and classification), and natural language text processing. Consent of instructor required for 3 units. Prerequisites: programming skills, interest in biology.
3-4 units, Spr (Altman, R)

CS 275. Translational Bioinformatics—(Same as BIOMEDIN 217.) Analytic, storage, and interpretive methods to optimize the transformation of genetic, genomic, and biological data into diagnostics and therapeutics for medicine. Topics: access and utility of publicly available data sources; types of genome-scale measurements in molecular biology and genomic medicine; analysis of microarray data; analysis of polymorphisms, proteomics, and protein interactions; linking genome-scale data to clinical data and phenotypes; and new questions in biomedicine using bioinformatics. Case studies. Prerequisites: programming ability at the level of CS 106A and familiarity with statistics and biology.
4 units, Win (Butte, A; Hillenmeyer, M; Southworth, L)

CS 276. Text Retrieval and Web Search—Text information retrieval systems; efficient text indexing; Boolean, vector space, and probabilistic retrieval models; ranking and rank aggregation; evaluating IR systems. Text clustering and classification: classification algorithms, latent semantic indexing, taxonomy induction, cluster labeling; Web search engines including crawling and indexing, link-based algorithms, and web metadata.
3 units, not given this year

CS 277. Experimental Haptics—Haptics as it relates to creating touch feedback in simulated or virtualized environments. Goal is to develop virtual reality haptic simulators and applications. Theoretical topics: psychophysical issues, performance and design of haptic interfaces, haptic rendering methods for 3-D virtual environments, and haptic simulation and rendering of rigid and deformable solids. Applied topics: the CHAI haptic library; implementation of haptic rendering algorithms; collision detection in 3-D environments; design of real-time models for deformable objects. Guest speakers. Lab/programming exercises; a more open-ended final project. Enrollment limited to 20. Prerequisite: experience with C++. Recommended: 148 or 248, 223A.
3 units, Spr (Salisbury, K)

CS 278. Introduction to Systems Biology—(Same as CSB 278.) For biologists, engineers, and computer scientists. Experimental and computational approaches to modeling and analysis of complex biological systems. Topics: biological noise; simple signaling circuits (cascades, feedback, and feed-forward circuits); bistability and oscillations; large scale models; synthetic biology; and analysis of omics-scale data sets. Computational approaches include ODE modeling, stochastic simulation, Boolean networks, Bayesian approaches, and hybrid modeling.
4 units, Spr (Dill, D; Brutlag, D; Koller, D; Covert, M; Ferrell, J)

CS 279. Computational Methods for Analysis and Reconstruction of Biological Networks—Types of interactions, including: regulatory such as transcriptional, signaling, and chromatin modification; protein-protein interactions; and genetic. Biological network structure at scales such as single interaction, small subgraphs, and global organization. Methods for analyzing properties of biological networks. Techniques for reconstructing networks from biological data, including: DNA/protein sequence motifs and sequence conservation; gene expression data; and physical binding data such as protein-DNA, protein-RNA, and protein-protein. Network dynamics and evolution. Prerequisites: biology at the level of BIOSCI 41; computer science and data structures at the level of CS 103 and 106; and probability and statistics at the level of STATS 116.

3 units, not given this year

CS 294. Research Project in Computer Science—Student teams work under faculty supervision on research and implementation of a large project in some major sub-discipline in computer science. Lectures on state-of-the-art methods related to the particular problem domain. Prerequisites: consent of instructor.

CS 294A. Research Project in Artificial Intelligence—Student teams under faculty supervision work on research and implementation of a large project in AI. State-of-the-art methods related to the problem domain. Prerequisites: AI course from 220 series, and consent of instructor.

3 units, Win (Ng, A), Spr (Koller, D)

CS 294W. Writing Intensive Research Project in Computer Science—Restricted to Computer Science and Computer Systems Engineering undergraduates. Students enroll in the CS 294W section attached to the CS 294 project they have chosen. WIM`

3 units, Win (Ng, A), Spr (Koller, D)

CS 295. Software Engineering—Software specification, testing, and verification. Emphasis is on current best practices and technology for developing reliable software at reasonable cost. Assignments focus on applying these techniques to realistic software systems. Prerequisites: 108. Recommended a project course such as 140, 143, or 145.

2-3 units, Spr (Engler, D)

CS 298. Seminar on Teaching Introductory Computer Science—Faculty, undergraduates, and graduate students interested in teaching discuss topics raised by teaching computer science at the introductory level. Prerequisite: consent of instructor.

1-3 units, not given this year

PRIMARILY FOR GRADUATE STUDENTS

CS 300. Departmental Lecture Series—For first-year Computer Science Ph.D. students. Presentations by members of the department faculty, each describing informally his or her current research interests and views of computer science as a whole.

1 unit, Aut (Motwani, R)

CS 309. Industrial Lectureships in Computer Science—Guest computer scientist. By arrangement. May be repeated for credit.

CS 309A. Software as a Service—For technology and business students. The shift from traditional software model of disconnected development and CD-ROM deployment to engineering and delivery on the Internet as a service. Guest industry experts give first-hand view of changes in the software industry.

1 unit, Aut (Chou, T)

CS 315A. Parallel Computer Architecture and Programming—The principles and tradeoffs in the design of parallel architectures. Emphasis is on naming, latency, bandwidth, and synchronization in parallel machines. Case studies on shared memory, message passing, data flow, and data parallel machines illustrate techniques. Architectural studies and lectures on techniques for programming parallel computers. Programming assignments on one or more commercial multiprocessors. Prerequisites: EE 282, and reasonable programming experience.

3 units, Win (Olukotun, O)

CS 315B. Parallel Computing Research Project—Advanced topics and new paradigms in parallel computing including parallel algorithms, programming languages, runtime environments, library debugging/tuning tools, and scalable architectures. Research project. Prerequisite: consent of instructor.

3 units, not given this year

CS 319. Topics in Digital Systems—Advanced material is often taught for the first time as a topics course, perhaps by a faculty member visiting from another institution. May be repeated for credit.

3 units, offered occasionally

CS 321. Information Processing for Sensor Networks—Design and implementation of algorithms and protocols for performing information processing tasks in sensor networks, including routing, data dissemination and aggregation, information discovery and brokerage, service establishment (localization, time synchronization), sensor tasking and control, and distributed data storage. Techniques from signal processing, networking, energy-ware computing, distributed databases and algorithms, and embedded systems and platforms. Physical, networking, and application layers and design trade-offs across the layers. Prerequisites: linear algebra and elementary probability, networking background at the level of 244A or EE 284.

3 units, Aut (Guibas, L)

CS 326A. Motion Planning—Computing object motions in computer graphics, geometrical computing, robotics, or artificial intelligence for applications such as design, manufacturing, robotics, animated graphics, surgical planning, drug design, assembly planning, graphic animation of human figures, humanoid robots, inspection and surveillance, simulation of crowds, and biology. Path planning methods to generate collision-free paths among static obstacles. Extensions include uncertainty, mobile obstacles, manipulating moveable objects, maneuvering with kinematic constraints, and making and breaking contacts. Configuration space, geometric arrangements, and random sampling. Theoretical methods.

3 units, Aut (Latombe, J)

CS 327A. Advanced Robotics—Emerging areas of human-centered robotics and interactive haptic simulation of virtual environments. Topics: redundancy, task-oriented dynamics and control, whole-body control-task and posture decomposition, cooperative robots, haptics and simulation, haptically augmented teleoperation, human-friendly robot design. Prerequisites: 223A or equivalent.

3 units, Spr (Khatib, O)

CS 329. Topics in Artificial Intelligence—Advanced material is often taught for the first time as a topics course, perhaps by a faculty member visiting from another institution. May be repeated for credit.

3 units, offered occasionally

CS 339. Topics in Numerical Analysis—Advanced material is often taught for the first time as a topics course, perhaps by a faculty member visiting from another institution. May be repeated for credit.

3 units, offered occasionally

CS 343. Advanced Topics in Compilers—Topics change every quarter. May be repeated for credit. Prerequisite: 243.

3 units, Spr (Lam, M)

CS 344. Projects in Computer Networks—Router implementation. A hardware and software student are paired to develop a functional Internet router. Course ends with open-ended design challenge judged by panel of expert network designers from industry. Prerequisites: 244A or network programming experience. Recommended: for those interested in hardware design, background in VHDL or Verilog; for those interested in software, C.

3 units, Spr (McKeown, N)

CS 344B. Advanced Topics in Distributed Systems—Continuation of 244B. The use of distributed systems research in practical systems. New applications due to the growth in high-bandwidth connections. Distributed systems knowledge and techniques from research and system implementations, and active research topics. Readings include research publications.

2 units, not given this year

CS 344E. Sensor Network Systems—(Formerly 344A.) Systems and networking research in wireless sensor networks; work from other areas such as databases. Topics include energy budgets, communication scheduling, application domains, protocols, technological trends, programming models, and fault tolerance. Students implement working systems on TinyOS, a sensor node OS.

3 units, Spr (Levis, P)

CS 345. Advanced Topics in Database Systems—Content varies. May be repeated for credit with instructor consent. Prerequisite: 145. Recommended: 245.

CS 345A. Data Mining—Algorithms for mining large-scale data, including data from the web and data maintained by web-based enterprises. Finding frequent itemsets and correlated items; web crawling; finding important web pages; link-spam detection; collaborative filtering; stream mining; clustering; optimizing ad selection; and virtual databases and extraction of relations from the web.

3 units, Win (Ullman, J; Rajaraman, A)

CS 345C. Data Integration—Techniques for integrating data from multiple heterogeneous data sources. Topics: semantic heterogeneity; languages for mediating between disparate data sources; techniques for automatic schema reconciliation and reference reconciliation; adaptive query processing; basics of XML and its relevance to data integration; peer-to-peer data sharing data exchange; combining structured and unstructured data; and dataspaces. Recommended: 145.

3 units, Spr (Halevy, A)

CS 346. Database System Implementation—A major database system implementation project realizes the principles and techniques covered in earlier courses. Students independently build a complete database management system, from file structures through query processing, with a personally designed feature or extension. Lectures on project details and advanced techniques in database system implementation, focusing on query processing and optimization. Guest speakers from industry on commercial DBMS implementation techniques. Prerequisites: 145, 245, programming experience in C++.

3-5 units, not given this year

CS 347. Transaction Processing and Distributed Databases—The principles and system organization of distributed databases. Data fragmentation and distribution, distributed database design, query processing and optimization, distributed concurrency control, reliability and commit protocols, and replicated data management. Distributed algorithms for data management: clocks, deadlock detection, and mutual exclusion. Heterogeneous and federated distributed database systems. Overview of commercial systems and research prototypes. Prerequisites: 145, 245.

3 units, Spr (Garcia-Molina, H)

CS 348A. Computer Graphics: Geometric Modeling—The mathematical tools needed for the geometrical aspects of computer graphics and especially for modeling smooth shapes. Fundamentals: homogeneous coordinates, transformations, and perspective. Theory of parametric and implicit curve and surface models: polar forms, Bezier arcs and de Casteljau subdivision, continuity constraints, B-splines, tensor product, and triangular patch surfaces. Subdivision surfaces and multiresolution representations of geometry. Representations of solids and conversions among them. Surface reconstruction from scattered data points. Geometry processing on meshes, including simplification. Prerequisite: linear algebra.

3-4 units, Win (Guibas, L)

CS 348B. Computer Graphics: Image Synthesis Techniques—Intermediate level, emphasizing the sampling, shading, and display aspects of computer graphics. Topics: local and global illumination methods including radiosity and distributed ray tracing, texture generation and rendering, volume rendering, strategies for anti-aliasing and photo-realism, human vision and color science as they relate to computer displays, and high-performance architectures for graphics. Written assignments and programming projects. Prerequisite: 248 or equivalent. Recommended: Fourier analysis or digital signal processing.

3-4 units, Spr (Hanrahan, P)

CS 349. Topics in Programming Systems—Advanced material is often taught for the first time as a topics course, perhaps by a faculty member visiting from another institution. May be repeated for credit.

3 units, offered occasionally

CS 355. Advanced Topics in Cryptography—Topics: pseudo-random generation, zero knowledge protocols, elliptic curve systems, threshold cryptography, security analysis using random oracles, lower and upper bounds on factoring and discrete log. May be repeated for credit. Prerequisite: 255.

3 units, Aut (Boneh, D)

CS 357. Advanced Topics in Formal Methods—Topics vary annually. Possible topics include automata on infinite words, static analysis methods, runtime analysis methods, verification of real-time and hybrid systems, formalization of middleware services. May be repeated for credit. Prerequisite: 256.

3 units, offered occasionally

CS 358. Topics in Programming Language Theory—Topics of current research interest in the mathematical analysis of programming languages, structured operational semantics, domain theory, semantics of concurrency, rich type disciplines, problems of representation independence, and full abstraction. May be repeated for credit. Prerequisites: 154, 157, 258, or equivalents.

3 units, offered occasionally

CS 359. Topics in the Theory of Computation—Advanced material is often taught for the first time as a topics course, perhaps by a faculty member visiting from another institution. May be repeated for credit.

3 units, offered occasionally

CS 361A. Advanced Algorithms—Advanced data structures: union-find, self-adjusting data structures and amortized analysis, dynamic trees, Fibonacci heaps, universal hash function and sparse hash tables, persistent data structures. Advanced combinatorial algorithms: algebraic (matrix and polynomial) algorithms, number theoretic algorithms, group theoretic algorithms and graph isomorphism, online algorithms and competitive analysis, strings and pattern matching, heuristic and probabilistic analysis (TSP, satisfiability, cliques, colorings), local search algorithms. May be repeated for credit. Prerequisite: 161 or 261, or equivalent.

3 units, not given this year

CS 361B. Advanced Algorithms—Topics: fundamental techniques used in the development of exact and approximate algorithms for combinational optimization problems such as generalized flow, multicommodity flow, sparsest cuts, generalized Steiner trees, load balancing, and scheduling. Using linear programming, emphasis is on LP duality for design and analysis of approximation algorithms; interior point methods for LP. Techniques for development of strongly polynomial algorithms.

3 units, Spr (Plotkin, S)

CS 364A. Game Theory in the Internet—Topics at the interface of theoretical computer science and game theory such as: algorithmic mechanism design; combinatorial and competitive auctions; congestion and potential games; cost sharing; existence, computation, and learning of equilibria; Internet game theory; network games; price of anarchy and stability; pricing; and selfish routing. Minimal overlap with 224M and 324. Prerequisites: 154N and 161, or equivalents.

3 units, not given this year

CS 364B. Foundations of Sponsored Search—Further exploration of topics from 364A. Students work on a research problem related to the course. May be taken prior to 364A; may be repeated for credit. Prerequisites: 154N and 161, or equivalents.

3 units, Aut (Roughgarden, T)

CS 365. Randomized Algorithms—Design and analysis of algorithms that use randomness to guide their computations. Basic tools, from probability theory and probabilistic analysis, that are recurrent in algorithmic applications. Randomized complexity theory and game-theoretic techniques. Algebraic techniques. Probability amplification and derandomization. Applications: sorting and searching, data structures, combinatorial optimization and graph algorithms, geometric algorithms and linear programming, approximation and counting problems, parallel and distributed algorithms, online algorithms, number-theoretic algorithms. Prerequisites: 161 or 261, STATS 116, or equivalents.

3 units, Aut (Motwani, R)

CS 369. Topics in Analysis of Algorithms—Advanced material is often taught for the first time as a topics course, perhaps by a faculty member visiting from another institution. May be repeated for credit.

CS 369B. Advanced Graph Algorithms—Fast algorithms for graph optimization problems, including maximum flow, minimum s-t and global cuts, minimum spanning trees, nonbipartite matching, planar separators and applications, and shortest paths. Data structures including Fibonacci heaps, splay trees, and dynamic trees. Tools from linear programming, matroid theory, minmax theorems, polytope theory, and random sampling. Pre- or corequisite: 261 or equivalent.

3 units, Win (Roughgarden, T)

CS 374. Algorithms in Biology—(Same as BIOMEDIN 374.) Algorithms and computational models applied to molecular biology and genetics. Topics vary annually. Possible topics include biological sequence comparison, annotation of genes and other functional elements, molecular evolution, genome rearrangements, microarrays and gene regulation, protein folding and classification, molecular docking, RNA secondary structure, DNA computing, and self-assembly. May be repeated for credit. Prerequisites: 161, 262 or 274, or BIOCHEM 218, or equivalents.

2-3 units, Spr (Batzoglou, S)

CS 376. Research Topics in Human-Computer Interaction—Interactive systems, research areas in interaction techniques, and the design, prototyping, and evaluation of user interfaces. Topics: computer-supported cooperative work; audio, speech, and multimodal interfaces; user interface toolkits; design and evaluation methods; ubiquitous and context-aware computing; tangible interfaces, haptic interaction; and mobile interfaces.

3 units, Spr (Klemmer, S)

CS 377. Topics in Human-Computer Interaction—Contents change each quarter. May be repeated for credit. See http://hci.stanford.edu/academics for offerings.

CS 377A. Introduction to Cybernetics and the Design of Systems—Application of cybernetics to designing complex interactive systems, modeling human-computer interaction, and managing design processes for physical, virtual, social, or hybrid systems. Software applications and web services; environments for learning, business, and government; and collaboration systems for work or play. History and principles of cybernetics relative to CS and AI. Technical background not required.

3 units, Aut (Dubberly, H; Pangaro, P)

CS 377S. Designing Applications that See—Computer vision and image processing from an interaction design standpoint; application to challenges in human-computer interaction. How these methods can be used in real systems; how to use existing computer vision tools and libraries. Recommended: some programming experience.

3 units, Win (Maynes-Aminzade, D)

CS 378. Phenomenological Foundations of Cognition, Language, and Computation—Critical analysis of theoretical foundations of the cognitive approach to language, thought, and computation. Contrasts of the rationalistic assumptions of current linguistics and artificial intelligence with alternatives from phenomenology, theoretical biology, critical literary theory, and socially-oriented speech act theory. Emphasis is on the relevance of theoretical orientation to the design, implementation, and impact of computer systems as it affects human-computer interaction.

3-4 units, alternate years, not given this year

CS 379. Interdisciplinary Topics—Advanced material is often taught for the first time as a topics course, perhaps by a faculty member visiting from another institution. May be repeated for credit.

CS 379D. Computer Vision and Image Analysis in the Study of Art—Application of algorithms including to computer vision, image analysis, and two-dimensional Western art such as paintings, drawings, and etchings. Topics: multispectral image enhancement and color manipulation; geometric perspective and warped (anamorphic) perspective; visual metrology; view synthesis; statistical analysis of form; texture and brushstrokes; and shape-from-shading. These techniques, pattern classification, statistical estimation methods, and stylometry (quantification of artistic style) address art historical problems such as attribution, authentication, and dating to reveal artists' working methods.

3 units, Spr (Stork, D)

CS 379Y. Interdisciplinary Design for Agile Aging—(Same as HUMBIO 131, MED 279Y.) First of two quarter sequence; students may take 379Y without 379Z; offered by the d.school. Perspectives from computer science, design, social and behavioral sciences, physiology, geriatrics, and biodesign to develop projects that address the potential of people to maintain vitality and mobility as they age. New ways to integrate computer and device technologies with behavioral and social interventions. Focus is on small projects. Prerequisite: background in one of design, computing, medicine, behavioral sciences, communications, or business.

3-4 units, Win (Winograd, T; Winograd, C; Friedlander, A; Yock, P)

CS 379Z. Design Project for Agile Aging—(Same as MED 279Z.) Second of two quarter sequence; students may take 379Y without 379Z; offered by the d.school. Small teams develop projects that can have an impact in the world through products, programs, and practices that affect people's health on a broad scale. Technical interventions, social and contextual design, organizational contexts, and business and distribution issues. Limited enrollment. Prerequisites: CS379Y, and master's level skills in one of design, computing, medicine, behavioral sciences, communications, or business.

3-4 units, Spr (Winograd, T; Winograd, C; Friedlander, A; Yock, P)

CS 390A,B,C. Curricular Practical Training—Educational opportunities in high technology research and development labs in the computing industry. Qualified computer science students engage in internship work and integrate that work into their academic program. Students register during the quarter they are employed and complete a research report outlining their work activity, problems investigated, results, and follow-on projects they expect to perform. 390 A, B, and C may each be taken once.

1 unit, Aut, Win, Spr, Sum (Staff)

CS 393. Computer Laboratory—For CS graduate students. A substantial computer program is designed and implemented; written report required. Recommended as a preparation for dissertation research. Register using the section number associated with the instructor. Prerequisite: consent of instructor.

1-9 units, Aut, Win, Spr, Sum (Staff)

CS 395. Independent Database Project—For graduate students in Computer Science. Use of database management or file systems for a substantial application or implementation of components of database management system. Written analysis and evaluation required. Register using the section number associated with the instructor. Prerequisite: consent of instructor.

1-6 units, Aut, Win, Spr, Sum (Staff)

CS 399. Independent Project—Letter grade only.

1-9 units, Aut, Win, Spr, Sum (Staff)

CS 399P. Independent Project—Graded satisfactory/no credit.

1-9 units, Aut, Win, Spr, Sum (Staff)

EXPERIMENTAL

CS 400. Future Faculty Seminar—How to enter and succeed in academia. Topics vary from year to year and may include the academic job search, time management for new faculty, grant writing, finding and advising students, designing courses, planning and delivering lectures, the service role of faculty, and the tenure process.
1 unit, Spr (Dally, W; Klingner, J; Beberg, A)

CS 447. Interdisciplinary Interaction Design—(Same as ME 325.) Small teams develop technology prototypes combining product and interaction design. Focus is on software and hardware interfaces, interaction, design aesthetics, and underpinnings of successful design including a reflective, interactive design process, group dynamics of interdisciplinary teamwork, and working with users. Prerequisite: CS 247A.
3-4 units, alternate years, not given this year

CS 448. Topics in Computer Graphics—Topic changes each quarter. Recent topics: exotic input and display technologies, graphics architectures, advanced rendering techniques, modeling shape and motion, data visualization, and computational photography. See http://graphics.stanford.edu/courses for offerings. May be repeated for credit. Prerequisite: 248 or consent of instructor.
3-4 units, Aut (Koltun, V)

CS 448A. Computational Photography—Capabilities unique to digital cameras. Sensors; in-camera processing systems; the ability to refocus photographs after they are taken or to combine views taken with different camera settings, aim, or placement. New technologies for creating efficient, controllable illumination such as pulsed LEDs or video projectors; the ability to selectively illuminate objects, recolor a scene, or extract shape information. How these developments relax notions of what constitutes a photograph, blur the distinction between photography and scene modeling, and lead to new photographic techniques, scientific tools, and art forms.
3-4 units, Spr (Levoy)

CS 448B. Topics in Computer Graphics—Topic changes each quarter. Recent topics: exotic input and display technologies, graphics architecures, advanced rendering techniques, modeling shape and motion, data visualization, and computational photography. See http://graphics.stanford.edu/courses/ for current offerings
1-3 units, Spr (Hanrahan)

CS 468. Topics in Geometric Algorithms—Recent offerings include: shape matching, proximity and nearest-neighbor problems, visibility and motion planning, collision detection, geometric sampling methods, shape interpolation, and computational topology. May be repeated for credit. Prerequisite: 268, 368, or consent of instructor.
3 units, Win (Koltun, V)

CS 499. Advanced Reading and Research—For CS graduate students. Register using the section number associated with the instructor. Prerequisite: consent of instructor.
1-15 units, Aut, Win, Spr, Sum (Staff)

GRADUATE SEMINARS

CS 528. Broad Area Colloquium for Artificial Intelligence, Geometry, Graphics, Robotics, and Vision—Weekly series of informal research talks on topics related to perceiving, modeling, manipulating, and displaying the physical world. The computational models and numerical methods underlying these topics. May be repeated for credit.
1 unit, Aut, Spr (Staff)

CS 531. Numerical Analysis/Scientific Computing Seminar—Weekly research lectures by experts from academia, national laboratories, industry, and doctoral students. May be repeated for credit.
1 unit, not given this year

CS 541. Clean Slate Internet Research Seminar—Solving Internet deficiences. Focus is on unconventional, bold, and long-term research that tries to break the network's ossification. Given what is known today, how would a newly designed global communications infrastructure work? How should the Internet look in 15 years? Weekly speakers describe new work or propose new problems.
1 unit, not given this year

CS 545. Database and Information Management Seminar—Current research and industrial innovation in database and information systems.
1 unit, Win (Garcia-Molina, H)

CS 547. Human-Computer Interaction Seminar—Weekly speakers. May be repeated for credit.
1 unit, Aut (Klemmer, S), Win, Spr (Winograd, T)

CS 548. Internet and Distributed Systems Seminar—Guest speakers from academia and industry. May be repeated for credit.
1 unit, not given this year

COGNATE COURSES

CHEMENG 459. Frontiers in Interdisciplinary Biosciences—(Same as BIOC 459, BIOE 459, BIOSCI 459, CHEM 459, PSYCH 459.)
1 unit, Aut, Win, Spr (Robertson, C)

CME 108. Introduction to Scientific Computing
3-4 units, Win (Staff), Sum (Lambers, J)

CME 302. Numerical Linear Algebra
3 units, Aut (Golub, G)

CME 306. Numerical Solution of Partial Differential Equations
3 units, Spr (Farhat, C)

CME 324. Advanced Methods in Matrix Computation: Iterative Methods
3 units, not given this year

CME 326. Numerical Methods for Initial Boundary Value Problems
3 units, not given this year

CME 342. Parallel Methods in Numerical Analysis
3 units, Spr (Staff)

CME 352. Molecular Algorithms
3 units, Win (Goel, A)

CME 500. Numerical Analysis and Computational and Mathematical Engineering Seminar
1 unit, Aut, Win, Spr (Staff)

COMM 107/207. The First Amendment in the Digital Age
4-5 units, Spr (Noveck, B)

EE 282. Computer Systems Architecture
3 units, Aut (Kozyrakis, C)

EE 380. Seminar on Computer Systems
1 unit, Aut, Win, Spr, Sum (Allison, D; Long, E)

EE 382A. Advanced Processor Architecture
3 units, Spr (Kozyrakis, C)

EE 385A. Digital Systems Reliability Seminar
1-4 units, Aut, Win, Spr, Sum (McCluskey, E)

MS&E 319. Approximation Algorithms
3 units, alternate years, not given this year

MS&E 430. Tools for Experience Design
3-4 units, not given this year

MUSIC 253. Musical Information: An Introduction
1-4 units, Win (Selfridge-Field, E)

MUSIC 254. Applications of Musical Information: Query, Analysis, and Style Simulation
1-4 units, Spr (Selfridge-Field, E)

ELECTRICAL ENGINEERING

Emeriti: (Professors) Clayton W. Bates, Ronald N. Bracewell,* Richard Bube, Von R. Eshleman,* Michael J. Flynn,* Gene F. Franklin,* Joseph W. Goodman, Robert A. Helliwell,* Martin E. Hellman, Thomas Kailath,* Gordon S. Kino, John G. Linvill, Albert Macovski,* Laurence A. Manning, Edward J. McCluskey,* Malcolm M. McWhorter, James D. Meindl, Richard H. Pantell,* Anthony E. Siegman, Leonard Tyler,* Alan T. Waterman, Robert L. White; (*Associate Professor*) Bruce B. Lusignan; *(Professors, Research)* Donald L. Carpenter,* Aldo da Rosa,* Antony Fraser-Smith,* C. Robert Helms, Ingolf Lindau, David Luckham, Calvin F. Quate

Chair: Bruce A. Wooley

Vice Chair: Simon Wong

Associate Chair (Admissions): R. Fabian Pease

Assistant Chair: Sharon A. Gerlach

Professors: Nicholas Bambos, Stephen P. Boyd, John M. Cioffi, Thomas M. Cover, Donald C. Cox, William J. Dally, Robert W. Dutton, Abbas El Gamal, Hector Garcia-Molina, Bernd Girod, Andrea G. Goldsmith, Robert M. Gray, Patrick Hanrahan, James S. Harris, Stephen E. Harris, John L. Hennessy, Lambertus Hesselink, Mark A. Horowitz, Roger T. Howe, Umran S. Inan, Joseph M. Kahn, Gregory T. A. Kovacs, Thomas H. Lee, Marc Levoy, Teresa H. Y. Meng, David A. B. Miller, Dwight G. Nishimura, Oyekunle Olukotun, Brad G. Osgood, R. Fabian W. Pease, James D. Plummer, Krishna Saraswat, Fouad A. Tobagi, Shan X. Wang, Jennifer Widom, Bernard Widrow, H. S. Philip Wong, S. Simon Wong, Bruce A. Wooley, Yoshihisa Yamamoto, Howard Zebker

Associate Professors: Dan Boneh, Dawson Engler, Shanhui Fan, John T. Gill III, Nick McKeown, John Pauly, Balaji Prabhakar, Mendel Rosenblum, Olav Solgaard, Sebastian Thrun, Benjamin Van Roy

Assistant Professors: Christoforos E. Kozyrakis, Philip Levis, Subhasish Mitra, Andrea Montanari, Boris Murmann, Peter Peumans, Krishna V. Shenoy, Jelena Vuckovic, Tsachy Weissman

Professors (Research): James F. Gibbons, Leonid Kazovsky, Butrus Khuri-Yakub, Yoshio Nishi, Arogyaswami J. Paulraj, Piero Pianetta

Courtesy Professors: Stacey Bent, John Bravman, David Cheriton, Amir Dembo, David L. Dill, Per Enge, Gary Glover, Peter Glynn, Leonidas Guibas, Monica S. Lam, David G. Luenberger, John C. Mitchell, Sandy Napel, Richard Olshen, Norbert Pelc, Zhi-Xun Shen, Julius Smith, Brian Wandell, Yinyu Ye, Shoucheng Zhang

Courtesy Associate Professors: Kwabena Boahen, Michael McConnell, Daniel Spielman, Claire Tomlin

Courtesy Assistant Professors: Ramesh Johari, Sanjay Lall, Hari Manoharan, David Mazieres, Andrew Ng, Gunter Niemeyer, Amin Saberi

Lecturers: Dennis Allison, Michel Digonnet, Eileen Long, Dieter Scherer, Jason Stinson, Howard Swain

Consulting Professors: David Adler, Ahmad Bahai, Marina Bosi-Goldberg, Nim K. Cheung, Richard Dasher, John Doolittle, Timothy Drabnik, Victor Eliashberg, Abbas Emami-Naeini, Leslie Field, Fred M. Gibbons, Michael Godfrey, Dimitry Gorinevsky, Timothy Groves, Homayoun Hashemi, Richard Hester, Bertrand Hochwald, Bob S. Hu, Theodore Kamins, John Koza, Rajeev Krishnamoorhy, David Leeson, Nadim Maluf, Roger Melen, Martin Morf, Madihally Narasimha, Debajyoti Pal, Yi-Ching Pao, Gurudatta Parulkar, Marcellinus Pelgrom, Bardia Pezeshki, Nirmal Saxena, Ronald Schafer, James Spilker, Jr., Simon Sze, Baylor Triplett, Martin Walt, Yao-Ting Wang, John Wenstrand, Jeffey Wilde

Consulting Associate Professors: Hamid Aghajan, John Apostolopoulos, David Burns, Ludwig Galambos, Nam Jeung Kim, Seongsin Kim, Philippe Lacroute, My. T. Le, Stuart Oberman, Stephen Richardson, David Su, Noel Thompson, Jun Ye, Bin Yu

Consulting Assistant Professors: Robert Candler, Edward Chan, Erik Chmelar, Maria del Mar Hershenson, Ronald Ho, Patrick Hung, Kapur Pawan, Seung Jean Kim, Tejas Krishnamohan, Ravi Narasimhan, Micah Siegel, Mehdi Soltan, Olaf Tornblad, Katelijn Vleugels, Eric Volkerink

Visiting Professors: Chern-Lin Chen, Robert Darling, Hyunsang Hwang, Jae-Hoon Kim, Yo-Sheng Lin, Wing Ching Luk, Jieh-Tsorng Wu

Visiting Associate Professors: David Elata, Yonina Eldar, Li Geng, Shin-Ichi Kobayashi, Heon Lee, John Lockwood, Juan Romero-Jerez

Visiting Assistant Professors: Pierpaolo Baccichet, Baoyong Chi, Markus Flierl, Ofer Levi, Maneesh Sahani

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*recalled to active duty

Mail Code: 94305-9505
Phone: (650) 723-3931; Fax: (650) 723-1882
Web Site: http://ee.stanford.edu/

Courses given in Electrical Engineering have the subject code EE. For a complete list of subject codes, see Appendix.

UNDERGRADUATE PROGRAMS

The mission of the undergraduate program of the Department of Electrical Engineering is to augment the liberal education expected of all Stanford undergraduates and impart a basic understanding of electrical engineering built on a foundation of physical science, mathematics, computing, and technology.

Graduates of the undergraduate program are expected to possess knowledge of the fundamentals of electrical engineering and at least one specialty area. The graduates are expected to have the basic experimental, design, and communication skills to be prepared for continued study at the graduate level or for entry-level positions that require a basic knowledge of electrical engineering, science, and technology.

The educational objectives of the program are:

1. Technical knowledge: provide a basic knowledge of electrical engineering principles along with the required supporting knowledge of computing, engineering fundamentals, mathematics, and science. The program must include depth in at least one specialty area, currently including computer hardware, computer software, controls, circuits, fields and waves, communication and signal processing, and semiconductor and photonic devices.
2. Laboratory and design skills: develop the basic skills needed to perform and design experimental projects. Develop the ability to formulate problems and projects and to plan a process for solution, taking advantage of diverse technical knowledge and skills.
3. Communications skills: develop the ability to organize and present information and to write and speak effective English.
4. Preparation for further study: provide sufficient breadth and depth for successful subsequent graduate study, postgraduate study, or lifelong learning programs.
5. Preparation for the profession: provide an appreciation for the broad spectrum of issues arising in professional practice, including economics, ethics, leadership, professional organizations, safety, service, and teamwork.

To major in Electrical Engineering (EE), undergraduates should follow the depth sequence given in the discussion of undergraduate programs in the "School of Engineering" section of this bulletin. Students are required to have a program planning sheet approved by their adviser and the department prior to the end of the quarter following the quarter in which they declare their major and at least one year prior to graduation. Program sheets for the general EE requirements and for each of the EE specialty sequences may be found at http://ughb.stanford.edu. Majors must receive at least a 2.0 grade point average (GPA) in courses taken for the EE depth requirement; all classes must be taken for a letter grade.

For information about an EE minor, see the "School of Engineering" section of this bulletin.

A Stanford undergraduate may work simultaneously toward the B.S. and M.S. degrees. See "Dual and Coterminal Degree Programs" in the "School of Engineering"section of this bulletin.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

HONORS

The Department of Electrical Engineering offers a program leading to a Bachelor of Science in Electrical Engineering with honors. This program offers a unique opportunity for qualified undergraduate majors to conduct independent study and research at an advanced level with a faculty mentor, graduate students, and fellow undergraduates.

Admission to the honors program is by application. Declared EE majors with a grade point average (GPA) of at least 3.5 in Electrical Engineering are eligible to submit an application. Applications must be submitted by Autumn quarter of the senior year, be signed by the thesis adviser and second reader (one must be a member of the EE Faculty), and include an honors proposal. Students need to declare honors on Axess.

In order to receive departmental honors, students admitted to the honors program must:

1. maintain a grade point average (GPA) of at least 3.5 in EE courses.
2. complete at least 10 units of EE 191 for a letter grade with their project adviser.
3. submit two final copies of the honors thesis approved by the adviser and second reader.
4. attend poster and oral presentation in the Electrical Engineering Honors Symposium held at the end of Spring Quarter or present in another suitable forum approved by the faculty adviser.

GRADUATE PROGRAMS

University regulations governing the M.S., Engineer, and Ph.D. degrees are described in the "Graduate Degrees" section of this bulletin.

The profession of electrical engineering demands a strong foundation in physical science and mathematics, a broad knowledge of engineering techniques, and an understanding of the relationship between technology and man. Curricula at Stanford are planned to offer the breadth of education and depth of training necessary for leadership in the profession. To engage in this profession with competence, four years of undergraduate study and at least one year of postgraduate study are recommended. For those who plan to work in highly technical development or fundamental research, additional graduate study is desirable.

A one- to two-year program of graduate study in Electrical Engineering may lead to the degree of Master of Science. The program is typically completed in five academic quarters. A two- to three-year program, offering a wider selection of engineering course work, more opportunity for study in the related fields of engineering, mathematics, and physics, and in particular, more independent work and individual guidance, may lead to the degree of Engineer.

The degree of Doctor of Philosophy is offered under the general regulations of the University. The doctoral program, requiring a minimum of 135 units of graduate study, should be considered by those with the ability and desire to make a life work of research or teaching.

Application for Admission—Applications for admission with graduate standing in Electrical Engineering (EE) should be completed electronically at http://gradadmissions.stanford.edu. For more information concerning Electrical Engineering graduate admissions, see http://ee-admissions.stanford.edu. The application deadline for admission for Autumn Quarter 2008-09 is December 11, 2007.

MASTER OF SCIENCE

Students with undergraduate degrees in physics, mathematics, or related sciences, as well as in various branches of engineering, are invited to apply for admission. They should typically be able to complete the master's degree in five academic quarters; note that many courses are not taught during the summer. Students with undergraduate degrees in other fields may also be admitted for graduate study; see below.

The master's degree program may provide advanced preparation for professional practice or for teaching on the junior college level, or it may serve as the first step in graduate work leading to the degree of Engineer or Ph.D. The faculty does not prescribe specific courses to be taken. Each student, with the help of a program adviser, prepares an individual program and submits it to the faculty for approval. The master's program proposal must be submitted to the department office during the first quarter of graduate study; modifications may be made until one quarter prior to degree conferral. Detailed requirements and instructions are in the *Handbook for Graduate Students in Electrical Engineering at Stanford University* (http://ee.stanford.edu/gradhandbook/). Programs of at least 45 quarter units that meet the following guidelines are normally approved. Cognate (extradepartmental) courses of the appropriate level are considered as Electrical Engineering courses.

1. A sequence of three or more letter-graded electrical engineering courses numbered above 200, to provide depth in one area. The student must maintain an average 3.0 grade point average (GPA) or better in both the depth area and overall.
2. At least one letter-graded EE course numbered above 200 in each of three distinct course areas outside of the area selected under item 1 to provide breadth.Two courses are not considered to be in distinct areas if they can be found under a common depth area.
3. Enough additional units of EE courses so that items 1 through 3 total at least 21 units of letter-graded EE courses numbered above 200, including at least 9 units of such courses numbered in the 300s or 400s. Some 600- or 700-level summer courses may also be considered for inclusion in the M.S. program. Special studies units may not be used.
4. Additional course work to bring the total to 45 or more quarter units, including:
   a) at least 36 letter-graded units
   b) at least 36 units at or above the 100 level
   c) at least 30 units in technical areas such as engineering, mathematics, and science; thesis and special studies units cannot be included.
5. Either (a) one formal EE seminar course for credit, or (b) attend a minimum of eight informal or formal EE research seminars, and submit with the final M.S. program a list of the seminars with a paragraph describing the content and the signature of the M.S. adviser. This requirement is to ensure that students sample the many available research seminars.

Capable students without formal undergraduate preparation in electrical engineering may also be admitted for graduate study. Such students may have graduated in any field and may hold either the B.S. or B.A. degree. Each student, with the help of an adviser, prepares a program of study to meet particular needs and submits it to the faculty for approval. A student with adequate preparation in mathematics through calculus and college physics including electricity can usually complete the M.S. degree requirements within two academic years. A student with some additional preparation in electrical engineering may be able to complete the M.S. requirements in onlyone academic year.

Graduate study in EE demands that students be adequately prepared in circuits, digital systems, fields, lab work, mathematics, and physics. Skill in using modern computing facilities is essential for electrical engineers, and an increasing number of courses routinely require it. Skill should be acquired early in the program, either by taking one of the regular computer science courses or one of the special short courses given by the Computation Center, or by self-study.

It is the student's responsibility, in consultation with an adviser, to determine whether the prerequisites for advanced courses have been met. Prerequisite courses ordinarily taken by undergraduates may be included as part of the graduate program of study. However, if the number of these is large, the proposed program may contain more than the typical 45 units, and the time required to meet the degree requirements may be increased.

Students working toward the Master of Science degree in Electrical Engineering who are considering a Ph.D. or Engineer degree program in Electrical Engineering at Stanford must request the addition of a new degree program by submitting a Graduate Program Authorization Petition for approval by the department. The petition must be submitted and approved at least one quarter prior to M.S. degree completion. Once the M.S. degree in EE has been conferred, a student may not register for additional course work without this approval. Permission to study beyond the M.S. degree is normally granted to students who were originally admitted to the Ph.D. program if the student:

1. has passed the Ph.D. qualifying examination within the past year, or
2. has a written commitment from a regular member of the EE faculty to serve as an Engineer or Ph.D. dissertation adviser, and has a satisfactory academic record to date.

Students originally admitted only for the M.S. degree and not to the Ph.D. program may petition the EE graduate admissions committee during Autumn Quarter of their second year at Stanford for a change of status to the Ph.D. program with permission to take the Ph.D. qualifying exam in January. Requirements for the petition include a grade point average of 3.5 on Stanford courses and a written statement of support from an EE faculty member with whom the student has conducted preliminary research through directed reading (EE 390 or 391) or as part of a 300-level project course. Decisions are based on performance and the strength of the support letter. If admitted to the Ph.D. program, permission to study beyond the M.S. degree is normally granted under the same conditions as those described above for students originally admitted to the Ph.D. program. Students not admitted to the Ph.D. program are normally granted permission to continue past the M.S. degree only if there is a written commitment from a regular member of the EE faculty to serve as an Engineer dissertation supervisor. The student should file for candidacy for the Engineer degree within one quarter of receiving the M.S.

ENGINEER

The degree of Engineer requires a minimum of 90 units of residency. Units completed at Stanford towards a master's degree in an Engineering discipline may be used towards the 90-unit residency requirement for the Engineer degree. A student who received an M.S. degree elsewhere can transfer in 45 units towards the 90-unit requirement for an Engineer's degree. A student would need to fill out the Application for Graduate Residency Credit form to be filed with the Degree Progress Office in the Registrar's Office.

Work toward the degree of Engineer in Electrical Engineering normally includes the requirements for work toward the master's degree in Electrical Engineering, including qualifications for admission.

An additional year allows time for a broader program, or a more concentrated program, or whatever arrangement may seem suitable to the candidate, the adviser, and the department. Advanced study at other universities, or in other departments at Stanford, may be allowed within the foregoing consideration. The equivalent of approximately one quarter is devoted to independent study and thesis work with faculty guidance. The thesis is often of the nature of a professional report on the solution of a design problem. The degree of Engineer differs from the Ph.D. in that it prepares for professional engineering work rather than theoretical research. The candidate may select courses that are suitable for either the degree of Engineer or the Ph.D. degree and decide later which program to pursue.

The best procedure for the applicant to follow is (1) if now working toward the Stanford M.S. degree in Electrical Engineering, request permission to continue graduate studies beyond the master's degree, using the Graduate Program Authorization Petition form obtained from the Department of Electrical Engineering office, or (2) if not planning to receive the Stanford M.S. degree in Electrical Engineering, apply for admission to the Department of Electrical Engineering as a candidate for the degree of Engineer.

During the first quarter of work beyond the M.S. degree, formal application for admission to candidacy for the degree of Engineer is made on a form that can be obtained from the department office. The program of study is prepared by the student with the help of the thesis adviser and submitted to the academic associate for approval. The form should contain a list of all graduate courses completed at Stanford and elsewhere and all courses yet to be completed. For the most recent information, see http://ee.stanford.edu/gradhandbook/engineer.html.

DOCTOR OF PHILOSOPHY

Admission to a graduate program does not imply that the student is a candidate for the Ph.D. degree. Advancement to candidacy requires superior academic achievement, satisfactory performance on a qualifying examination, and sponsorship by two faculty members. Enrollment in EE 391, Special Studies, is recommended as a means for getting acquainted with a faculty member who might be willing to serve as a supervisor.

Students admitted to the Ph.D. program should submit an application to take the department qualifying examination (given each Winter Quarter). Upon completion of the qualifying examination and after securing agreement by two faculty members to serve as dissertation advisers, the student should file an Application for Doctoral Candidacy. Students are expected to apply for candidacy prior to the end of their second year in the Ph.D. program. The Ph.D. in Electrical Engineering is a specialized degree, and is built on a broad base of physics, mathematics, and engineering skills. The course program is expected to reflect competency in Electrical Engineering and specialized study in other areas relevant to the student's research focus. Normally the majority of units are drawn from EE department or cognate courses, with typically 9 units from related advanced physics, mathematics, engineering, or computer science courses, depending on the area of research. Only after receiving department approval to that application does the student become a candidate for the Ph.D. degree.

Requirements may be summarized as follows. The student must complete (1) a minimum of 135 units of residence with graduate standing at Stanford; (2) one or more qualifying examinations given by the faculty of the Department of Electrical Engineering; (3) an approved course of study in Electrical Engineering; (4) an approved program of research and a written dissertation, based on research, which must be a contribution to knowledge; (5) an oral examination that is a defense of dissertation research and is taken near the completion of the doctoral program.

PH.D. MINOR

For a minor in Electrical Engineering (EE), the student must fulfill the M.S. depth requirement, complete a total of at least 20 units of course work at the 200-plus level in electrical engineering (of which 15 units must be graded) and be approved by the department's Ph.D. Degree Committee. A grade point average (GPA) of at least 3.35 on these courses is required.

FINANCIAL ASSISTANCE

The department awards a limited number of fellowships, teaching and course assistantships, and research assistantships to incoming graduate students. Applying for such assistance is part of the admission application.

THE HONORS COOPERATIVE PROGRAM

Many of the department's graduate students are supported by the Honors Cooperative Program (HCP), which makes it possible for academically qualified engineers and scientists in nearby companies to be part-time graduate students in Electrical Engineering while continuing nearly full-time professional employment. Prospective HCP students follow the same admission process and must meet the same admission requirements as full-time graduate students. For more information regarding the Honors Cooperative Program, see the "School of Engineering" section of this bulletin.

AREAS OF RESEARCH

Candidates for advanced degrees participate in the research activities of the department as paid research assistants or as students of individual faculty members. At any one time, certain areas of research have more openings than others. A new applicant should express a second choice of research interest in the event that there are no vacancies in the primary area of interest. At present, faculty members and students are actively engaged in research in the areas listed below.

COMMUNICATIONS

Adaptive Modulation and Coding
Adaptive Multiuser Coding and Reception
Applied Optics and Optoelectronics
Cellular Radio Systems/Networks
Coding and Coded Modulation
Communication Channels and Signal Propagation
Communication and Information Theory
Digital Subscriber Lines
Digital Transmission
Frequency Reuse in Large Wireless Networks
Mobility in Wireless Networks
Multicarrier Modulation and OFDM
Multipath Mitigation Techniques
Multiple Access Techniques

Multiple Antenna and MIMO Systems
Optical Communications
Optical Networks
Optoelectronic Components and Systems
Resource Allocation/Channel Assignment/Handoff in Wireless Networks
Wavelength Division Multiplexing
Wireless Ad-Hoc Networks
Wireless Communications
Wireless Local Area Networks
Wireless Personal Communication Systems

COMPUTER SYSTEMS

Asynchronous Circuits
Compilers
Computer-Aided Design
Computer Architecture
Computer Graphics
Computer Networks
Computer Organization
Computer Reliability
Concurrent Languages
Concurrent Processes and Processors
Database and Information Systems
Distributed Systems
Embedded System Design
Hardware/Software Co-Design
Hardware Verification
Human Computer Interaction
Multimedia Systems
Operating Systems
Performance Measurement and Modeling
Programming Languages
Program Verification
Robust Systems
VLSI Design

INFORMATION SYSTEMS

Adaptive Control and Signal Processing
Adaptive Neural Networks
Biomedical Signal Analysis
Computer-Aided Design and Analysis of Systems
Data Communications
Digital Signal Processing
Estimation Theory and Applications
Fourier and Statistical Optics
Information and Coding Theory
Medical Imaging and Image Processing
Multivariable Control
Optical Communications
Optimization-Based Design
Pattern Recognition and Complexity
Quantization and Data Compression
Real-Time Computer Applications
Signal Processing
Speech and Image Coding

INTEGRATED CIRCUITS

Analog Integrated Circuits
Biomedical Sensors, Circuits, and Signal Processing
Bipolar, MOS, and other Device and Circuit Technologies
CAD of Processes, Devices, and Equipment
Custom Integrated Circuits for Computers and Telecommunications
Digital Integrated Circuits
Integrated Sensors and Actuators
Mixed Signal Integrated Circuits
Nanostructures
Neural Recording and Signal Processing
Optoelectronic Integrated Circuits
Organic Materials, Devices and Circuits
Process, Device, Circuit, and Equipment Modeling
RF Circuits for Wireless Transmission
Robust Circuits
Sensors and Control for VLSI Manufacturing
VLSI Device Structures and Physics
VLSI Fabrication Technology
VLSI Materials, Interconnections, and Contacts
VLSI Packaging and Testing

LASERS AND QUANTUM ELECTRONICS

Coherent UV and X-Ray Sources
Free-Electron Lasers
Laser Applications in Aeronautics, Biology, Chemistry, Communications, Electronics, and Physics
Laser Devices and Laser Physics
Nonlinear Optical Devices and Materials
Optoelectronic Devices
Photoacoustic Phenomena
Semiconductor Diode Lasers
Ultrafast Optics and Electronics

MICROWAVES, ACOUSTICS, AND OPTICS

Acoustic Microscopy
Acousto-Optic Devices
Fiber Optics
Holography
Microwave Integrated Circuits and Devices
Nanophotonics
Nondestructive Testing
Optical Interferometry
Scanning Optical Microscopes

RADIOSCIENCE AND REMOTE SENSING

Environmental Studies using Satellite Technology
Exploration of the Earth from Space
Interferometric and Holographic Imaging with Radio Waves
Numerical Methods for Science Data Analysis
Optical Remote Sensing
Planetary Exploration
Radar Interferometry
Radar Remote Sensing
Radio Occultation Studies
Radio Wave Scattering
Remote Sensing of Atmospheres and Surfaces
Signal and Image Processing Methods
Space Data Management
Spaceborne Radio Receiver Development
Synthetic Aperture Radar Satellites

SOLID STATE

Applied and Fundamental Superconductivity
Crystal Preparation: Epitaxy and Ion Implantation, and Molecular Beam Epitaxy
Defect Analysis in Semiconductors
Electron and Ion Beam Optics
Electron Spectroscopy
Experimental Determination of the Electronic Structure of Solids
High Resolution Lithography
Laser, Electron, and Ion Beam Processing and Analysis
Magnetic Information Storage
Magnetic Materials Fundamentals and Nanostructures
Nanostructure Fabrication and Applications
Nanophotonics
Molecular Beam Epitaxy
Novel Packaging Approaches for Electronic Systems
Optoelectronic Devices
Physics and Chemistry of Surfaces and Interfaces

Semiconductor and Solid State Physics
Solid State Devices: Physics and Fabrication
Ultrasmall Electron and Photodevices

SPACE PHYSICS AND ELECTROMAGNETICS

Computational Electromagnetics
Detection of Electromagnetic Fields from Earthquakes
Electromagnetic Waves and Plasmas
Geomagnetically Trapped Radiation
Ionospheric and Magnetospheric Physics
Ionospheric Modification
Lightning Discharges
Lightning-Ionosphere Interactions
Space Engineering (also see the "Space Science and Astrophysics" section of this bulletin)
Ultra-Low Frequency Fluctuations of the Earth's Magnetic Field
Very Low Frequency Wave Propagation and Scattering

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

Electrical Engineering courses are typically numbered according to the year in which the courses are normally taken.

10- 99	first or second year
100-199	second through fourth year
200-299	mezzanine courses for advanced undergraduates or graduates
300-399	first graduate year
400-499	second or third graduate year
600-799	special summer courses

The Department of Electrical Engineering (EE) offers courses in the following areas:

Communication Systems
Computer Hardware
Computer Software Systems
Control and System Engineering
Dynamic Systems and Optimization
Electronic Circuits
Electronic Devices, Sensors, and Technology
Fields, Waves, and Radioscience
Image Systems
Lasers, Optoelectronics, and Quantum Electronics
Network Systems
Signal Processing
Solid State Materials and Devices

Cognate courses offered by other departments are listed following the EE courses.

UNDERGRADUATE

EE 15N. The Life of an Engineering Project—Stanford Introductory Seminar. Preference to freshmen. The process of taking an engineering product from idea to shipment. Focus is on the design of a large engineering system. Student teams proposes ideas; architects turn the ideas into a functional specification; engineering managers determine needed resources and schedule; the engineering team works out design details; and verification engineers ensure that the designs operate correctly. GER:DB-EngrAppSci

3 units, Win (Goldsmith, A; Le, M)

EE 17N. Engineering the Micro and Nano Worlds: From Chips to Genes—Stanford Introductory Seminar. Preference to freshmen. Hands-on operation of microscopes and micro-fabrication tools in the Stanford Nanofabrication Facility, field trips to local companies engaged in the applications of micro/nanotechnologies, and guest speakers in microelectronics, MEMS, and bio- and nanotechnology. Prerequisites: high-school physics. GER:DB-EngrAppSci

3 units, Spr (Pease, R; Maluf, N)

EE 20N. Hacking Stuff—Stanford Introductory Seminar. Preference to freshmen. The design of a complete system by combining electrical engineering disciplines such as control theory, circuit design, microprocessors, and semiconductor devices. Based on radio-controlled toy cars, the design and construction of a robot capable of autonomously following a track. Teams compete in a race against the clock in a version of the DARPA Grand Challenge. GER:DB-EngrAppSci

3 units, Win (Peumans, P)

EE 21N. What is Nanotechnology?—Stanford Introductory Seminar. Preference to freshmen. Possibilities and impossibilities of nanotechnology. Sources include Feynman's *There's Plenty of Room at the Bottom*, Drexler's *Engines of Creation: The Coming Era of Nanotechnology*, and Crichton's *Prey*. Assumptions and predictions of these classic works; what nano machinery may do; scenarios of a technology that may go astray. Prerequisites: high school math, physics and chemistry. GER:DB-EngrAppSci

3 units, Aut (Wong, P)

EE 22N. Medical Imaging Systems—Stanford Introductory Seminar. Preference to freshmen. The technology of major imaging modalities used for disease diagnosis: x-ray, ultrasound, and magnetic resonance; their history, societal impact, and clinical applications. Field trips to a medical center and an imaging research lab. Term paper and presentation. Prerequisites: high school physics and calculus. GER:DB-EngrAppSci

3 units, Win (Nishimura, D)

EE 41. Physics of Electrical Engineering—How everything from electrostatics to quantum mechanics is used in common high-technology products. Electrostatics are critical in micro-mechanical systems used in many sensors and displays, and basic EM waves are essential in all high-speed communication systems. How to propagate energy in free space. Which aspects of modern physics are needed to generate light for the operation of a DVD player or TV. Introduction to semiconductors, solid-state light bulbs, and laser pointers. Hands-on labs to connect physics to everyday experience. GER:DB-EngrAppSci

5 units, Win (Staff)

EE 100. The Electrical Engineering Profession—Lectures/discussions on topics of importance to the electrical engineering professional. Continuing education, professional societies, intellectual property and patents, ethics, entrepreneurial engineering, and engineering management.

1 unit, Aut (Gray, R)

EE 101A. Circuits I—First of two-course sequence. Introduction to circuit modeling and analysis. Topics include creating the models of typical components in electronic circuits and simplifying non-linear models for restricted ranges of operation (small signal model); and using network theory to solve linear and non-linear circuits under static and dynamic operations. GER:DB-EngrAppSci

4 units, Win (Wong, S)

EE 101B. Circuits II—Second of two-course sequence. MOS large-signal and small-signal models. MOS amplifier design including DC bias, small signal performance, multistage amplifiers, frequency response, and feedback. Prerequisite: 101A. GER:DB-EngrAppSci

4 units, Aut (Shenoy, K; Hershenson, M), Spr (Shenoy, K)

EE 102A. Signal Processing and Linear Systems I—Concepts and mathematical tools in continuous-time signal processing and linear systems analysis, illustrated with examples from signal processing, communications, and control. Mathematical representation of signals and systems. Linearity and time-invariance. System impulse and step response. Frequency domain representations: Fourier series and Fourier transforms. Filtering and signal distortion. Time/frequency sampling and interpolation. Continuous-discrete time signal conversion and quantization. Stability and causality in linear systems. Laplace transforms and Bode plots. Feedback and control system design. Examples from filter design and linear control. Prerequisite: MATH 53 or ENGR 155A. GER:DB-EngrAppSci

4 units, Win (Pauly, J), Spr (Gray, R)

EE 102B. Signal Processing and Linear Systems II—Concepts and mathematical tools in discrete-time signal processing and linear systems analysis with examples from digital signal processing, communications, and control. Discrete-time signal models. Continuous-discrete-continuous signal conversion. Discrete-time impulse and step response. Frequency domain representations: Fourier series and transforms. Connection between continuous and discrete time frequency representations. Discrete Fourier transform (DFT) and fast Fourier transform (FFT). Digital filter and signal processing examples. Discrete-time and hybrid linear systems. Stability and causality. Z transforms and their connection to Laplace transforms. Frequency response of discrete-time systems. Discrete-time control. Prerequisite: 102A. GER:DB-EngrAppSci

4 units, Spr (Kahn, J), Sum (Staff)

EE 106. Planetary Exploration—The other worlds of the solar system as revealed by their electromagnetic emissions and recent space missions. Comparative properties of the terrestrial and Jovian planets; planetary atmospheres, surfaces, interiors, and rings; planetary and satellite orbits and spacecraft trajectories; properties of interplanetary gas, dust, comets, and meteorites. Blackbody radiation and the basis for global warming. What the planets reveal about potential terrestrial catastrophes such as runaway greenhouse effect or collision with an asteroid or large comet. Origin and evolution of planetary systems. Remote sensing from spacecraft at radio, infrared, light, and ultraviolet wavelengths. Stanford EE department radio experiments. Prerequisite: one year of college engineering. GER:DB-EngrAppSci

3 units, Spr (Fraser-Smith, A)

EE 108A. Digital Systems I—Digital circuit, logic, and system design. Digital representation of information. CMOS logic circuits. Combinational logic design. Logic building blocks, idioms, and structured design. Sequential logic design and timing analysis. Clocks and synchronization. Finite state machines. Microcode control. Digital system design. Control and datapath partitioning. Lab. Prerequisite: ENGR 40. Corequisite for WIM: ENGR 102E. GER:DB-EngrAppSci

3-4 units, Aut (Dally, W), Win (Levis, P)

EE 108B. Digital Systems II—The design of processor-based digital systems. Instruction sets, addressing modes, data types. Assembly language programming, low-level data structures, introduction to operating systems and compilers. Processor microarchitecture, microprogramming, pipelining. Memory systems and caches. Input/output, interrupts, buses and DMA. System design implementation alternatives, software/hardware tradeoffs. Labs involve the design of processor subsystems and processor-based embedded systems. Prerequisite: 108A, CS 106B. GER:DB-EngrAppSci

3-4 units, Aut (Olukotun, O), Win (Kozyrakis, C)

EE 109. Digital Systems Design Lab—The design of integrated digital systems encompassing both customized software and hardware. Software/hardware design tradeoffs. Algorithm design for pipelining and parallelism. System latency and throughput tradeoffs. FPGA optimization techniques. Integration with external systems and smart devices. Firmware configuration and embedded system considerations. Enrollment limited to 25; preference to graduating seniors. Prerequisites: 108B, and CS 106B or X. GER:DB-EngrAppSci

4 units, Spr (Olukotun, O)

EE 113. Electronic Circuits—Bipolar and MOS amplifier design including DC bias, small signal performance, multistage amplifiers, frequency response, feedback. Design and use of operational amplifiers. Prerequisites: 102, 112. GER:DB-EngrAppSci

3 units, not given this year

EE 114X. Simulation-Based Circuit Design—Electronic circuit design based on analysis and circuit simulations. Concepts of design space, robust design and constraint-driven optimization. Hands-on, simulation lab-based experience that bridges electronics fundamentals and more advanced electronics design classes. Prerequisite: 101B.

2 units, Aut (Dutton, R)

EE 116. Semiconductor Device Physics—The fundamental operation of semiconductor devices and overview of applications. The physical principles of semiconductors, both silicon and compound materials; operating principles and device equations for junction devices (diodes, bipolar transistor, photo-detectors). Introduction to quantum effects and band theory of solids. Prerequisite: ENGR 40. Corequisite: 101B. GER:DB-EngrAppSci

3 units, Spr (Peumans, P)

EE 118. Introduction to Mechatronics—Technologies involved in mechatronics (intelligent electro-mechanical systems) and techniques to integrate these technologies into mechatronic systems. Topics: electronics (A/D, D/A converters, op-amps, filters, power devices); software program design (event-driven programming, state machine based design); DC and stepper motors; basic sensing; mechanical design (machine elements and mechanical CAD). Lab component of structured assignments combined with large, open-ended team project. Limited enrollment. Prerequisites: ENGR 40, and CS 106A or 106X (preferred).

4 units, not given this year

EE 122. Analog Circuits Laboratory—Practical applications of analog circuits, including simple amplifiers, filters, oscillators, power supplies, and sensors. Design skills, computer-aided design, and circuit fabrication and debugging. The design process through proposing, designing, simulating, building, debugging, and demonstrating a project. Radio frequency and largely digital projects not suitable for EE122. Prerequisite: ENGR 40 or equivalent. GER:DB-EngrAppSci

3 units, Aut, Spr (Kovacs, G)

EE 133. Analog Communications Design Laboratory—Design, testing, and applications. Amplitude modulation (AM) using multiplier circuits. Frequency modulation (FM) based on discrete oscillator and integrated modulator circuits such as voltage-controlled oscillators (VCOs). Phased-lock loop (PLL) techniques, characterization of key parameters, and their applications. Practical aspects of circuit implementations. Labs involve building and characterization of AM and FM modulation/demodulation circuits and subsystems. Enrollment limited to 30 undergraduates and coterminal EE students. Prerequisite: 101B. GER:DB-EngrAppSci

4 units, Win (Dutton, R)

EE 134. Introduction to Photonics—Photonics, optical sensors, and fiber optics. Conceptual and mathematical tools for design and analysis of optical communication and sensor systems. Experimental characterization of semiconductor lasers, optical fibers, photodetectors, receiver circuitry, fiber optic links, optical amplifiers, and optical sensors. Class project aimed on confocal microscopy for biomedical applications. Laboratory experiments. Prerequisite: 41 or equivalent. GER:DB-EngrAppSci

4 units, Aut (Solgaard, O)

EE 136. Introduction to Nanophotonics and Nanostructures—Electromagnetic and quantum mechanical waves and semiconductors. Confining these waves, and devices employing such confinement. Localization of light and applications: metallic mirrors, photonic crystals, optical waveguides, microresonators, plasmonics. Localization of quantum mechanical waves: quantum wells, wires, and dots. Generation of light in semiconductors: spontaneous and stimulated emission, lasers, and light emitting diodes. Devices incorporating localization of both electromagnetic and quantum mechanical waves such as resonant cavity quantum well lasers and microcavity-based single photon sources. System-level applications such as optical communications, biochemical sensing, and quantum cryptography. Prerequisite: familiarity with electromagnetic and quantum mechanical waves and semiconductors at the level of EE 41 or equivalent. GER:DB-EngrAppSci

3 units, Aut (Vuckovic, J)

EE 138. Microscopes and Microscopy—Principles and operation of microscopes inclu…ding optical, scanning-electron, transmission-electron, atomic-force, and scanning-tunneling. Comparison of images taken of the same sample with different microscopes. Individual student-designed final projects. Prerequisite: PHYSICS 21 or AP Physics. GER:DB-EngrAppSci

3 units, Aut (Pease, R)

EE 140. The Earth From Space: Introduction to Remote Sensing—(Formerly GEOPHYS 140.) Global change science as viewed using space remote sensing technology. Global warming, ozone depletion, the hydrologic and carbon cycles, topographic mapping, and surface deformation. Physical concepts in remote sensing. EM waves and geophysical information. Sensors studied: optical, near and thermal IR, active and passive microwave. GER:DB-EngrAppSci

3 units, Win (Zebker, H)

EE 141. Engineering Electromagnetics—Lumped versus distributed circuits. Transient response of transmission lines with resistive and reactive loads. Reflection, transmission, attenuation and dispersion. Steady-state waves on transmission lines. Standing wave ratio, impedance matching, and power flow. Coulomb's law, electrostatic field, potential and gradient, electric flux and Gauss's law and divergence. Metallic conductors, Poisson's and Laplace's equations, capacitance, dielectric materials. Electrostatic energy and forces. Steady electric currents, Ohm's law, Kirchoff's laws, charge conservation and the continuity equation, Joule's law. Biot-Savart's law and the static magnetic field. Ampere's law and curl. Vector magnetic potential and magnetic dipole. Magnetic materials, forces and torques. Faraday's law, magnetic energy, displacement current and Maxwell's equations. Uniform plane waves. Prerequisites: 102A, MATH 52.GER:DB-EngrAppSci

4 units, Aut (Inan, U)

EE 144. Wireless Electromagnetic Design Laboratory—Hands-on experiments and projects with antennas, transmission lines and propagation for wireless communications and remote sensing. Using spectrum analysers, swept frequency generators, frequency counters, couplers, detectors and slotted lines, develop measurement and design capability in the 1-20 GHz range in support of chosen design projects. Two- to three-person team projects from antenna, guided wave distributed circuits, remote sensing, or related topics. Working model constructed and demonstrated; some funding available for project costs. Prizes for best projects. Lab. Enrollment limited to 30. Prerequisite: 122 or 142.

3 units, not given this year

EE 168. Introduction to Digital Image Processing—Computer processing of digital 2-D and 3-D data, combining theoretical material with implementation of computer algorithms. Topics: properties of digital images, design of display systems and algorithms, time and frequency representations, filters, image formation and enhancement, imaging systems, perspective, morphing, and animation applications. Instructional computer lab exercises implement practical algorithms. Final project consists of computer animations incorporating techniques learned in class. Prerequisite: Matlab programming. GER:DB-EngrAppSci

3-4 units, not given this year

EE 178. Probabilistic Systems Analysis—Introduction to probability and statistics and their role in modeling and analyzing real world phenomena. Events, sample space, and probability. Discrete random variables, probability mass functions, independence and conditional probability, expectation and conditional expectation. Continuous random variables, probability density functions, independence and expectation, derived densities. Transforms, moments, sums of independent random variables. Simple random processes. Limit theorems. Introduction to statistics: significance, hypothesis testing, estimation and detection, Bayesian analysis. Prerequisites: basic calculus and linear algebra. GER:DB-EngrAppSci

3 units, Win (El Gamal, A)

EE 179. Introduction to Communications—Communication system design and performance analysis. Topics include current communication systems (cellular, WLANs, radio and TV broadcasting, satellites, Internet), Fourier techniques, energy and power spectral density, random variables and random (noise) signals, filtering and modulation of noise, analog modulation (AM and FM) and its performance in noise, digital modulation (PSK and FSK), optimal receiver design, and probability of bit error for digital modulation. Prerequisite: 102A. GER:DB-EngrAppSci

3 units, Win (Gray, R)

EE 190. Special Studies or Projects in Electrical Engineering—Independent work under the direction of a faculty member. Individual or team activities involve lab experimentation, design of devices or systems, or directed reading.

1-15 units, Aut, Win, Spr, Sum (Staff)

EE 191. Special Studies and Reports in Electrical Engineering—Independent work under the direction of a faculty member given for a letter grade only. If a letter grade given on the basis of required written report or examination is not appropriate, enroll in 190.

1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

Courses approved to fulfill EE program requirements at the level of 100-199 EE courses are listed below. See respective department listings for course descriptions and General Education Requirements (GER) information. For applicability to a degree program, see http://eebulletin.stanford.edu/; click on the 2007-08 EE courses database link and select the Cognates layout.

APPPHYS 207. Laboratory Electronics

3 units, Win (Fox, J)

APPPHYS 208. Laboratory Electronics

3 units, alternate years, not given this year

CS 107. Programming Paradigms

3-5 units, Aut, Spr (Cain, G)

CS 108. Object-Oriented Systems Design

3-4 units, Aut, Win (Parlante, N)

CS 148. Introductory Computer Graphics

3 units, Win (Hanrahan, P), Sum (Staff)

CS 194. Software Project

3 units, Spr (Plummer, R)

ENGR 105. Feedback Control Design

3 units, Win (Rock, S), Sum (Emami-Naeini, A)

UNDERGRADUATE AND GRADUATE

EE 202. Medical Electronics—Open to all. Primarily biological introduction to physiological and anatomic aspects of medical instrumentation. Areas include patient monitoring, imaging, medical transducers, the unique aspects of medical electronic systems, the socio-economic impact of technology on medical care, and the constraints unique to medicine. Prerequisite: familiarity with circuit instrumentation techniques as in 101B.

3 units, Aut (Thompson, N)

EE 203. The Entrepreneurial Engineer—Seminar. For prospective entrepreneurs with an engineering background. Contributions made to the business world by engineering graduates. Speakers include Stanford and other engineering and M.B.A. graduates who have founded large and small companies in nearby communities. Contributions from EE faculty and other departments including Law, Business, and MS&E.

1 unit, Win (Melen, R)

EE 212. Integrated Circuit Fabrication Processes—For students interested in the physical bases and practical methods of silicon VLSI chip fabrication, or the impact of technology on device and circuit design, or intending to pursue doctoral research involving the use of Stanford's Nanofabrication laboratory. Process simulators illustrate concepts and provide a virtual lab experience. Topics: principles of integrated circuit fabrication processes, physical and chemical models for crystal growth, oxidation, ion implantation, etching, deposition, lithography, and back-end processing. Required for 410.

3 units, Aut (Plummer, J)

EE 214. Analog Integrated Circuit Design—Analysis and design of MOS analog integrated circuits, emphasizing quantitative measures of performance and circuit limitations. Evaluation of circuit performance by means of hand calculations and computer-aided circuit simulations. Design of operational transconductance amplifiers, biasing circuits, and voltage references. Feedback amplifier design. Prerequisite: 101B.

3 units, Aut (Murmann, B)

EE 215. Bipolar Analog Integrated Circuit Design—Bipolar analog circuits for high-frequency operation, including applications for networking and communications, such as video and broadband RF amplifiers. Device operation and compact modeling in support of circuit simulations needed for design. Circuit building blocks, including current and voltage references, and cascaded multi-stage amplifiers. Analysis and design of feedback circuits. Small design projects and use of SPICE models representative of state-of-the-art bipolar technology. Prerequisite: 101B.

3 units, Win (Dutton, R; Murmann, B)

EE 216. Principles and Models of Semiconductor Devices—Carrier generation, transport, recombination, and storage in semiconductors. Physical principles of operation of the p-n junction, heterojunction, metal semiconductor contact, bipolar junction transistor, MOS capacitor, MOS and junction field-effect transistors, and related optoelectronic devices such as CCDs, solar cells, LEDs, and detectors. First-order device models that reflect physical principles and are useful for integrated-circuit analysis and design. Prerequisite: 116 or equivalent.

3 units, Aut (Harris, J), Win (Saraswat, K; Pease, R)

EE 222. Applied Quantum Mechanics I—Emphasis is on applications in modern devices and systems. Topics include: Schrödinger's equation, eigenfunctions and eigenvalues, operator approach to quantum mechanics, Dirac notation, solutions of simple problems including quantum wells and tunneling. Quantum harmonic oscillator, coherent states. Calculation techniques including matrix diagonalization, perturbation theory, and variational method. Time-dependent perturbation theory, applications to optical absorption, nonlinear optical coefficients, and Fermi's golden rule. Quantum mechanics in crystalline materials. Prerequisites: MATH 52 and 53, PHYSICS 65 (or PHYSICS 43 and 45).

3 units, Aut (Miller, D)

EE 223. Applied Quantum Mechanics II—Continuation of 222, including more advanced topics: angular momentum in quantum mechanics, spin, hydrogen atom, systems of identical particles (bosons and fermions), methods for one-dimensional problems, introductory quantum optics (electromagnetic field quantization, coherent states), fermion annihilation and creation operators, interaction of different kinds of particles (spontaneous emission, optical absorption, and stimulated emission). Quantum information and interpretation of quantum mechanics. Other topics in electronics, optoelectronics, optics, and quantum information science. Prerequisite: 222.

3 units, Win (Miller, D)

EE 228. Basic Physics for Solid State Electronics—Topics: energy band theory of solids, energy bandgap engineering, classical kinetic theory, statistical mechanics, and equilibrium and non-equilibrium semiconductor statistics. Prerequisite: course in modern physics.

3 units, Aut (Peumans, P)

EE 231. Introduction to Lasers—How lasers work, including quantum transitions in atoms, stimulated emission and amplification, rate equations, saturation, feedback, coherent optical oscillation, laser resonators, and optical beams. Limited primarily to steady-state behavior; classical models for atomic transitions with little quantum mechanics background required. Prerequisites: electromagnetic theory to the level of 142, preferably 241, and some atomic or modern physics such as PHYSICS 70 or 130, 131.

3 units, Win (Digonnet, M)

EE 232. Laser Dynamics—Continuation of 231, emphasizing dynamic and transient effects including spiking, Q-switching, mode locking, frequency modulation, frequency and spatial mode competition, linear and nonlinear pulse propagation, short pulse expansion, and compression. Prerequisite: 231.

3 units, Spr (Fan, S)

EE 234. Photonics Laboratory—Photonics and fiber optics with a focus on communication and sensing. Experimental characterization of semiconductor lasers, optical fibers, photodetectors, receiver circuitry, fiber optic links, optical amplifiers, and optical sensors. Prerequisite: 142.

3 units, Spr (Hesselink, L)

EE 235. Guided Wave Optical Devices—Guided wave optics, optical waveguide devices, and integrated optics. Wave propagation in layered media, slab waveguides, and optical fibers. Rectangular waveguides. Optical waveguide technology. Coupled-mode theory. Numerical analysis of complex waveguides. Photonic crystals. Physics and design of waveguide devices. Fiber sensors, waveguide gratings, waveguide modulators, directional couplers, ring filters. Prerequisite: electromagnetic theory to the level of 142 or equivalent.

3 units, not given this year

EE 242. Electromagnetic Waves—Continuation of 141. Maxwell's equations. Plane waves in lossless and lossy media. Skin effect. Flow of electromagnetic power. Poynting's theorem. Reflection and refraction of waves at planar boundaries. Snell's law and total internal reflection. Reflection and refraction from lossy media. Guided waves. Parallel-plate and dielectric-slab waveguides. Hollow wave-guides, cavity resonators, microstrip waveguides, optical fibers. Interaction of fields with matter and particles. Antennas and radiation of electromagnetic energy. Prerequisite: 141 or PHYSICS 120. GER:DB-EngrAppSci

3 units, Win (Inan, U)

EE 243. Semiconductor Optoelectronic Devices—Semiconductor physics and optical processes in semiconductors. Operating principles and practical device features of semiconductor optoelectronic materials and heterostructures. Devices include: optical detectors (p-i-n, avalanche, and MSM); light emitting diodes; electroabsorptive modulators (Franz-Keldysh and QCSE), electrorefractive (directional couplers, Mach-Zehnder), switches (SEEDs); and lasers (waveguide and vertical cavity surface emitting). Prerequisites: semiconductor devices and solid state physics such as EE 216 and 228 or equivalents. Recommended: basic quantum mechanics and lasers such as EE 216 and 231 or equivalents.

3 units, Win (Harris, J)

EE 245. Wireless Electromagnetic Design Laboratory—Same content as 144 but with a higher level project.

3 units, not given this year

EE 246. Microwave Engineering—Microwave applications (terrestrial and satellite communications, radar, remote sensing, wireless communications) and their system and component requirements. Review of Maxwell's equations. Propagation modes of transmission lines (TEM, waveguide, microstrip), S-parameter matrix modeling of discontinuities, junctions and circuits (impedance transformers, directional couplers, hybrids, filters, circulators, solid state amplifiers and oscillators). Microwave computer-aided design examples. General flow of course is application to system to component; individual components are modeled by fields to modes to equivalent network. Prerequisite: 142.

3 units, alternate years, not given this year

EE 247. Introduction to Optical Fiber Communications—Fibers: single- and multi-mode, attenuation, modal dispersion, group-velocity dispersion, polarization-mode dispersion. Nonlinear effects in fibers: Raman, Brillouin, Kerr. Self- and cross-phase modulation, four-wave mixing. Sources: light-emitting diodes, laser diodes, transverse and longitudinal mode control, modulation, chirp, linewidth, intensity noise. Modulators: electro-optic, electro-absorption. Photodiodes: p-i-n, avalanche, responsivity, capacitance, transit time. Receivers: high-impedance, transimpedance, bandwidth, noise. Digital intensity modulation formats: non-return-to-zero, return-to-zero. Receiver performance: Q factor, bit-error ratio, sensitivity, quantum limit. Sensitivity degradations: extinction ratio, intensity noise, jitter, dispersion. Wavelength-division multiplexing. System architectures: local-area, access, metropolitan-area, long-haul. Prerequisites: 102A or 261, and 242 or 235 or 241, and 178 or 179.

3 units, Aut (Kahn, J)

EE 248. Fundamentals of Noise Processes—Mathematical methods, statistical and quantum mechanical models, and physical properties of noisy systems. Fundamentals of statistics, Fourrier analysis, statistical mechanics, quantum mechanics, and linear and nonlinear circuit theory. Noise propertiesof devices and systems such as simple conductor, mesoscopic conductor, simple p-n junction, mesoscopic p-n junction, FET, laser amplifier/oscillator, parametric amplifier/oscillator, classical optical communication, and quantum communication.

3 units, Aut (Yamamoto, Y)

EE 249. Introduction to the Space Environment—The environment through which space probes and vehicles travel and orbit, and which moderates solar gases and radiation. Experimentation in this environment, tools used; regions into which it is divided including ionosphere, magnetosphere, heliosphere, and interplanetary space. The role of the Sun, the effects of changes in solar activity, charged particle motion which in combination with the Earth's magnetic field leads to auroras and the Van Allen belts. Prerequisites: electromagnetics at the level of 242 and senior or graduate standing.

3 units, Aut (Fraser-Smith, A)

EE 261. The Fourier Transform and Its Applications—The Fourier transform as a tool for solving physical problems. Fourier series, the Fourier transform of continuous and discrete signals and its properties. The Dirac delta, distributions, and generalized transforms. Convolutions and correlations and applications; probability distributions, sampling theory, filters, and analysis of linear systems. The discrete Fourier transform and the FFT algorithm. Multidimensional Fourier transform and use in imaging. Further applications to optics, crystallography. Emphasis is on relating the theoretical principles to solving practical engineering and science problems. Prerequisites: Fourier series at the level of 102A, and linear algebra.

3 units, Aut (Osgood, B), Win (Gill III, J), Sum (Staff)

EE 262. Two-Dimensional Imaging—Time and frequency representations, two-dimensional auto- and cross-correlation, Fourier spectra, diffraction and antennas, coordinate systems and the Hankel and Abel transforms, line integrals, impulses and sampling, restoration in the presence of noise, reconstruction and tomography, imaging radar. Tomographic reconstruction using projection-slice and layergarm methods. Students create software to form images using these techniques with actual data. Final project consists of design and simulation of an advanced imaging system. Prerequisite: 261. Recommended: 278, 279.

3 units, Win (Zebker, H)

EE 263. Introduction to Linear Dynamical Systems—Applied linear algebra and linear dynamical systems with application to circuits, signal processing, communications, and control systems. Topics: least-squares approximations of over-determined equations and least-norm solutions of underdetermined equations. Symmetric matrices, matrix norm, and singular value decomposition. Eigenvalues, left and right eigenvectors, with dynamical interpretation. Matrix exponential, stability, and asymptotic behavior. Multi-input/multi-output systems, impulse and step matrices; convolution and transfer matrix descriptions. Control, reachability, and state transfer; observability and least-squares state estimation. Prerequisites: linear algebra and matrices as in MATH 103; differential equations and Laplace transforms as in EE 102A.

3 units, Aut (Boyd, S), Spr (Lall, S)

EE 264. Digital Signal Processing—Two sided Z-transform. Linear time in variant discrete time systems. Sampling theory, A/D and D/A conversion. Analog and digital filter design. Quantization of signals and filter coefficients. Signal scaling. DFS, DFT, and sampling in the frequency domain. Interpolation and decimation. Oversampling techniques for ADC and DAC. Digital signal processing for wireless communications. Prerequisite: 102B. Recommended: 261, 278.

3 units, Aut (Meng, T), Sum (Staff)

EE 265. Digital Signal Processing Laboratory—Applying 102A,B to real-world signal processing applications. Lab exercises use a programmable DSP to implement signal processing tasks. Topics: A/D conversion and quantization, sampling theorem, Z-transform, discrete-time Fourier transform, IIR filters, FIR filters, filter design and implementation, spectral analysis, rate conversion, wireless data communication, OFDM receiver design. Prerequisites: 102A,B. Recommended: 261.

3-4 units, Win (Meng, T)

EE 268. Introduction to Modern Optics—Geometrical optics: ray matrices, Gaussian beams, optical instruments, and radiometry. Wave nature of light: Maxwell's equations, propagation through media with varying index of refraction (e.g., fibers). Interferometry: basic principles, practical systems, and applications.

3 units, Aut (Byer, R)

EE 271. Introduction to VLSI Systems—Large-scale MOS design. Topics: MOS transistors, static and dynamic MOS gates, MOS circuit fabrication, design rules, resistance and capacitance extraction, power and delay estimation, scaling, MOS combinational and sequential logic design, registers and clocking schemes, memory, data-path, and control-unit design. Elements of computer-aided circuit analysis, synthesis, and layout techniques. Prerequisites: 101A and 108B; familiarity with transistors, logic design, Verilog, and digital system organization.

3 units, Aut (Mitra, S)

EE 273. Digital Systems Engineering—Electrical issues in the design of high-performance digital systems, including signaling, timing, synchronization, noise, and power distribution. High-speed signaling methods; noise in digital systems, its effect on signaling, and methods for noise reduction; timing conventions; timing noise (skew and jitter), its effect on systems, and methods for mitigating timing noise; synchronization issues and synchronizer design; clock and power distribution problems and techniques; impact of electrical issues on system architecture and design. Prerequisites: 102B and 108A, or equivalents. Recommended: 214.

3 units, not given this year

EE 276. Introduction to Wireless Personal Communications—Frequency reuse, cellular concepts, cochannel interference, handoff. Radio propagation in and around buildings: Friis equation, multipath, narrow-band and wide-band channels, small scale and large-scale statistics, space and time signal variation. Diversity. Receiver sensitivity, sources of noise, range. Performance statistics: coverage, margin, digital modulation, adjacent channel interference, and digital error rates. Wide band channels: maximum transmission rates. Multi-server queuing and traffic: Erlang formulas. Multiple access, FDMA, TDMA, CDMA; duplexing, FDD and TDD; multipath mitigation, OFDM, equalization, spread spectrum. Prerequisites: 242 and 278 or equivalent. Corequisite: 279 or equivalent.

3 units, Spr (Cox, D)

EE 278. Introduction to Statistical Signal Processing—Random variables, vectors, and processes; convergence and limit theorems; IID, independent increment, Markov, and Gaussian random processes; stationary random processes; autocorrelation and power spectral density; mean square error estimation, detection, and linear estimation. Prerequisites: 178 or STATS 116, and linear systems and Fourier transforms at the level of 102A,B or 261.

3 units, Aut (El Gamal, A), Spr (Gill III, J), Sum (Staff)

EE 279. Introduction to Communication Systems—Analysis and design of communication systems; analog and digital modulation and demodulation, frequency conversion, multiplexing, noise and distortion; spectral and signal-to-noise ratio analysis, probability of error in digital systems, spread spectrum. Prerequisites: 179 or 261, and 178 or 278.

3 units, Win (Hashemi, H)

EE 282. Computer Systems Architecture—Advanced system-level architecture techniques for devices such as personal computers, servers, and embedded or portable systems. Topics such as cache hierarchies, memory systems, storage and IO systems, virtualization, clusters, fault-tolerance, and low-power design. Interactions between hardware and software layers in such systems. Performance analysis and optimization techniques for small- and large-scale systems. Principles such as locality,

coarse-grain parallelism, overlapping communication and computation, performance/power trade-offs, and reliability. Prerequisite: 108B. Recommended: CS 140.
3 units, Aut (Kozyrakis, C)

EE 284. Introduction to Computer Networks—Structure and components of computer networks; functions and services; packet switching; layered architectures; OSI reference model; physical layer; data link layer; error control; window flow control; media access control protocols used in local area networks (Ethernet, Token Ring, FDDI) and satellite networks; network layer (datagram service, virtual circuit service, routing, congestion control, Internet Protocol); transport layer (UDP, TCP); application layer.
3 units, Aut (Tobagi, F)

EE 290A,B,C. Curricular Practical Training for Electrical Engineers—For EE majors who need work experience as part of their program of study. Final report required. Prerequisites: for 290B, candidacy for Engineer or Ph.D. in Electrical Engineering; for 290C, candidacy for Ph.D. degree in Electrical Engineering.
1 unit, Aut, Win, Spr, Sum (Wong, S)

EE 292C. Embedded Systems Engineering—From problem statement to final design and fabrication at the system level. Topics include: microprocessor and microcontroller architecture review, communication protocols (I2C, SPI, EIA/TIA232,422,485, CAN, OneWire), peripheral devices (timers, ADCs, DACs, human-computer interface), solid state storage (CF, MMC), OrCAD design tools, hardware-software interactions and design considerations, and real time operating systems (RTOS). Final design project from concept to PCB layout and firmware development.
3 units, not given this year

EE 292E. Analysis and Control of Markov Chains—Finite-state and countable-state Markov chains. Controlled Markov chains and dynamic programming algorithms. Application to modeling and analysis of engineering systems. Prerequisites: 263, 278.
3 units, Spr (Van Roy, B)

EE 293A. Fundamentals of Energy Processes—For seniors and graduate students. Thermodynamics, heat engines, thermoelectics, biomass. Recommended: MATH 41, 43; PHYSICS 41, 43, 45
3 units, Aut (da Rosa, A)

EE 293B. Fundamentals of Energy Processes—For seniors and graduate students. Fuel cells. Production of hydrogen: electrolytic, chemical, thermolytic, photolytic. Hydrogen storage: hydrides. Photoelectric converters; photo-thermovoltaic converters. Wind turbines. Recommended: EE 293A; MATH 41; PHYSICS 41, 43, 45
3 units, Win (da Rosa, A; Parker, M)

COGNATE COURSES

Courses approved to fulfill EE program requirements at the level of 200-299 EE courses are listed below. See respective department listings for course descriptions. For applicability to a degree program, see http://eebulletin.stanford.edu/; click on the 2007-08 EE courses database link and select the Cognates layout.

AA 272C. Global Positioning Systems
3 units, Win (Enge, P)

AA 278. Optimal Control and Hybrid Systems
3 units, not given this year

APPPHYS 226. Physics of Quantum Information
3 units, alternate years, not given this year

APPPHYS 227. Applications of Quantum Information
3 units, alternate years, not given this year

APPPHYS 272,273. Solid State Physics I,II
3 units, **272:** *Win,* **273:** *Spr (Kivelson, S)*

CS 140. Operating Systems and Systems Programming
3-4 units, Aut (Mazieres, D), Win (Rosenblum, M)

CS 143. Compilers
3-4 units, Aut (Cain, G), Sum (Staff)

CS 205A. Mathematical Methods for Robotics, Vision, and Graphics
3 units, Aut (Fedkiw, R)

CS 221. Artificial Intelligence: Principles and Techniques
3-4 units, Aut (Ng, A)

CS 223B. Introduction to Computer Vision
3 units, Win (Kosecka, J)

CS 240. Advanced Topics in Operating Systems
3 units, Win (Mazieres, D), Spr (Engler, D)

CS 242. Programming Languages
3 units, Aut (Mitchell, J)

CS 244A. Introduction to Computer Networks
3-4 units, Win (McKeown, N)

CS 248. Introduction to Computer Graphics
3-5 units, Aut (Staff)

CS 255. Introduction to Cryptography
3 units, Win (Boneh, D)

ENGR 205. Introduction to Control Design Techniques
3 units, Aut (Rock, S)

ENGR 206. Control System Design
4 units, Spr (Niemeyer, G)

ENGR 240. Introduction to Micro and Nano Electromechanical Systems (M/NEMS)
3 units, Aut (Pruitt, B)

MATSCI 199/209. Electronic and Optical Properties of Solids
3 units, Spr (Brongersma, M)

MATSCI 323. Thin Film and Interface Microanalysis
3 units, not given this year (Brongersma, M)

MATSCI 347. Introduction to Magnetism and Magnetic Nanostructures
3 units, Spr (Wang, S; White, R)

ME 358. Heat Transfer in Microdevices
3 units, Spr (Goodson, K)

MS&E 237. Progress in Worldwide Telecommunications
3 units, Sum (Ivanek, F; Chiu, S)

MS&E 246. Game Theory with Engineering Applications
3 units, Win (Erhun Oguz, F)

MS&E 251. Stochastic Decision Models
3 units, Win (Veinott, A)

GRADUATE

EE 300. Master's Thesis and Thesis Research—Independent work under the direction of a department faculty. Written thesis required for final letter grade. The continuing grade 'N' is given in quarters prior to thesis submission. See 390 if a letter grade is not appropriate.
1-15 units, Aut, Win, Spr, Sum (Staff)

EE 309. Semiconductor Memory Devices and Technology—Memory devices: SRAM, DRAM, NVRAM (non-volatile memory). Functionality and performance of ULSI systems. Semiconductor memories, device design considerations, device scaling, device fabrication, addressing, and readout circuits. Cell structures (1T-1C, 6T, 4T, 1T-1R, 0T-1R, floating gate FLASH, SONOS, NROM), and memory organization (open bit-line, folded bit-line, NAND, NOR, cross-point). New memory concepts such as nanocrystal memory, single-electron memory, magnetic tunnel junction memory (MRAM), ferroelectric memory (FRAM), phase change memory (PRAM), T-RAM, polymer memory, metal oxide memory, nanoconductive bridge memory). Prerequisite: 216. Recommended: 316.
3 units, Aut (Wong, P)

EE 310. Integrated Circuits Technology and Design Seminar—State-of-the-art micro- and nanoelectronics, nanotechnology, advanced materials, and nanoscience for device applications. Prerequisites: 216, 316.
1 unit, Win (Nishi, Y; Wong, P; Saraswat, K)

EE 311. Advanced Integrated Circuit Fabrication Processes—Practical and fundamental limits to the evolution of the technology of modern MOS devices. Modern device and circuit fabrication and likely future changes. Advanced techniques and models of device and back-end (interconnect and contact) processing. Use of TSUPREM4 and MEDICI for process and device modeling. MOS process integration. Prerequisites: 212, 216.
3 units, Spr (Saraswat, K)

EE 312. Micromachined Sensors and Actuators—Solid-state sensors and actuators, focusing on the use of integrated circuit fabrication technology for their realization. Categories of sensors and actuators include biological, chemical, mechanical, optical, and thermal. Mechanisms of transduction, fabrication techniques, and relative merits of different technologies. Micromachining techniques for monolithic integration of active circuits with sensors or actuators. Directions for future research. Prerequisite: 212 or equivalent.
3 units, Win (Kovacs, G)

EE 313. Digital MOS Integrated Circuits—Analysis and design of digital MOS integrated circuits. Development of different models for MOS transistors and how to use them to analyze circuit performance. Use of computer-aided circuit analysis. Logic styles include static, dynamic and pass logic, pulse-mode gates, and current-mode logic. Topics include sizing for min delay, noise and noise margins, power dissipation. The class uses memory design (SRAM) as a motivating example. DRAM and EEPROM design issues. Prerequisites: 101B, 108A. Recommended: 271.
3 units, Win (Horowitz, M)

EE 314. RF Integrated Circuit Design—Design of RF integrated circuits for communications systems, primarily in CMOS. Topics: the design of matching networks and low-noise amplifiers at RF, passive and active filters, mixers, modulators, and demodulators; review of classical control concepts necessary for oscillator design including PLLs and PLL-based frequency synthesizers. Design of low phase noise oscillators. Design of high-efficiency (e.g., class E, F) RF power amplifiers, coupling networks. Behavior and modeling of passive and active components at RF. Narrowband and broadband amplifiers; noise and distortion measures and mitigation methods. Overview of transceiver architectures. Prerequisite: 214.
3 units, Win (Lee, T)

EE 315. VLSI Data Conversion Circuits—Design of mixed-signal integrated circuits for implementing the interfaces between analog and digital signals in CMOS VLSI systems. Fundamental circuit elements such as sample-and-hold circuits, comparators, analog gain blocks and integrators. The design of the constituent circuits for Nyquist-rate and oversampling analog-to-digital and digital-to-analog converters, sampled-data and continuous-time analog filters, and digital decimation and interpolation filters. Prerequisite: 214.
3 units, Spr (Murmann, B)

EE 316. Advanced VLSI Devices—In modern VLSI technologies, device electrical characteristics are sensitive to structural details and therefore to fabrication techniques. How are advanced VLSI devices designed and what future changes are likely? What are the implications for device electrical performance caused by fabrication techniques? Physical models for nanometer scale structures, control of electrical characteristics (threshold voltage, short channel effects, ballistic transport) in small structures, and alternative device structures for VLSI. Prerequisites: 212 and 216, or equivalent.
3 units, Win (Wong, P)

EE 317. Micropatterning for Integrated Circuits—The fundamentals of generating submicron patterns in integrated circuit manufacturing. Technologies include the formation of submicron images of ultraviolet light, the resulting exposure of polymeric resists, the subsequent development of resist patterns and their transfer into functional circuit material patterns through plasma etching and other techniques. Use of phase-shifting masks and other wavefront-engineering approaches. Hands-on computer simulations. Prerequisites: 141 or equivalent, 212 or equivalent.
3 units, not given this year

EE 319. Advanced Nanoelectronic Devices and Technology—Recent advances in materials science, device physics and structures, and processing technology, to extend VLS1 device scaling towards atomistic and quantum-mechanical physics boundaries. Topics include: mobility-enhancement techniques; nanomaterial structures including tube, wire, beam, and crystal; conducting polymer; 3D FET; gate-wraparound FET; nonvolatile memory phenomena and devices; self-assembly; flash annealing; plasma doping; and nano pattering. Prerequisites: 216, 316.
3 units, Win (Nishi, Y; Sze, S)

EE 322. Molecular Electronics and Photonics—Physics of charge and energy transfer in molecular systems and connection with traditional mesoscopic transport theories. Analysis of molecular organic light-emitting diodes, photovoltaic cells and transistors. Technology and applications of molecular semiconductors. Prerequisite: 228 or equivalent.
3 units, not given this year

EE 327. Properties of Semiconductor Materials—Modern semiconductor devices and integrated circuits are based on unique energy band, carrier transport, and optical properties of semiconductor materials. How to choose these properties for operation of semiconductor devices. Emphasis is on quantum mechanical foundations of the properties of solids, energy bandgap engineering, semiclassical transport theory, semiconductor statistics, carrier scattering, electro-magneto transport effects, high field ballistic transport, Boltzmann transport equation, quantum mechanical transitions, optical absorption, and radiative and non-radiative recombination. Prerequisites: 216, 228.
3 units, not given this year

EE 328. Physics of Advanced Semiconductor Devices—Principles governing the operation of modern semiconductor devices. Assumptions and approximations commonly made in analyzing devices. Emphasis is on the application of semiconductor physics to the development of advanced semiconductor devices such as heterojunctions, HJ-bipolar transistors, HJ-FETs, nanostructures, tunneling, single electron transistor and photonic devices. Use of Sentaurus, a 2-D Poisson solver, for simulation of ultra-small devices. Examples related to state-of-the-art devices and current device research. Prerequisite: 216. Recommended: 316.
3 units, Spr (Harris, J)

EE 329. The Electronic Structure of Surfaces and Interfaces—Physical concepts and phenomena for surface science techniques probing the electronic structure of surfaces and interfaces. Microscopic and atomic models of microstructures; applications such as within semiconductor device technology and catalysis. Physical processes of low energy electron diffraction, Auger electron spectroscopy, UV and X-ray photoemission spectroscopy, electron/photon stimulated ion desorption, inelastic tunneling spectroscopy, ion scattering, surface EXAFS, and energy loss spectroscopy; and experimental aspects of these surface science techniques. Prerequisites: PHYSICS 70 and MATSCI 199/209, or consent of instructor.
3 units, not given this year

EE 335. Introduction to Information Storage Systems—State-of-the-art data storage technologies, including magnetic disk drive storage, optical data storage (CD-ROM, DVD, magneto-optic recording), solid state memory (flash memory, ferro-electric memory), and emerging technologies (magnetic random access memory, probe-based storage). Magnetic disk recording and comparisons among data storage technologies. Related nanotechnologies. Final presentation. Prerequisites: electromagnetism, optics, transistors, binary algebra, probability, and Fourier transform.
3 units, Win (Wang, S)

EE 336. Nanophotonics—(Same as MATSCI 346.) Recent developments in micro- and nanophotonic materials and devices. Basic concepts of photonic crystals. Integrated photonic circuits. Photonic crystal fibers.

Superprism effects. Optical properties of metallic nanostructures. Subwavelength phenomena and plasmonic excitations. Meta-materials. Prerequisite: electromagnetic theory at the level of 242.
3 units, Win (Fan, S; Brongersma, M)

EE 340. Advanced Topics in Optics and Quantum Optics—Optical microcavities and their device applications. Types of optical microcavities (microdisks, microspheres, and photonic crystal cavities), and their electromagnetic properties, design, and fabrication techniques. Cavity quantum electrodynamics: strong and weak-coupling regime, Purcell factor, spontaneous emission control. Applications of optical microcavities, including low-threshold lasers, resonant cavity light-emitting diodes, and single-photon sources. Prerequisites: advanced undergraduate or basic graduate-level knowledge of electromagnetics, quantum mechanics, and physics of semiconductors.
3 units, Spr (Vuckovic, J)

EE 343. Advanced Optoelectronic Devices—Semiconductor quantum well structures; superlattices and coupled quantum wells; optical properties of quantum wells; valence band structure; effects of strain; quantum well lasers; intersubband detectors; excitons in quantum wells; absorption saturation; electroabsorption; quantum well modulators and switches. Prerequisites: 222 or equivalent quantum mechanics, 243. Recommended: 223.
3 units, Spr (Miller, D)

EE 344. High Frequency Laboratory—Lecture/lab emphasizing lab. Techniques in the 1MHz-1GHz range useful in designing and measuring oscillators, amplifiers, and mixers. High frequency measurement techniques including s-parameter measurements, amplifier noise figure, and oscillator phase noise. Guest speakers from Lucent and Hewlett-Packard. Enrollment limited to 25. Prerequisites: transmission lines, Smith charts. Recommended: 314.
3 units, Aut (Cox, D)

EE 346. Introduction to Nonlinear Optics—Wave propagation in anisotropic, nonlinear, and time-varying media. Microscopic and macroscopic description of electric dipole susceptibilities. Free and forced waves-phasematching; slowly varying envelope approximation-dispersion, diffraction, space-time analogy; harmonic generation; frequency conversion; parametric amplification and oscillation; electro-optic light modulation; nonlinear processes in optical fibers. Prerequisites: 141, 242.
3 units, Spr (Harris, S)

EE 347. Optical Methods in Engineering Science—Design and understanding of modern optical systems. Topics: geometrical optics; aberration theory; systems layout; applications such as microscopes, telescopes, optical processors. Computer ray tracing program as a design tool. Prerequisite: 268 or 366, or equivalent.
3 units, Win (Hesselink, L)

EE 348. Advanced Optical Fiber Communications—Optical amplifiers: gain, saturation, noise. Semiconductor amplifiers. Erbium-doped fiber amplifiers. System applications: preamplified receiver performance, amplifier chains. Raman amplifiers, lumped vs. distributed amplification. Group-velocity dispersion management: dispersion-compensating fibers, filters, gratings. Interaction of dispersion and nonlinearity, dispersion maps. Multichannel systems. Wavelength-division multiplexing components: filters, multiplexers. WDM systems, crosstalk. Time-, subcarrier-, code- and polarization-division multiplexing. Solitons, loss- and dispersion-managed solitons. Comparison of modulation techniques: duobinary, pulse-amplitude modulation, differential phase-shift keying, phase-shift keying, quadrature-amplitude modulation. Comparison of detection techniques: noncoherent, differentially coherent, coherent. Spectral efficiency limits. Error-control coding. Prerequisite: 247.
3 units, Win (Kahn, J)

EE 349. Nano Optics and Grating Photonics—Coupled wave analysis of periodic structures, gratings structures for optical communcations, wave-matter interactions with periodic media and photonic crystals, applications of periodic structures. Prerequisite: 268 or 366, or equivalent.
3 units, not given this year

EE 350. STARLab Seminar—Research topics from space physics, planetary exploration, ionospheric and magnetospheric physics, radar and remote sensing of the environment, applied electromagnetics, waves in optical fibers, and information systems with space applications. Applied research areas include wireless personal communications, high bandwidth wired and wireless transmission, optical communication systems, sensor networks, and related underlying and advancing technologies.
1 unit, Win (Inan, U)

EE 353. Business Management for Electrical Engineers and Computer Scientists—For graduate students with little or no business experience. Leading computer, high-tech, and Silicon Valley companies and their best practices. Tools and frameworks for analyzing decisions these companies face. Corporate strategy, new product development, marketing, sales, distribution, customer service, financial accounting, outsourcing, and human behavior in business organizations. Case studies. Prerequisite: graduate standing.
3 units, Spr (Gibbons, F; Siegel, M)

EE 354. Introduction to Radio Wave Scattering—Integral and differential equations of radio wave scattering; exact, approximate, and numerical solutions of single particle scattering for spheres, edges, points, and cylinders. Scattering from rough surfaces with large and small roughness scales, as time permits. Multiple scattering; formulation and solution techniques for equation of transfer in discrete media and scattering by continuous media in weak and strong regimes. Applications to radar, radar astronomy, remote sensing, and biological media. Prerequisites: electromagnetic theory through standard graduate engineering topics; partial differential equations, boundary value problems in rectangular and spherical coordinates; and consent of instructor.
3 units, not given this year

EE 355. Imaging Radar and Applications—Radar remote sensing, radar image characteristics, viewing geometry, range coding, synthetic aperture processing, correlation, range migration, range/Doppler algorithms, wave domain algorithms, polar algorithm, polarimetric processing, interferometric measurements. Applications: polarimetry and target discrimination, topographic mapping surface displacements, velocities of ice fields.
3 units, alternate years, not given this year

EE 356. Elementary Plasma Physics: Principles and Applications—Plasmas in nature and industry. Single particle motions. Plasma kinetic theory. Boltzmann equation and its moments. Cold and warm plasma models. Plasma as a fluid. Magnetohydrodynamics. Plasma conductivity and diffusion. Langmuir oscillations. Debye shielding. Plasma sheath. Waves in cold, magnetized, warm, and hot plasmas. Electron and ion waves. MHD waves. Landau damping. Nonlinear effects. Applications in industry and space science. Prerequisite: 242 or PHYSICS 122.
3 units, Spr (Inan, U)

EE 359. Wireless Communication—Design, performance analysis, and performance limits of wireless systems. Topics include: current wireless systems, path loss and shadowing, statistical multipath channel models, capacity of wireless channels, digital modulation and its performance in fading and intersymbol interference, adaptive modulation, diversity, multiple antenna systems (MIMO), equalization, multicarrier modulation, and spread spectrum and RAKE receivers. Possible additional topics: multiuser system design issues such as multiple access, frequency reuse in cellular systems, and ad hoc wireless network design. Prerequisite: 279.
3-4 units, Win (Goldsmith, A)

EE 360. Multiuser Wireless Systems and Networks—Design, analysis, and fundamental limits. Possible topics include multiuser detection and interference cancellation, multiple access, cellular system design and optimization, Shannon capacity and achievable rate regions of wireless multiuser channels and networks, ad hoc wireless network design, sensor and energy-constrained networks, and cross-layer design. Prerequisite: 359.
3 units, not given this year

EE 363. Linear Dynamic Systems—Continuation of 263. Optimal control and dynamic programming; linear quadratic regulator. Lyapunov theory and methods. Linear estimation and the Kalman filter. Perron-Frobenius theory. Examples and applications from digital filters, circuits, signal processing, and control systems. Prerequisites: 263 or equivalent; basic probability.

3 units, not given this year

EE 364A. Convex Optimization I—Convex sets, functions, and optimization problems. The basics of convex analysis and theory of convex programming: optimality conditions, duality theory, theorems of alternative, and applications. Least-squares, linear and quadratic programs, semidefinite programming, and geometric programming. Numerical algorithms for smooth and equality constrained problems; interior-point methods for inequality constrained problems. Applications to signal processing, communications, control, analog and digital circuit design, computational geometry, statistics, machine learning, and mechanical engineering. Prerequisite: linear algebra such as 263.

3 units, Win (Boyd, S)

EE 364B. Convex Optimization II—Continuation of 364. Subgradient, cutting-plane, and ellipsoid methods. Decentralized convex optimization via primal and dual decomposition. Alternating projections. Exploiting problem structure in implementation. Convex relaxations of hard problems, and global optimization via branch and bound. Robust optimization. Applications in areas such as control, circuit design, signal processing, and communications. Substantial project. Prerequisite: 364A.

3 units, Spr (Boyd, S)

EE 366. Introduction to Fourier Optics—Applications of Fourier theory to the analysis and synthesis of optical imaging and optical data processing systems. Propagation and diffraction of light, Fresnel and Fraunhofer approximations, Fourier transforming properties of lenses, image formation with coherent and incoherent light, transform functions of imaging systems, optical data processing, and holography. Prerequisite: familiarity with Fourier analysis. Recommended: 261.

3 units, Aut (Hesselink, L)

EE 368. Digital Image Processing—Image sampling and quantization, color, point operations, segmentation, linear image filtering and correlation, image transforms, eigenimages, multidimensional signals and systems, multiresolution image processing, wavelets, morphological image processing, noise reduction and restoration, simple feature extraction and recognition tasks, image registration. Students write and investigate image processing algorithms in Matlab. Competitive term project. Prerequisites: 261, 278.

3 units, Spr (Girod, B)

EE 369A. Medical Imaging Systems I—Imaging internal structures within the body using high-energy radiation studied from a systems viewpoint. Modalities covered: x-ray, computed tomography, and nuclear medicine. Analysis of existing and proposed systems in terms of resolution, frequency response, detection sensitivity, noise, and potential for improved diagnosis. Prerequisite: 261.

3 units, not given this year

EE 369B. Medical Imaging Systems II—Imaging internal structures within the body using non-ionizing radiation studied from a systems viewpoint. Modalities include ultrasound and magnetic resonance. Analysis of ultrasonic systems including diffraction and noise. Analysis of magnetic resonance systems including physics, Fourier properties of image formation, and noise. Prerequisite: 261.

3 units, Spr (Nishimura, D)

EE 369C. Medical Image Reconstruction—Reconstruction problems from medical imaging, including magnetic resonance imaging (MRI), computed tomography (CT), and positron emission tomography (PET). Problems include reconstruction from non-uniform frequency domain data, automatic deblurring, phase unwrapping, reconstruction from incomplete data, and reconstruction from projections. Prerequisite: 369B.

3 units, Aut (Pauly, J)

EE 371. Advanced VLSI Circuit Design—Issues in high performance digital CMOS VLSI design from a system perspective. Topics: wire modeling, logic families, latch design and clocking issues, clock distribution, RAMs, ALUs, I/O and I/O noise issues. Final project involves the design of a subsystem for a high-speed processor. Extensive use of SPICE. Prerequisites: 271 and 313, or consent of instructor.

3 units, not given this year

EE 373A. Adaptive Signal Processing—Self-optimizing systems whose performance is improved through contact with their environments. Feedback models for least mean-square adaptation processes. Steepest descent, Newton's method, and Southwell relaxation methods. Random search. LMS algorithm. Efficiency measures for adaptive processes. Adaptive digital filters, noise canceling and signal enhancement, adaptive antennas, adaptive control systems. Original theoretical and experimental research projects in electrical engineering and biomedical engineering, teamwork. Prerequisites: 263, 264. Recommended: 278.

3 units, Win (Widrow, B)

EE 373B. Adaptive Neural Networks—Adaptive threshold elements, feedforward layered networks, back-propagation algorithm. Adaptive decision making. Adaptive gaming. Principal components analysis. Nonlinear adaptive filtering. Volterra adaptive filtering. Recurrent neural networks. Experimental and theoretical applications of neural networks to pattern recognition, speech recognition, and self-learning adaptive control systems. Reinforcement learning. Cognitive memory, human and machine. Original theoretical and experimental research projects in electrical engineering and biomedical engineering. Continuation of projects begun in 373A. Prerequisite: 373A.

3 units, Spr (Widrow, B)

EE 374. Inference in Graphical Models—Graphical models as a unifying framework for describing the statistical relationships among large sets of variables; computing the marginal distribution of one or a few such variables. Focus is on sparse graph structures and theoretical analysis. Topics include: message passing algorithms; belief propagation; survey propagation; correlation decay; density evolution; distributional recursions; the cavity method; sparse graph codes; multi-user detection; and random combinatorial optimization (random K-satisfiability). Prerequisite: 278, STATS 116, or CS 228. Recommended: 376A or STATS 217/218.

3 units, not given this year

EE 375. Quantization Noise—The effects of roundoff noise in digital computation, signal processing, control, and communication systems. Definition of the quantizer. Analog-to-digital and digital-to-analog conversion. Probability density functions, characteristic functions, and moments. Statistical analysis of quantization noise. General statistical relations between quantization noise, the quantizer input, and the quantizer output. Sampling and quantization of Gaussian and other time series. Linearization with additive dither signals. Quantization noise in feedback control systems, signal processing systems, FFT algorithm, linear and nonlinear systems, chaotic systems. Quantizing noise theorems for conditions of whiteness, uncorrelatedness, zero mean, and variance of (q^2)/12. Coefficient quantization in digital filters. Recommended: 264, 278.

3 units, Aut (Widrow, B)

EE 376A. Information Theory—Extreme points of communication theory: data compression to the entropy limit, and communication at the channel capacity limit. Shannon entropy. Rate distortion theory. Huffman coding. Kolmogorov complexity. Unified treatment based on the asymptotic equipartition theorem. Prerequisite: 178 or 278 or STATS 116, or equivalent.

3 units, Win (Cover, T)

EE 376B. Information Theory—Rate distortion theory and Kolmogorov complexity. Information theory and statistics. Method of types. Stein's lemma. AEP. Information capacity of networks. Slepian-Wolf theorem. Optimal investment and information theory. Universal portfolios and universal data compression. Maximum entropy and Burg's theorem. Prerequisite: 376A.

3 units, not given this year

EE 378. Statistical Signal Processing—Random signals in electrical engineering. Discrete-time random processes: stationarity and ergodicity, covariance sequences, power spectral density, parametric models for stationary processes. Fundamentals of linear estimation: minimum mean squared error estimation, optimum linear estimation, orthogonality principle, the Wold decomposition. Causal linear estimation of stationary processes: the causal Wiener filter, Kalman filtering. Parameter estimation: criteria of goodness of estimators, Fisher information, Cramer-Rao inequality, Chapman-Robbins inequality, maximum likelihood estimation, method of moments, consistency, efficiency. ARMA parameter estimation: Yule-Walker equations, Levinson-Durbin algorithm, least squares estimation, moving average parameter estimation, modified Yule-Walker method for model order selection. Spectrum estimation: sample covariances, covariance estimation, Bartlett formula, periodogram, periodogram averaging, windowed periodograms. Prerequisite: 278.
3 units, Spr (Ozonat, K)

EE 379A. Digital Communication I—Maximum-likelihood data detection, modulation methods and bandwidth requirements, bandpass systems and analysis, intersymbol interference and equalization methods, diversity, phase-locking, and synchronization. Prerequisites: 102B, 278.
3 units, Win (Cioffi, J)

EE 379B. Digital Communication II—Basic channel capacity formulae, decoding algorithms; Viterbi detection, sequence detectors, and iterative decoding methods; partial-response methods, convolutional, trellis, turbo codes, and low-density parity check codes; shaping codes. Prerequisites: 278, 379A. Recommended: 387.
3 units, not given this year

EE 379C. Advanced Digital Communication—Multi-dimensional modulation and basis functions, transmit optimization for channels with intersymbol interference, discrete multitone (DMT), orthogonal frequency division multiplexing (OFDM), vector modulation, generalized decision-feedback equalization (GDFE). Prerequisite: 379A.
3 units, Spr (Cioffi, J)

EE 380. Seminar on Computer Systems—Current research in the design, implementation, analysis, and use of computer systems from integrated circuits to operating systems and programming languages.
1 unit, Aut, Win, Spr, Sum (Allison, D; Long, E)

EE 382A. Advanced Processor Architecture—Topics include advanced instruction-set design and pipelining, wide instruction fetch, branch prediction, out-of-order and speculative execution, memory disambiguation, vector processors, simultaneous multithreading, multi-core systems, memory hierarchies, and low-level compiler optimizations for processor efficiency. Trade-offs among performance, power, and complexity, and techniques for addressing them. Design or research project in processor architecture. Prerequisites: 108B, 282.
3 units, Spr (Kozyrakis, C)

EE 382C. Interconnection Networks—The architecture and design of interconnection networks used to communicate from processor to memory, from processor to processor, and in switches and routers. Topics: network topology, routing methods, flow control, router microarchitecture, and performance analysis. Enrollment limited to 30. Prerequisite: 282.
3 units, not given this year

EE 382D. Advanced Computer Arithmetic—Number systems, floating point representation, state of the art in arithmetic algorithms, problems in the design of high speed arithmetic units. Prerequisite: 282.
3 units, not given this year

EE 384A. Internet Routing Protocols and Standards—Local area networks: MAC addressing; IEEE 802.1 bridging protocols (transparent bridging, virtual LANs). Internet routing protocols: Internet protocol (IPv4, IPv6, ICMP); interior gateways (RIP, OSPF) and exterior gateways (BGP, policy routing); IP multicast (IGMP, DVMRP, CBT, MOSPF, PIM); multiprotocol label switching (MPLS). Prerequisite: 284 or CS 244A.
3 units, Win (Tobagi, F)

EE 384B. Multimedia Communication over the Internet—Applications and requirements. Traffic generation and characterization: voice encoding (G.711, G.729, G.723); image and video compression (JPEG, H.261, MPEG-2, H.263, H.264), TCP data traffic. Quality impairments and measures. Networking technologies: LAN technologies; home broadband services (ADSL, cable modems, PONs); and wireless LANs (802.11). Network protocols for multimedia applications: resource reservation (ST2+, RSVP); differentiated services (DiffServ); and real-time transport protocol (RTP, RTCP). Audio-video-data conferencing standards: Internet architecture (SDP, SAP, SIP); ITU recommendations (H.320, H.323 and T.120); and real-time streaming protocol (RTSP). Prerequisite: 284 or CS 244A. Recommended: 384A.
3 units, not given this year

EE 384C. Wireless Local Area Networks—Characteristics of wireless communication: multipath, noise, and interference. Communications techniques: spread-spectrum, CDMA, and OFDM. IEEE 802.11 physical layer specifications: FHSS, DSSS, IEEE 802.11b (CCK), and 802.11a/g (OFDM). IEEE 802.11 media access control protocols: carrier sense multiple access with collision avoidance (CSMA/CA), point coordination function (PCF), IEEE802.11e for differentiated services. IEEE 802.11 network architecture: ad hoc and infrastructure modes, access point functionality. Management functions: synchronization, power management and association. Current research papers in the open literature. Prerequisite: 284 or CS 244A.
3 units, Spr (Tobagi, F)

EE 384M. Network Algorithms—Theory and practice of designing and analyzing algorithms arising in networks. Topics include: designing algorithms for load balancing, switching, congestion control, network measurement, the web infrastructure, and wireless networks; and analyzing the performance of algorithms via stochastic network theory. Algorithm design using randomization, probabilistic sampling, and other approximation methods. Analysis methods include the use of large deviation theory, fluid models, and stochastic comparison. Research project. Prerequisite: 278 or CS 365.
3 units, Spr (Prabhakar, B)

EE 384S. Network Architectures and Performance Engineering—Modeling and control methodologies for high-performance network engineering, including: Markov chains and stochastic modeling, queueing networks and congestion management, dynamic programming and task/processor scheduling, network dimensioning and optimization, and simulation methods. Applications for design of high-performance architectures for wireline/wireless networks and the Internet, including: traffic modeling, admission and congestion control, quality of service support, power control in wireless networks, packet scheduling in switches, video streaming over wireless links, and virus/worm propagation dynamics and countermeasures. Enrollment limited to 30. Prerequisites: basic networking technologies and probability.
3 units, Spr (Bambos, N; Prabhakar, B)

EE 384X. Packet Switch Architectures I—First of two-course sequence. Theory and practice of designing packet switches and routers. Evolution of switches and routers. Output scheduling: fairness, delay guarantees, algorithms. Unicast switching: blocking phenomena and their alleviation, connection between switch scheduling and bipartite graph matching. Multicast switching. Theoretical complements: simple queueing models, Bernoulli and Poisson processes, graph matching algorithms, urn problems, stability analysis using Lyapunov functions, fluid models. Prerequisites: 284 or CS 244A, 178 or 278 or STAT 116.
3 units, Win (McKeown, N; Prabhakar, B)

EE 384Y. Packet Switch Architectures II—Second of two-course sequence. Theory and practice of designing packet switches and routers. Address lookup: exact matches, longest prefix matches, performance metrics, hardware and software solutions. Packet classifiers: for firewalls, QoS, and policy-based routing; graphical description and examples of 2-D classification, examples of classifiers, theoretical and practical considerations.
3 units, Spr (McKeown, N)

EE 385A. Digital Systems Reliability Seminar—Student/faculty discussions of research problems in the design of reliable digital systems. Areas: fault-tolerant systems, design for testability, production testing, and system reliability. Emphasis is on student presentations and Ph.D. thesis research. Prerequisite: consent of instructor.
1-4 units, Aut, Win, Spr, Sum (McCluskey, E)

EE 386. Robust System Design—Causes of system malfunctions; techniques for building robust systems that avoid or are resilient to such malfunctions through built-in error detection and correction, prediction, self-test, self-recovery, and self-repair; case studies and new research problems. Prerequisites: 108A,B, 282.
3 units, Spr (Mitra, S)

EE 387. Algebraic Error Control Codes—Theory and implementation of algebraic codes for detection and correction of random and burst errors. Introduction to finite fields. Linear block codes, cyclic codes, Hamming codes, Fire codes, BCH codes, Reed-Solomon codes. Decoding algorithms for BCH and Reed-Solomon codes. Prerequisites: elementary probability, linear algebra.
3 units, not given this year

EE 388. Modern Coding Theory—Tools for analysis and optimization of iterative coding systems. LDPC, turbo and, RA codes. Optimized ensembles, message passing algorithms, density evolution, and analytic techniques. Prerequisite: 376A.
3 units, Win (Montanari, A)

EE 390. Special Studies or Projects in Electrical Engineering—Independent work under the direction of a faculty member. Individual or team activities may involve lab experimentation, design of devices or systems, or directed reading.
1-15 units, Aut, Win, Spr, Sum (Staff)

EE 391. Special Studies and Reports in Electrical Engineering—Independent work under the direction of a faculty member; written report or written examination required. Letter grade given on the basis of the report; if not appropriate, student should enroll in 390.
1-15 units, Aut, Win, Spr, Sum (Staff)

EE 392B. Introduction to Imaging Sensors—Design and analysis: silicon photodetectors; CCD and CMOS passive and active sensor operation; noise and FPN analysis; spatial resolution and MTF; SNR and dynamic range; high dynamic range architectures; A/D conversion approaches. Analysis of the signal path in a digital camera starting from the optics, through the sensor, the A/D converter, to the different color processing steps. MATLAB camera simulator is used to explore various tradeoffs in camera design. Prerequisites: undergraduate level device, circuit, and system background equivalent to 102A, 101A,B; and familiarity with noise analysis.
3 units, not given this year

EE 392F. Logic Synthesis of VLSI Circuits—Similar to former 318. Solving logic design problems with CAD tools for VLSI circuits. Exact and heuristic algorithms for logic synthesis. Representation and optimization of combinational logic functions (encoding problems, binary decision diagrams) and of multiple-level networks (algebraic and Boolean methods, don't-care set computation, timing verification, and optimization);and modeling and optimization of sequential functions and networks (retiming), semicustom libraries, and library binding. Prerequisites: familiarity with logic design, algorithm development, and programming.
3 units, not given this year

EE 392R. Charged Particle Optics—Electron optics of charged particle instruments including transmission electron microscope, scanning electron microscope and related tools, mass and energy spectrometers, electron beam lithography tools, focused ion beam systems, electron diffraction, proximal probe tools such as the scanning tunneling microscope. Topics include sources, first-order focusing of electrons and ions, third-order aberrations, space-charge effects and diffraction. Goal is to compute the optical parameters of axially-symmetric magnetic and electric lenses and to be familiar with the principles of operation of the above charged-particle systems and the factors limiting their performance. Prerequisites: undergraduate geometrical optics and vector calculus or 217.
3 units, not given this year

EE 392T. Seminar in Chip Test and Debug—Seminars by industry professionals in digital IC manufacturing test and silicon debug. Topics include yield and binsplit modeling, defect types and detection, debug hardware, physical analysis, and design for test/debug circuits. Case studies of silicon failures. Prerequisite: basic digital IC design (271 or 371).
1 unit, Aut (Stinson, J)

EE 392V. Signal Processing in VoIP Systems—VoIP protocols: RTP and SIP. Voice encoding standards: PCM, ADPCM, and LPC. Speech quality measurement: MOS, PESQ, and E-model. Characterization of VoIP impairments: delay, jitter, packet loss, and clock skew. Signal processing algorithms to improve VoIP quality: echo cancellation, adaptive jitter buffering, packet loss concealment, and decoder clock synchronization. Prerequisites: 261 and 278, or equivalents.
3 units, Win (Narasimha, M)

EE 392Y. Vision Sensor Networks Lab—Operation of wireless sensor networks emphasizing algorithm development for distributed vision processing in image sensor networks. Project platforms at the Wireless Sensor Networks Lab are used for conducting term projects. Students identify potential areas for long-term research. Application areas in smart environments. Prerequisites: 179, 279, or 359; and 261, 263, or 278); and programming in Matlab and C.
3 units, not given this year

EE 395. Electrical Engineering Instruction: Practice Teaching—Open to advanced EE graduate students who plan to make teaching their career. Students conduct a section of an established course taught in parallel by an experienced instructor. Enrollment limited.
1-15 units, Aut, Win, Spr (Wong, S)

EE 398. Image and Video Compression—Condensed version of 398A,B sequence. The principles of source coding for the efficient storage and transmission of still and moving images. Entropy and lossless coding techniques. Run-length coding and fax compression. Arithmetic coding. Rate-distortion limits and quantization. Lossless and lossy predictive coding. Transform coding, JPEG. Subband coding, wavelets, JPEG2000. Motion-compensated coding, MPEG standards. Students investigate image and video compression algorithms in Matlab or C. Prerequisites: 261, 278.
3 units, Win (Girod, B)

EE 398A. Image Communication I—First of two-course series. Principles and systems for digital image communication, emphasizing source coding for efficient storage and transmission of still and moving images. Fundamentals and still image communication techniques. Lossless coding principles. Arithmetic coding, run-length coding. Facsimile coding. Lossy compression principles, scalar quantization, vector quantization. Lossless and lossy predictive coding. Transform coding. Multiresolution coding, subband coding, and wavelets. EZW and SPIHT coding. Embedded image representations. Standards: ITU-T T.4, T.6, JBIG, JPEG, JPEG-2000. Students investigate image compression algorithms in Matlab. Prerequisites: 261, 278.
3 units, not given this year

EE 398B. Image Communication II—Second of two-course series. Digital video communication techniques. Interframe coding. Conditional replenishment. Motion-compensated prediction. Motion-compensated hybrid coding. Motion estimation. Rate distortion analysis and optimization of video coding schemes. Advanced motion compensation techiques. Scalable layered video representations. Error-resilient video coding. Applications: videotelephony, videoconferencing, digital TV broadcasting, Internet video streaming, wireless video. Standards: MPEG-1, MPEG-2, MPEG-4, ITU-T, H.261, H.263, H264. Students investigate video compression algorithms in Matlab or C. Term project. Prerequisite: 398A.
3 units, not given this year

EE 400. Thesis and Thesis Research—Limited to candidates for the degree of Engineer or Ph.D.

1-15 units, Aut, Win, Spr, Sum (Staff)

EE 402A. Topics in International Technology Management—Theme for 2007-08 is innovation systems and processes in Asia. Government funding, university/industry relations, and technology transfer in Asia, with the U.S. as point of comparison. How companies and entrepreneurs convert invention into profit. Guest speakers from industry and government.

1 unit, Aut (Dasher, R)

EE 402S. Topics in International Advanced Technology Research—Theme for 2007-08 is novel memory technologies and their applications. Nanomaterials such as complex metal oxides and ferroelectrics, and nanoscale phenomena such as electron spin, and their integration into novel circuits and system architectures. Challenges of developing real-world applications. Recommended: basic electronics.

1 unit, Spr (Dasher, R)

EE 402T. Entrepreneurship in Asian High Tech Industries—Patterns and challenges of entrepreneurship in Asia. Business and technology issues in start-up companies in Asian economies. Guest speakers from industry, government, and universities. May be repeated for credit.

1 unit, Spr (Dasher, R)

EE 410. Integrated Circuit Fabrication Laboratory—Fabrication, simulation, and testing of a highly simplified 1.5 micron CMOS process developed for this course. Practical aspects of IC fabrication including silicon wafer cleaning, photolithography, etching, oxidation, diffusion, ion implantation, chemical vapor deposition, physical sputtering, and wafer testing. Students perform simulations of the CMOS process using process simulator TSUPREM4 of the structures and electrical parameters that should result from the process flow in the lab. Taught in the Stanford Nanofabrication Facility (SNF) in the Center for Integrated Systems (CIS). Preference to students pursuing doctoral research program requiring SNF facilities. Enrollment limited to 20. Prerequisites: 212, 216, consent of instructor.

3-4 units, Win (Saraswat, K)

EE 414. Design of Discrete RF Circuits for Communications Systems—Students design, build, and test GHz transceivers using microstrip construction techniques and discrete components. The design, construction, and experimental characterization of representative transceiver building blocks: low noise amplifiers (LNAs), diode ring mixers, PLL-based frequency synthesizers, voltage-controlled oscillators (VCOs), power amplifiers (PAs), and microstrip filters and patch antennas. The characteristics of passive microstrip components (including interconnect). Emphasis is on a quantitative reconciliation of theoretical predictions and extensive experimental measurements performed with spectrum and network analyzers, time-domain reflectometers (TDRs), noise figure meter and phase noise analyzers. Prerequisites: 314, 344.

3 units, Spr (Lee, T)

EE 418. Topics in Neuroengineering—Neuroscience and electrical engineering, focusing on principles and theory in modern neural prosthetic systems (brain-computer or brain-machine interfaces). Electrical properties of neurons, information encoding, neural measurement techiques and technology, processing electronics, information decoding and estimators, and statistical data analysis. Prerequisites: 214, 278.

3 units, Win (Shenoy, K)

EE 453. Geomagnetically Trapped Radiation—Research on the radiation belts of Earth and other planets. Physical processes which lead to magnetic trapping of electrons and ions. Analytical tools for trapped radiation research. The nature of radiation belts, source and loss mechanisms, and the relation of radiation belts to other geophysical phenomena.

3 units, not given this year

EE 469B. RF Pulse Design for Magnetic Resonance Imaging—Magnetic resonance imaging (MRI) and spectroscopy (MRS) based on the use of radio frequency pulses to manipulate magnetization. Analysis and design of major types of RF pulses in one and multiple dimensions, analysis and design of sequences of RF pulses for fast imaging, and use of RF pulses for the creation of image contrast in MRI. Prerequisite: 369B.

3 units, not given this year

EE 477. Universal Schemes in Information Theory—Universal schemes for lossless and lossy compression, channel coding and decoding, prediction, denoising, and filtering. Characterization of performance limitations in the stochastic settting: entropy rate, rate-distortion function, channel capacity, Bayes envelope for prediction, denoising, and filtering. Lempel-Ziv lossless compression, and Lempel-Ziv based schemes for lossy compression, channel coding, prediction, and filtering. Discrete universal denoising. Compression-based approach to denoising. The compound decision problem. Prerequisites: 278, 376A,B.

3 units, not given this year

EE 478. Topics in Multiple User Information Theory—Topics in multiple user source and channel coding; multiple access channel, correlated source coding, broadcast channel, interference channel, relay channel, and channels with feedback; asymptotic capacity of networks; source coding with side information, multiple descriptions, channels with state, MIMO channels. Prerequisite: 376A.

3 units, not given this year

EE 479. Multiuser Digital Transmission Systems—Multiuser communications design, modulation, and reception. Capacity regions and fundamentally optimum designs for multiple access, broadcast, and interference channels. Iterative waterfilling, optimum spectrum balancing, band preference methods, vectoring, and multi-user generalized decision feedback equalization (GDFE) as used for vector broadcast and multiple access. Prerequisite: 379C.

3 units, not given this year

EE 492M. Space-Time Wireless Communications—For EE graduate students and wireless design engineers. Space-time wireless (smart antenna) communications and improvements in capacity, coverage, and quality of wireless networks. Multiple input multiple output (MIMO), and its use in WiFi and WIMAX systems and in next generation mobile systems such as 3GPPLTE. Prerequisites: 276, 278, 279. Recommended: 359.

3 units, Win (Paulraj, A)

COGNATE COURSES

Courses approved to fulfill EE program requirements at the level of 300-499 EE courses are listed below. See respective department listings for course descriptions. For applicability to a degree program, see http://eebulletin.stanford.edu/; click on the 2007-08 EE courses database link and select the Cognates layout.

APPPHYS 304. Lasers Laboratory

3 units, Win (Byer, R)

APPPHYS 305. Nonlinear Optics Laboratory

3 units, Spr (Byer, R)

APPPHYS 387. Quantum Optics and Measurements

3 units, Win (Yamamoto, Y), alternate years, not given next year

APPPHYS 388. Mesoscopic Physics and Nanostructures

3 units, Spr (Yamamoto, Y), alternate years, not given next year

CS 228. Probabilistic Models in Artificial Intelligence

3 units, Win (Koller, D)

CS 229. Machine Learning

3 units, Aut (Ng, A)

CS 243. Advanced Compiling Techniques

3-4 units, Win (Lam, M)

CS 245. Database Systems Principles

3 units, Win (Garcia-Molina, H)

CS 315A. Parallel Computer Architecture and Programming

3 units, Win (Olukotun, O)

CS 343. Advanced Topics in Compilers
3 units, Spr (Lam, M)

CS 344. Projects in Computer Networks
3 units, Spr (McKeown, N)

CS 346. Database System Implementation
3-5 units, not given this year

CS 347. Transaction Processing and Distributed Databases
3 units, Spr (Garcia-Molina, H)

CS 348A. Computer Graphics: Geometric Modeling
3-4 units, Win (Guibas, L)

CS 348B. Computer Graphics: Image Synthesis Techniques
3-4 units, Spr (Hanrahan, P)

CS 528. Broad Area Colloquium for Artificial Intelligence, Geometry, Graphics, Robotics, and Vision
1 unit, Aut, Spr (Staff)

ENGR 207A,B. Linear Control Systems I,II
3 units, **A:** *Aut,* **B:** *Win (Lall, S)*

ENGR 209A. Analysis and Control of Nonlinear Systems
3 units, Win (Staff)

ENGR 210B. Advanced Topics in Computation for Control
3 units, not given this year (Lall, S)

ENGR 341. Micro/Nano Systems Design and Fabrication Laboratory
3-5 units, Spr (Solgaard, O; Pruitt, B)

MATSCI 316. Nanoscale Science, Engineering, and Technology
3 units, Win (Cui, Y)

MATSCI 343. Organic Semiconductors for Electronics and Photonics
3 units, Win (McGehee, M; Peumans, P)

MS&E 310. Linear Programming
3 units, Aut (Ye, Y)

MS&E 311. Optimization
3 units, Win (Ye, Y)

MS&E 313. Vector Space Optimization
3 units (Luenberger, D) alternate years, not given this year

MS&E 321. Stochastic Systems
3 units, Spr (Glynn, P)

MS&E 322. Stochastic Calculus and Control
3 units, Win (Glynn, P), alternate years, not given next year

MS&E 336. Topics in Game Theory with Engineering Applications
3 units, Spr (Staff)

MS&E 338. Advanced Topics in Information Science and Technology
3 units, not given this year(Van Roy, B)

MS&E 339. Approximate Dynamic Programming
3 units, not given this year(Van Roy, B)

MS&E 351. Dynamic Programming and Stochastic Control
3 units, Spr (Veinott, A)

MUSIC 420. Signal Processing Models in Musical Acoustics
3-4 units, Win (Smith, J)

MUSIC 421. Audio Applications of the Fast Fourier Transform (FFT)
3-4 units, Spr (Smith, J)

MUSIC 422. Perceptual Audio Coding
3 units, Win (Bosi-Goldberg, M)

PSYCH 221. Applied Vision and Image Systems
1-3 units, Win (Wandell, B)

RAD 226. In Vivo Magnetic Resonance Spectroscopy and Imaging
3 units, Win (Spielman, D)

STATS 315A. Modern Applied Statistics: Learning
2-3 units, Aut (Tibshirani, R)

STATS 315B. Modern Applied Statistics: Data Mining
2-3 units, Win (Friedman, J)

OVERSEAS STUDIES

Courses approved for the Electrical Engineering major and taught overseas can be found in the “Overseas Studies” section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

BERLIN

OSPBER 40B. Introductory Electronics
5 units, Aut, Win (Howe, R), Spr (Wong, S)

OSPBER 50B. Introductory Science of Materials
4 units, Aut, Win, Spr (Staff)

FLORENCE

OSPFLOR 50F. Introductory Science of Materials
4 units, Aut, Win, Spr (Staff)

KYOTO

OSPKYOTO 40K. Introductory Electronics
5 units, Spr (Wong, S)

PARIS

OSPPARIS 40P. Introductory Electronics
5 units, Aut (Howe, R), Spr (Wong, S)

OSPPARIS 50P. Introductory Science of Materials
4 units, Aut, Win (Staff)

MANAGEMENT SCIENCE AND ENGINEERING

Emeriti: (Professors) James L. Adams, Kenneth J. Arrow, Richard W. Cottle, Donald A. Dunn, B. Curtis Eaves, Frederick S. Hillier, Donald L. Iglehart, James V. Jucker, Michael M. May, Robert V. Oakford, Henry E. Riggs, David A. Thompson
Chair: M. Elisabeth Paté-Cornell
Professors: Nicholas Bambos, Stephen R. Barley, Margaret L. Brandeau, Robert C. Carlson, Kathleen M. Eisenhardt, Peter W. Glynn, Warren H. Hausman, Ronald A. Howard, David G. Luenberger, M. Elisabeth Paté-Cornell, William J. Perry, Robert I. Sutton, James L. Sweeney, Arthur F. Veinott, Jr., Yinyu Ye
Associate Professors: Samuel S. Chiu, Ashish Goel, Pamela J. Hinds, Ross D. Shachter, Edison T. S. Tse, Benjamin Van Roy
Assistant Professors: Diane E. Bailey, Feryal Erhun, Kay Giesecke, Ramesh Johari, Riitta Katila, Ozalp Ozer, James A. Primbs, Amin Saberi, Thomas A. Weber
Professors (Research): Siegfried S. Hecker, Walter Murray, Michael A. Saunders, John P. Weyant
Professors (Teaching): Thomas H. Byers, Robert E. McGinn
Courtesy Professors: Anat Admati, Walter Powell
Courtesy Assistant Professor: Timothy Roughgarden
Lecturers: Steve Blank, Barchi Gillai, Gregory Hamm, Hill Huntington, Ferdo Ivanek, Mary Morrison, Andrew Nelson, Donna Novitsky, Lena Ramfelt, Tina Seelig, Rosanne Siino, Lynda Kate Smith
Consulting Professors: Gerd Infanger, Thomas Kosnik, James E. Matheson, Robert R. Maxfield, D. Warner North, Burke Robinson, Sam L. Savage, Behnam Tabrizi
Consulting Associate Professors: Adam Borison, Peter Haas, Samuel Holtzman, Randy Komisar, Michael Lyons, Audrey MacLean, Adam Seiver, F. Victor Stanton
Consulting Assistant Professors: Blake E. Johnson, Hervé Kieffel, Jan Pietzsch
Visiting Professor: Olivier de La Grandville
Visiting Associate Professors: Charles Feinstein, Yee-Tien Fu
Director of the Industrial Affiliates Program: Yinyu Ye

Department Offices: Terman Engineering Center, 380 Panama Mall
Mail Code: 94305-4026
Web Site: http://www.stanford.edu/dept/MSandE

Courses given in Management Science and Engineering have the subject code MS&E. For a complete list of subject codes, see Appendix.

In December 1999, the Board of Trustees authorized the creation of the Department of Management Science and Engineering from the Department of Industrial Engineering and Engineering Management and the Department of Engineering-Economic Systems and Operations Research. Its main objective is to be the leader at the interface of engineering, business, and public policy. The department's mission is, through education and research, to advance the design, management, operation, and interaction of technological, economic, and social systems. The department's engineering research strength is integrated with its educational program at the undergraduate, master's, and doctoral levels: graduates of the program are trained as engineers and future leaders in technology, policy, and industry. Research and teaching activities are complemented by an outreach program that encourages the transfer of ideas to the environment of Silicon Valley and beyond.

Management Science and Engineering (MS&E) provides programs of education and research by integrating three basic strengths: (1) depth in conceptual and analytical foundations; (2) comprehensive coverage of functional areas of application; and (3) interaction with other Stanford departments, Silicon Valley industry, and organizations throughout the world. The analytical and conceptual foundations include decision and risk analysis, dynamic systems, economics, optimization, organizational science, and stochastic systems. The functional areas of application include entrepreneurship, finance, information, marketing, organizational behavior, policy, production, and strategy. Close associations with other engineering departments and with industry enrich the programs by providing opportunities to apply MS&E methods to important problems and by motivating new theoretical developments from practical experience. MS&E's programs also provide a basis for contributing to other areas such as biotechnology, defense policy, environmental policy, information systems, and telecommunications.

CAREERS IN MS&E

MS&E helps students prepare for a variety of professional careers in business, government, industry, non-profit institutions, and universities. Graduates have pursued successful careers in consulting, enterprise management, financial analysis, government policy analysis, industrial research, line management, product development, project management, strategic planning, and university teaching and research. Some have founded companies specializing in financial services, high technology products, management and systems consulting, or software. Other graduates have helped establish new analytical capabilities in existing firms or government agencies.

Many graduates have become leaders in technology-based businesses, which have an increasing need for well-educated, analytically oriented people who understand both business and technology. The Department of MS&E is attractive to people with engineering, mathematical science, and physical science backgrounds as it complements their technical abilities with the conceptual frameworks needed to analyze problems of investment, management, marketing, operations, production, and strategic planning in a technical environment.

UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE

The program leading to the B.S. degree in Management Science and Engineering (MS&E) is stated earlier under the "School of Engineering" section of this bulletin, and more information is contained in the School of Engineering's *Handbook for Undergraduate Engineering Programs*. Students are encouraged to plan their academic programs as early as possible, ideally in the freshman or sophomore year. Students should not wait until they are declaring a major to consult with the department's student services staff. This is particularly important for students who would like to study overseas or pursue another major or minor.

The undergraduate curriculum in Management Science and Engineering provides students training in the fundamentals of engineering systems analysis to prepare them to plan, design, and implement complex economic and technological management systems where a scientific or engineering background is necessary or desirable. Graduates are prepared for work in a variety of career paths, including facilities and process management, investment banking, management consulting, or graduate study in industrial engineering, operations research, economics, public policy, medicine, law, or business.

The educational objectives of the undergraduate degree program are:

1. *Principles and Skills:* provide students with a basic understanding of management science and engineering principles, including analytical problem solving and communications skills.
2. *Preparation for Practice:* prepare students for practice in a field that sees rapid changes in tools, problems, and opportunities.
3. *Preparation for Continued Growth:* prepare students for graduate study and self development over an entire career, and
4. *Preparation for Service:* develop in students the awareness, background, and skills necessary to become responsible citizens, employees, and leaders.

In particular, the department wants to help students develop:

1. an ability to apply knowledge of math, science, and engineering.
2. an ability to design and conduct experiments.
3. an ability to design a system or components to meet desired needs.
4. an ability to identify, formulate, and solve engineering problems.
5. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

6. an ability to function on multidisciplinary teams.
7. an ability to communicate effectively.
8. a recognition of the need for and an ability to engage in life-long learning.
9. background necessary for admission to top professional graduate engineering or business programs.
10. an understanding of professional and ethical responsibility.
11. the broad education necessary to understand the impact of engineering solutions in a global and societal context.
12. a knowledge of contemporary issues pertinent to the field of management science and engineering.

The program builds on the foundational courses for engineering, including calculus, engineering fundamentals, and physics or chemistry.

The department core, taken for all concentrations, includes courses in computer science, deterministic optimization, information, organization theory, a senior project, and finance or production. Through the core, students in the program are exposed to the breadth of faculty interests, and are in a good position to choose a concentration during the junior year.

The five concentrations are designed to allow a student to explore one area of the department in greater depth.

1. *Financial and Decision Engineering:* focuses on the design and analysis of financial and strategic plans. It features accounting, decision analysis, economics, finance, investment science, and stochastic models.
2. *Operations Research:* provides a more mathematical program, based on algorithms, theory, and applications in economics and operations.
3. *Organization, Technology, and Entrepreneurship:* focuses on understanding and design of organizations, particularly technology-based issues. It features courses on innovation, product development, entrepreneurship, work and manufacturing systems, information systems, and human-computer interaction.
4. *Production and Operations Management:* focuses on the design and analysis of manufacturing, production, and service systems.
5. *Policy and Strategy*: focuses on the design and analysis of public policies and corporate strategies, especially those with technology-based issues. It features a core in microeconomics and modeling approaches, and policy-focused courses in topics such as national security, energy and environment, and health care, and strategy-focused courses in topics such as entrepreneurship, innovation, and product development.

For information about an MS&E minor, see the "School of Engineering" section of this bulletin.

MS&E also participates with the departments of Computer Science, Mathematics, and Statistics in a program leading to a B.S. in Mathematical and Computational Science. See the "Mathematical and Computational Science" section of this bulletin.

GRADUATE PROGRAMS

MS&E, in collaboration with other departments of the University, offers programs leading to the degrees of Master of Science and Doctor of Philosophy. The department also offers a coterminal B.S./M.S. degree, and a dual master's degree in cooperation with each of the other departments in the School of Engineering.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

Applicants for admission as graduate students in MS&E must submit the results of the verbal, quantitative, and analytical parts of the Graduate Record Examination. The deadline for application is January 8 for doctoral and master's applicants.

Except in unusual circumstances, admission is limited to the Autumn Quarter because courses are arranged sequentially with basic courses and prerequisites offered early in the academic year.

Assistantships and Fellowships—A limited number of fellowships and assistantships are awarded each year. Applicants admitted to the doctoral program, who have indicated on their application that they would like to be considered for financial aid, are automatically considered for these assistantships and fellowships.

Information about loan programs and need-based aid for U.S. citizens and permanent residents can be obtained from the Financial Aid Office.

MASTER OF SCIENCE

The M.S. degree programs require a minimum of 45 units beyond the equivalent of a B.S. degree at Stanford. All programs represent substantial progress in the major field beyond the bachelor's degree.

University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin.

MANAGEMENT SCIENCE AND ENGINEERING

The M.S. program in Management Science and Engineering (MS&E) prepares individuals for a lifelong career addressing critical technical and managerial needs in private and public decision making. Department requirements for the M.S. degree provide breadth across some of the areas of the department, and flexibility for meeting individual objectives of depth in a particular area of concentration. The master's degree may be a terminal degree program with a professional focus, or a preparation for a more advanced graduate program. The M.S. degree can normally be earned in one academic year (three academic quarters) of full-time work, although students may choose to continue their education by taking additional MS&E courses beyond that year. Background requirements, taken in addition to degree requirements, must be met by students who have had insufficient course work in mathematical sciences, computer science, engineering and/or natural sciences.

Students must take a minimum of 45 course units as follows:

1. At least five core courses
2. At least three other courses in an area of concentration of their choice
3. A course in probability, unless a college-level course in probability has already been passed
4. A project course requirement
5. The remaining units in elective courses

Background Requirements—Students must have had or must take the following (or equivalent) courses before the M.S. degree is conferred: MATH 41, 42, 51, Calculus, 15 units; CS 106A Programming Methodology, 5 units, and an additional 15 units of engineering, mathematical sciences, or natural sciences. These courses do not count toward the 45 units of the M.S. degree. Courses taken to meet MS&E background requirements may be at either the undergraduate or graduate level, and may be taken as credit/no credit. These additional background requirements would typically be met by students who have a bachelor's degree in engineering, or mathematical or natural sciences.

Core Courses—M.S. students must take at least five courses out of the following ten options:

MS&E 201. Dynamic Systems *or* MS&E 251. Stochastic Decision Models
MS&E 211. Linear and Nonlinear Optimization
MS&E 221. Introduction to Stochastic Modeling *or* MS&E 223. Simulation
MS&E 240. Industrial Accounting *or* MS&E 242. Investment Science
MS&E 241. Economic Analysis
MS&E 252. Decision Analysis *or* MS&E 250A. Risk Analysis
MS&E 261. Production Systems
MS&E 270. Strategy in Technology-Based Companies
MS&E 271. Global Entrepreneurial Marketing
MS&E 280. Organizational Behavior and Management

Students may not waive core courses. They may, however, petition to substitute an approved, more advanced course in the same area. Courses used to satisfy the core requirement must be taken for a letter grade, must be taken for a minimum of three units each, and may not also be used to satisfy the concentration requirement.

Courses in an Area of Concentration—Students must complete a departmentally approved set of three or more letter-graded courses taken for a minimum of three units each, in an area of concentration of one of the following types:

1. An area of concentration in the MS&E department
2. An area of concentration in one of the seven other departments of the School of Engineering

3. In exceptional cases, a coherent area of concentration designed by the student. Petitions for student-designed concentrations must list the three proposed courses (taken for three units or more and at the 200-level or above) and include a brief justification. The petition must be submitted to student services no later than the fifth week of the quarter prior to graduation.

Project Course Requirement—Students must take either a designated project course or two designated integrated project courses. The project course(s) must be taken for letter grade, must be taken for a minimum of three units, and may also be used to satisfy the core or concentration requirement.

Additional requirements are:

1. At least 45 units must be in courses numbered 100 and above
2. At least 27 units must be in courses numbered 200 and above in MS&E, taken for a letter grade and a minimum of two units each, and at least 36 letter-graded units must be in MS&E or closely related fields. Closely related fields include any department in the School of Engineering, mathematics, statistics, economics, sociology, psychology, or business.
3. The degree program must be completed with a grade point average (GPA) of 3.0 or higher.
4. A maximum of three units of language courses (numbered 100 and above)
5. A maximum of three units of 1-unit courses such as seminars, colloquia, workshops, in any department, and a maximum of one unit of MS&E 208A, B, or C, Curricular Practical Training.
6. A maximum of 18 non-degree option (NDO) units through the Stanford Center for Professional Development (SCPD)
7. Courses in athletics may not be applied toward the degree.

Please see the student services office or department web site for complete listing of project, integrated project and approved concentrations.

ENERGY AND ENVIRONMENT

The Energy and Environment M.S. track is designed for students interested in energy and environmental issues from the perspectives of public policy, nongovernmental organizations, or corporations. This track includes core courses that provide the conceptual background in economics, decisions, strategy, investment, and organizational behavior; courses in energy resources, natural resource economics, and energy/environmental policy analysis; and an individually designed concentration emphasizing policy, strategy, and/or technology. Seminars provide insights into current corporate strategy, public policy, and research community developments. Energy/environmental project courses give practice in applying methodologies and concepts. Students can complete the program in one year or may extend the program up to two years, taking additional courses for greater depth and breadth. For additional information, see http://www.stanford.edu/dept/MSandE/academics/energyenvironment.html.

DUAL MASTER'S DEGREE

Admission—For the dual degree, admission to two departments is required, but is coordinated by designated members of both Admissions Committees who make recommendations to the committees of their respective departments. Students may apply to only one Department initially. After the first quarter at Stanford, students may apply to be admitted to the second Department.

Advising—Every student in the dual degree program has one adviser in each department.

The Dual Degree Program—This dual degree program enables a small set of graduate students to obtain two master's degrees simultaneously. Students complete the course requirements for each department. A total of 90 units is required to complete the dual master's degree.

PROFESSIONAL EDUCATION

The Stanford Center for Professional Development (SCPD) provides opportunities for employees of some local and remote companies to take courses at Stanford.

The Honors Cooperative Program (HCP) provides opportunities for employees of SCPD Member companies to earn an M.S. degree, over a longer period, by taking one or two courses per academic quarter. Some courses are only offered on campus; HCP students may attend those courses at Stanford to meet the degree requirements. It is possible to complete this program as a remote HCP student although the remote offerings are limited. Students must apply for a degree program through the standard application process, and must meet the standard application deadline of January 8, 2008.

The non-degree option (NDO) allows employees of some local companies to take courses for credit from their company sites before being admitted to a degree program. Students apply to take NDO courses each quarter through the Stanford Center for Professional Development. Up to 18 units taken as an NDO student may be applied toward a degree program. For additional information about the NDO application process and deadlines, see http://scpd.stanford.edu, or contact SCPD at (650) 725-3000.

The department offers a certificate program within the framework of the NDO program. A certificate can be obtained by completing three MS&E core courses, plus one MS&E elective course for a total of four courses. For further information, see http://scpd.stanford.edu/scpd/programs/certs/managementSci.htm.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. degree are described in the "Graduate Degrees" section of this bulletin.

The Ph.D. degree in MS&E is intended for students primarily interested in a career of research and teaching, or high-level technical work in universities, industry, or government. The program requires three years of full-time graduate study, at least two years of which must be at Stanford. Typically, however, students take about four to five years after entering the program to complete all Ph.D. requirements. The Ph.D. is generally organized around the requirement that the students acquire a certain breadth across some of the eight areas of the department, and depth in one of them. These fields of study are:

Decision analysis and risk analysis
Economics and finance
Information science and technology
Organization, technology, and entrepreneurship
Policy and strategy
Probability and stochastic systems
Production and operations management
Systems modeling and optimization

Doctoral students are required to take a number of courses, both to pass a qualifying exam in one of these areas, or the Systems Program which is a combination of several areas, and to complete a dissertation based on research which must make an original contribution to knowledge.

Each student admitted to the Ph.D. program must satisfy a breadth requirement and pass a qualification procedure. The purpose of the qualification procedure is to assess the student's command of the field and to evaluate his or her potential to complete a high-quality dissertation in a timely manner. The student must complete specified course work in one of the eight areas of the department, or the Systems Program which is a combination of several areas. The qualification decision is based on the student's grade point average (GPA), on the one or two preliminary papers prepared by the student, and on the student's performance in an area examination. Considering this evidence, the department faculty votes on advancing the student to candidacy in the department at large. The Ph.D. requires a minimum of 135 units, at least 54 of which must be in courses of 3 units or more. At least 48 course units in courses of 3 units or more must be taken for a letter grade. Finally, the student must pass a University oral examination and complete a Ph.D. dissertation. During the course of the Ph.D. program, students who do not have a master's degree are strongly encouraged to complete one, either in MS&E or in another Stanford department.

Breadth Requirement—

1. The breadth requirement is to be satisfied by a choice of four courses spanning four out of the above mentioned eight areas of the department. The list of courses satisfying the breadth requirement is available from the MS&E student services office.

2. The Ph.D. candidacy form must contain four courses that satisfy the breadth requirement.
3. Courses chosen to satisfy the breadth requirement must be taken for letter grades.
4. At least one of the four courses chosen to satisfy the breadth requirement must be at the 300 level.

Qualification Procedure Requirements—The qualification procedure is based both on breadth across the department's disciplines and depth in an area of the student's choice. The qualification process must be completed by the end of the month of May of the student's second year of graduate study in the department. The performance of all doctoral students is reviewed every year at a department faculty meeting at the end of May or beginning of June. Ph.D. qualification decisions are made at that time and individual feedback is provided.

The Ph.D. qualification requirements comprise these elements:

1. *Grade Point Average:* a student must maintain a GPA of at least 3.4 in the four courses chosen to satisfy the breadth requirements, and a GPA of at least 3.4 in the set of all courses taken by the student within the department. In both cases, the GPA is computed on the basis of the nominal number of units for which each course is offered.
2. *Paper(s):* a student may choose between two options, either to be completed before the Spring Quarter of the student's second year. The first option involves one paper supervised by a primary faculty adviser and a faculty consultant. This paper should be written in two quarters.

   The second option involves two shorter sequential tutorials, with two different faculty advisers. Each tutorial should be completed in one quarter. In both options, the student chooses the faculty adviser(s)/ consultant with the faculty members' consent.

   A student may register for up to 3 units per tutorial and up to 6 units for a paper. These paper or tutorial units do not count towards the 54 course units required for the Ph.D., and letter grades are not given.
3. *Area Qualification:* in addition, during the second year, a student must pass an examination in one of the eight areas of the MS&E department or the Systems Program which is a combination of several areas, which is of the student's choice. This area examination is written, oral, or both at the discretion of the area faculty administering the exam.
4. *Area Course Requirement:* students must complete the depth requirements of one of the eight fields of study of the MS&E department or the Systems Program which is a combination of several areas. Courses used to satisfy depth requirements must be taken for a letter grade. The Ph.D. requirements for the eight areas of the MS&E department are available from the MS&E student services office.

PH.D. MINOR

Students pursuing a Ph.D. in another department who wish to receive a Ph.D. minor in Management Science and Engineering should consult the MS&E student services office. A minor in MS&E may be obtained by completing 20 units of approved graduate-level MS&E courses, of which at least 6 units must be at the 300-level. Courses approved for the minor must form a coherent program, and must include one course from at least three of the ten MS&E M.S. core options. The program must include a minimum of 16 letter-graded units, and a minimum grade point average of 3.3 must be achieved in these courses.

JOINT MS&E AND LAW DEGREES

The School of Law and the Department of Management, Science and Engineering offer joint degree programs leading to a J.D. degree and an M.S. degree in MS&E, or to a J.D. and Ph.D. in MS&E. These programs are designed for students who wish to prepare themselves for careers in areas relating to both law and to the decision making, policy making, and problem solving knowledge and skills developed in the MS&E program. Students interested in either joint degree program must apply and gain admission separately to the School of Law and the Department of Management, Science and Engineering and, as an additional step, must secure consent from both academic units to pursue degrees in those units as part of a joint degree program. Interest in either joint degree program should be noted on the student's admission applications and may be considered by the admission committee of each program. Alternatively, an enrolled student in either the Law School or MS&E may apply for admission to the other program and for joint degree status in both academic units after commencing study in either program.

Joint degree students may elect to begin their course of study in either the School of Law or MS&E. Students are assigned to a joint program committee composed of at least one faculty member from Law and one from MS&E. This committee plans the student's program jointly with the student. Students must be enrolled full time in the Law School for the first year of law studies, and it is recommended that students devote exclusively one Autumn Quarter to the MS&E M.S. program to initiate their MS&E work. After that time, enrollment may be in MS&E or Law, and students may choose courses from either program regardless of where enrolled. A candidate in the joint J.D./Ph.D. program should spend a substantial amount of full time residency in MS&E. Students must satisfy the requirements for both the J.D. and the M.S. or Ph.D. degrees as specified in this bulletin or by the School of Law . The Law School may approve courses from MS&E or courses in the student's MS&E program from outside of the Department of Management, Science and Engineering that may count toward the J.D. degree, and MS&E may approve courses from the Law School that may count toward the M.S. or Ph.D. degree in MS&E. In either case, approval may consist of a list applicable to all joint degree students or may be tailored to each individual student's program. The lists may differ depending on whether the student is pursuing an M.S. or a Ph.D. in MS&E.

In the case of a J.D./M.S. program, no more than 30 semester (45 quarter) hours of approved courses may be counted toward both degrees. In the case of a J.D./Ph.D. program, no more than 36 semester (54 quarter) hours of approved courses may be counted toward both degrees. In either case, no more than 24 semester (36 quarter) hours of courses that originate outside the Law School may count toward the law degree. To the extent that courses under this joint degree program originate outside the Law School but count toward the law degree, the law credits permitted under Section 17(1) of the Law School Regulations are reduced on a unit-per-unit basis, but not below zero. The maximum number of law school credits that may be counted toward the M.S. in MS&E is the greater of: (a) 12 semester (18 quarter) hours in the case of the M.S., or (b) the maximum number of hours from courses outside the department that an M.S. candidate in MS&E is permitted to count toward the applicable degree under general departmental guidelines or under departmental rules that apply in the case of a particular student.

Tuition and financial aid arrangements are normally through the school in which the student is then enrolled.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations for undergraduates (8 units maximum).

UNDERGRADUATE

MS&E 41. Financial Literacy—Practical knowledge about personal finance and money management including budgeting, pay checks, credit cards, banking, insurance, taxes, and saving. Class especially appropriate for those soon to be self-supporting. Limited enrollment.

1 unit, Win, Spr (Morrison, M)

MS&E 76. Pre-field Course for Alternative Spring Break—Preparation course for the Alternative Spring Break program, administered through the Haas Center for Public Service. Readings and guest speakers focus on discovering social entrepreneurship as a technique for large-scale social change, focusing on innovative individuals and organizations in the Bay Area. Emphasis is on developing an entrepreneurial approach to social-sector problems.

1 unit, Win (Seelig, T)

MS&E 92Q. International Environmental Policy—Stanford Introductory Seminar. Preference to sophomores. Science, economics, and politics of international environmental policy. Current negotiations on global climate change, including actors and potential solutions. Sources include briefing materials used in international negotiations and the U.S. Congress.

4 units, Win (Weyant, J)

MS&E 93Q. Nuclear Weapons, Terrorism, and Energy—Stanford Introductory Seminar. Preference to sophomores. What are nuclear weapons and what do they do? Why do some nations want them? What are the risks of nuclear terrorism? What is radioactivity? What role does nuclear power play? Can it help with global warming? Emphasis is on policy options in the light of changes in the world. Recommended: a course in international relations, engineering, or physical science. GER:DB-EngrAppSci

3 units, Spr (Hecker, S)

MS&E 94Q. The Public Use and Misuse of Mathematics: How to Interpret Numbers as Used by Media and Politicians—Stanford Introductory Seminar. Preference to sophomores. How to unearth and interpret relevant math to illuminate underlying political and economic issues. How to interpret public budgets, whether jury pool selection is biased, estimate pollution risks, and when to believe poll results and statistical relationships; how to deal with rare but high-consequence eventualities such as terrorism, a nuclear meltdown, or a possible pandemic. How to determine how much to pay to reduce carbon emissions, when a medicine should be withdrawn, and what is a useful forecast.

3 units, Spr (May, M)

MS&E 101. Undergraduate Directed Study—Subject of mutual interest to student and faculty member. Prerequisite: faculty sponsor.

1-15 units, Aut, Win, Spr, Sum (Staff)

MS&E 107. Interactive Management Science—(Graduate students register for 207.) Analytical techniques such as linear and integer programming, Monte Carlo simulation, forecasting, decision analysis, and Markov chains in the environment of the spreadsheet. Probability management. Materials include spreadsheet add-ins for implementing these and other techniques. Emphasis is on building intuition through interactive modeling, and extending the applicability of this type of analysis through integration with existing business data structures. GER:DB-EngrAppSci

3 units, Aut (Savage, S)

MS&E 108. Senior Project—Restricted to MS&E majors in their senior year. Students carry out a major project in groups of four, applying techniques and concepts learned in the major. Project work includes problem identification and definition, data collection and synthesis, modeling, development of feasible solutions, and presentation of results.

5 units, Win (Brandeau, M; Hecker, S; Shachter, R; Tse, E)

MS&E 111. Introduction to Optimization—(Same as ENGR 62.) Formulation and analysis of linear optimization problems. Solution using Excel solver. Polyhedral geometry and duality theory. Applications to contingent claims analysis, production scheduling, pattern recognition, two-player zero-sum games, and network flows. Prerequisite: MATH 51. GER:DB-EngrAppSci

4 units, Aut (Goel, A), Spr (Van Roy, B)

MS&E 112. Mathematical Programming and Combinatorial Optimization—(Graduate students register for 212; same as CME 208.) Combinatorial and mathematical programming (integer and nonlinear) techniques for optimization. Topics: linear program duality and LP solvers; integer programming; combinatorial optimization problems on networks including minimum spanning trees, shortest paths, and network flows; matching and assignment problems; dynamic programming; linear approximations to convex programs; NP-completeness. Hands-on exercises. Prerequisites: CS 106A or X; ENGR 62 or MATH 103. GER:DB-EngrAppSci

3 units, Win (Saberi, A)

MS&E 120. Probabilistic Analysis—Concepts and tools for the analysis of problems under uncertainty, focusing on model building and communication: structuring, processing, and presentation of probabilistic information. Examples from legal, social, medical, and physical problems. Spreadsheets illustrate and solve problems as a complement to analytical closed-form solutions. Topics: axioms of probability, probability trees, random variables, distributions, conditioning, expectation, change of variables, and limit theorems. Prerequisite: MATH 51. Recommended: knowledge of spreadsheets. GER:DB-EngrAppSci

5 units, Aut (Shachter, R)

MS&E 121. Introduction to Stochastic Modeling—Stochastic processes and models in operations research. Discrete and continuous time parameter Markov chains. Queuing theory, inventory theory, simulation. Prerequisite: 120 or Statistics 116. GER:DB-EngrAppSci

4 units, Win (Glynn, P)

MS&E 130. Information Systems and Networks—Technical, social, and economic issues in modern information networks. Introduction to Internet architectures and search technologies. Network economics and the pricing of digital goods. Advertising and marketing models for the Internet. Social interaction in the networked society emphasizing how information systems have altered work and the workplace. Recommendation systems, reputation systems, and information markets. Prequisite: CS 106B or X.

3 units, Spr (Barley, S)

MS&E 134. Organizations and Information Systems—(Graduate students register for 234.) How information systems impact organizations and how organizations take control of information technology (IT) to gain a competitive edge. Topics include: IT components, architecture, and transformation; the effect of IT on competition; real-time enterprise; leadership; and outsourcing. Student teams perform field studies based on situations in which information technology is creating a significant management problem or business opportunity. Enrollment limited. Prerequisites: CS 106A, 180, or equivalents.

4 units, Win (Tabrizi, B)

MS&E 140. Industrial Accounting—(Graduate students register for 240.) Non-majors and minors who have taken or are taking elementary accounting should not enroll. Introduction to accounting concepts and the operating characteristics of accounting systems. The principles of financial and cost accounting, design of accounting systems, techniques of analysis, and cost control. Interpretation and use of accounting information for decision making. Designed for the user of accounting information and not as an introduction to a professional accounting career.

3-4 units, Win, Sum (Stanton, F)

MS&E 142. Investment Science—(Graduate students register for 242.) Theory and application of modern quantitative investment analysis from an engineering perspective. How investment concepts are used to evaluate and manage opportunities, portfolios, and investment products including stocks, bonds, mortgages, and annuities. Topics: deterministic cash flows (term structure of interest rates, bond portfolio immunization, project optimization); mean-variance theory (Markowitz model, capital asset pricing); and arbitrage pricing theory. Group project. Prerequisites: 120, ENGR 60, MATH 51, or equivalents. Recommended: 140, ENGR 62, knowledge of spreadsheets.

3 units, Aut (Primbs, J)

MS&E 152. Introduction to Decision Analysis—(Same as 152W.) How to make good decisions in a complex, dynamic, and uncertain world. People often make decisions that on close examination they regard as wrong. Decision analysis uses a structured conversation based on actional thought to obtain clarity of action in a wide variety of domains. Topics: distinctions, possibilities and probabilities, relevance, value of information and experimentation, relevance and decision diagrams, risk attitude. Students seeking to fulfill the Writing in the Major requirement should register for MS&E 152W. GER:DB-EngrAppSci

3-4 units, Spr (Shachter, R)

MS&E 152W. Introduction to Decision Analysis—(Same as 152.) For students seeking to fulfill the Writing in the Major requirement. GER:DB-EngrAppSci, WIM

3-4 units, Spr (Shachter, R)

MS&E 153. Introduction to Decision Making in Organizations—Experienced management consultants share lessons and war stories. Case studies, disguised examples from real engagements, and movie clips illustrate theories and concepts of decision analysis. Student teams critique decisions made in actual organizations. Topics include what makes a good decision, how decisions can be made better, framing and structuring techniques, modeling and analysis tools, biases and probability assessment, evaluation and appraisal methods, decision mindsets, creativity, leadership, and effective presentation styles.

3 units, Sum (Holtzman, S; Robinson, B)

MS&E 154. Business Strategy and Public Policy Decision Making—Comparative study of how decision makers should formulate, evaluate, and implement strategy or policy in organizations of all sizes. Student teams apply qualitative and quantitative methods to private sector strategies, such as Internet company growth, entrepreneurial start-up, or corporate R&D portfolio, and public sector policies, such as nuclear nonproliferation, flu pandemic mitigation, and terrorist attack prevention. Topics: right people doing the right thing in the right way; framing key issues and challenges; crafting doable strategies and policies; capturing uncertainties; resolving value dilemmas; analyzing consequences; testing sensitivities; gathering additional information; and committing to action.

3 units, Sum (Robinson, B)

MS&E 160. Analysis of Production and Operating Systems—(Graduate students register for 260; see 260.)

4 units, Aut (Ozer, A)

MS&E 169. Quality Control and Management—(Graduate students register for 269; see 269.)

3-4 units (Staff) not given this year

MS&E 175. Innovation, Creativity, and Change—Problem solving in organizations; creativity and innovation skills; thinking tools; creative organizations, teams, individuals, and communities.

3-4 units (Katila, R) alternate years, given next year

MS&E 180. Organizations: Theory and Management—For undergraduates only; preference to MS&E majors. Classical and contemporary organization theory; the behavior of individuals, groups, and organizations. Limited enrollment. Students must attend first session.

4 units, Aut (Siino, R), Spr (Eisenhardt, K)

MS&E 181. Issues in Technology and Work for a Post-Industrial Economy—How changes in technology and organization are altering work and lives. Approaches to studying and designing work. How understanding work and work practices can assist engineers in designing better technologies and organizations. Topics include job design, distributed and virtual organizations, the blurring of boundaries between work and family life, computer supported cooperative work, trends in skill requirements and occupational structures, monitoring and surveillance in the workplace, downsizing and its effects on work systems, project work and project-based lifestyles, the growth of contingent employment, telecommuting, electronic commerce, and the changing nature of labor relations.

3 units, Spr (Nelson, A)

MS&E 184. Technology and Work—Interplay between technology and work, emphasizing technological change and its impact on workers at all levels. Technologies include the assembly line, computer and information systems, cardiac surgery techniques, and advanced computational software. Motivations for and consequences of change, including rationalization, deskilling, reskilling, offshoring, and increasing abstraction of work.

3 units, Aut (Bailey, D)

MS&E 185. Global Work—Issues, challenges, and opportunities facing workers, teams, and organizations working across national boundaries. Topics include geographic distance, time zones, language and cultural differences, technologies to support distant collaboration, team dynamics, and corporate strategy.

4 units (Hinds, P) not given this year

MS&E 190. Methods and Models for Policy and Strategy Analysis—Guest lectures by departmental practitioners. Emphasis is on links among theory, application, and observation. Environmental, national security, and health policy; marketing, new technology, and new business strategy analyses. Comparisons between domains and methods.

3 units, Spr (Eisenhardt, K)

MS&E 193. Technology and National Security—(Graduate students register for 293; same as 193W.) The interaction of technology and national security policy from the perspective of history to implications for the new security imperative, homeland defense. Key technologies in nuclear and biological weapons, military platforms, and intelligence gathering. Policy issues from the point of view of U.S. and other nations. The impact of terrorist threat. Guest lecturers include key participants in the development of technology and/or policy. Students seeking to fulfill the WIM requirement should register for 193W.

3 units, Aut (Perry, W; Hecker, S)

MS&E 193W. Technology and National Security—(Same as 193/293.) For students seeking to fulfill the Writing in the Major requirement. WIM

3 units, Aut (Perry, W; Hecker, S)

MS&E 196. Transportation Systems and Urban Development—(Graduate students register for 296.) Transportation systems and planning, and their roles in society. Analytical tools at a conceptual level to examine issues and evaluate alternatives. Policy implications and system effectiveness analysis of transportation in an urban context. Topics: economic analysis of transportation, supply and demand equilibrium analysis, urban transportation networks, congestion management, short and long term transportation planning, the impact of technology on transportation systems, land use and transportation, case studies of current transportation news items. Prerequisite: MATH 41.

3 units, Win (Chiu, S)

MS&E 197. Ethics and Public Policy—(Same as PUBLPOL 103B, STS 110.) Ethical issues in science- and technology-related public policy conflicts. Focus is on complex, value-laden policy disputes. Topics: the nature of ethics and morality; rationales for liberty, justice, and human rights; and the use and abuse of these concepts in policy disputes. Case studies from biomedicine, environmental affairs, technical professions, communications, and international relations. GER:DB-Hum, EC-EthicReas, WIM

5 units, Win (McGinn, R)

MS&E 198. Applied Modeling of Energy and Environmental Markets—Economic principles in models of energy and environmental markets. Spreadsheet examples for developing insights and communicating with decision makers. Market-clearing conditions, controlling emissions through fees, diffusion of new technologies, resource depletion, cartel behavior, and model evaluation. Prerequisites: ECON 50 and spreadsheets, or consent of instructor.

1 unit, Aut (Huntington, H)

COGNATE COURSES (UNDERGRADUATE)

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the department's student services office for applicability of these courses to a major or minor program.

ENGR 60. Engineering Economy

3 units, Aut (Chiu, S), Win, Sum (Weber, T)

ENGR 145. High Technology Entrepreneurship

4 units, Aut (Gould, A; Kosnik, T), Win (Byers, T; Komisar, R, Kosnik, T)

POLISCI 114S. International Security in a Changing World—(Same as IPS 241.)

5 units, Win (Sagan, S; Blacker, C)

PRIMARILY FOR GRADUATE STUDENTS

GENERAL AND SYSTEMS ANALYSIS METHODS

MS&E 201. Dynamic Systems—Goal is to think dynamically in decision making, and recognize and analyze dynamic phenomena in diverse situations. Concepts: formulation and analysis; state-space formulation; solutions of linear dynamic systems, equilibria, dynamic diagrams; eigenvalues and eigenvectors of linear systems, the concept of feedback; nonlinear dynamics, phase plane analysis, linearized analysis, Liapunov functions, catastrophe theory. Examples: grabber-holder dynamics, technology innovation dynamics, creation of new game dynamics in business competition, ecosystem dynamics, social dynamics, and stochastic exchange dynamics. Prerequisite: MATH 103 or equivalent.
3-4 units, Spr (Tse, E)

MS&E 206. Art of Mathematical Modeling—Practicum. Students build mathematical models of real-life, ill-framed problems. Emphasis is on framing the issues, articulating modeling components logically (drawing from student's mathematical background), and analyzing the resulting model. Hands-on modeling. Project work in small groups. Prerequisites: basic analysis, calculus and algebra, and probability theory. Recommended: decision analysis, optimization and dynamic systems.
3-4 units, Spr (Kieffel, H)

MS&E 207. Interactive Management Science—(Undergraduates register for 107; see 107.)
3 units, Aut (Savage, S)

MS&E 208A,B,C. Practical Training—MS&E students obtain employment in a relevant industrial or research activity to enhance professional experience, consistent with the degree program they are pursuing. Students submit a one-page statement showing relevance to degree program along with offer letter before the start of the quarter, and a 2-3 page final report documenting the work done and relevance to degree program at the conclusion of the quarter. Master's students are limited to one quarter of practical training. B.S. and Ph.D. students may take each of A, B, and C once.
1 unit, Aut, Win, Spr, Sum (Staff)

OPTIMIZATION

MS&E 211. Linear and Nonlinear Optimization—Optimization theory and modeling. The role of prices, duality, optimality conditions, and algorithms in finding and recognizing solutions. Perspectives: problem formulation, analytical theory, computational methods, and recent applications in engineering, finance, and economics. Theories: finite dimensional derivatives, convexity, optimality, duality, and sensitivity. Methods: simplex and interior-point, gradient, Newton, and barrier. Prerequisite: MATH 51.
3-4 units, Aut (Ye, Y)

MS&E 212. Mathematical Programming and Combinatorial Optimization—(Undergraduates register for 112; see 112; same as CME 208.)
3 units, Win (Saberi, A)

PROBABILITY AND STOCHASTIC SYSTEMS

MS&E 220. Probabilistic Analysis—Concepts and tools for the analysis of problems under uncertainty, focusing on model building and communication: the structuring, processing, and presentation of probabilistic information. Examples from legal, social, medical, and physical problems. Spreadsheets illustrate and solve problems as a complement to analytical closed-form solutions. Topics: axioms of probability, probability trees, random variables, distributions, conditioning, expectation, change of variables, and limit theorems. Prerequisite: MATH 51. Recommended: knowledge of spreadsheets.
3-4 units, Aut (Chiu, S)

MS&E 221. Stochastic Modeling—Focus is on time-dependent random phenomena. Topics: discrete and continuous time Markov chains, renewal processes, queueing theory, and applications. Emphasis is on building a framework to formulate and analyze probabilistic systems. Prerequisite: 220 or consent of instructor.
3 units, Win (Johari, R)

MS&E 223. Simulation—Discrete-event systems, generation of uniform and non-uniform random numbers, Monte Carlo methods, programming techniques for simulation, statistical analysis of simulation output, efficiency-improvement techniques, decision making using simulation, applications to systems in computer science, engineering, finance, and operations research. Prerequisites: working knowledge of a programming language such as C, C++, Java, or FORTRAN; probability; and statistical methods.
3 units, Spr (Haas, P)

INFORMATION SCIENCE AND TECHNOLOGY

MS&E 234. Organizations and Information Systems—(Undergraduates register for 134; see 134.)
4 units, Win (Tabrizi, B)

MS&E 235. Internet Commerce—The technology, mathematics, and economics of Internet commerce. Topics include: models of Internet commerce; online advertising; product recommendation systems and personalized marketing; pricing and delivery of digital media; web tools; piracy, copyright, and peer-to-peer networks; rating and reviewing of online businesses; and co-evolution of Internet technology and commerce. Hands-on exercises; group project. Prerequisites: 111 or 211, and CS 106B or X.
3 units, Win (Goel, A)

MS&E 237. Progress in Worldwide Telecommunications—Interdisciplinary. Guest speakers from industry, government and academia. Topics include networks and services, market-driven competition, policy, regulation and deregulation, technology, standardization, and the needs of underserved parts of the world. Focus is on wireless communications, broadband user access, the Internet, and globalization. Individual or team case study and verbal presentation. May be repeated for credit. Limited enrollment.
3 units, Sum (Ivanek, F; Chiu, S)

MS&E 238. Network Structures and Analysis—The role of networks in social, technological, and economic systems. The impact of network structures on systems such as social networks including LinkedIn and Facebook; web pages and hyperlinks; buyers and sellers connected through a market; and towns connected by roads or airplane routes. Topics: graph and network analysis; epidemics on networks, the spread of fads, and tipping points; six degrees of separation and the small world phenomenon; power laws and their emergence; and network effects and externalities. Prerequisites: 220 and MATH 51.
3 units, Spr (Johari, R), alternate years, not given next year

ECONOMICS, FINANCE, AND INVESTMENT

MS&E 240. Industrial Accounting—(Undergraduates register for 140; see 140.)
3-4 units, Win, Sum (Stanton, F)

MS&E 241. Economic Analysis—Principal methods of economic analysis of the production activities of firms, including production technologies, cost and profit, and perfect and imperfect competition; individual choice, including preferences and demand; and the market-based system, including price formation, efficiency, and welfare. Practical applications of the methods presented. See 341 for continuation of 241. Recommended: 211, ECON 50.
3-4 units, Win (Weber, T)

MS&E 242. Investment Science—(Undergraduates register for 142.) Theory and application of modern quantitative investment analysis from an engineering perspective. How investment concepts are used to evaluate and manage opportunities, portfolios, and investment products including stocks, bonds, mortgages, and annuities. Topics: deterministic cash flows (term structure of interest rates, bond portfolio immunization, project optimization); mean-variance theory (Markowitz model, capital asset pricing); and arbitrage pricing theory. Group project. Limited enrollment. Prerequisites: 120, ENGR 60, MATH 51, or equivalents. Recommended: 140, ENGR 62, knowledge of spreadsheets.
3 units, Aut (Primbs, J)

MS&E 242H. Investment Science Honors—Concepts of modern quantitative finance and investments. Basic concepts under certainty including arbitrage, term structure of interest rates, and bond portfolio immunization. A situation of uncertainty in one period. Topics: arbitrage; theorems of asset pricing; pricing measures; derivative securities; applications and estimating of financial risk measures; mean-variance portfolio analysis; and equilibrium and the capital asset pricing model. Group projects involving financial market data. Prerequisites: basic probability, statistics, and economics such as MS&E 120, 121, MATH 51, ENGR 60, or equivalents. No prior knowledge of finance required.

3 units, Aut (Giesecke, K)

MS&E 242S. Investment Science—Emphasis is on a cash flow approach. Topics include deterministic cash flow analysis (time value of money, present value, internal rate of return, taxes, inflation), fixed income securities, duration and bond portfolio immunization, term structure of interest rates (spot rates, discount factors, forward rates), Fisher-Weill duration and immunization, capital budgeting, dynamic optimization problems, investments under uncertainty, mean-variance portfolio theory, capital asset pricing, and basic options theory. Goal is to create a link between engineering analysis and business decision making.

3 units, Sum (Feinstein, C)

MS&E 243. Energy and Environmental Policy Analysis—(Same as IPER 243.) Concepts, methods, and applications. Energy/environmental policy issues such as automobile fuel economy regulation, global climate change, research and development policy, and environmental benefit assessment. Group project. Prerequisite: 241 or ECON 50, 51.

3 units, Spr (Sweeney, J)

MS&E 245G. Finance for Non-MBAs—(Same as ECON 135, FINANCE 221.) For graduate students and advanced undergraduates. The foundations of finance; applications in corporate finance and investment management. Financial decisions made by corporate managers and investors with focus on process valuation. Topics include criteria for investment decisions, valuation of financial assets and liabilities, relationships between risk and return, market efficiency, and the valuation of derivative securities. Corporate financial instruments including debt, equity, and convertible securities. Equivalent to core MBA finance course, FINANCE 220. Prerequisites: 51, or ENGR 60, or equivalent; ability to use spreadsheets, and basic probability and statistics concepts including random variables, expected value, variance, covariance, and simple estimation and regression.

4 units, Aut (Admati, A)

MS&E 246. Game Theory with Engineering Applications—Strategic interactions among multiple decision makers emphasizing applications to engineering systems. Topics: efficiency and fairness; collective decision making and cooperative games; static and dynamic noncooperative games; and complete and incomplete information models. Competition: Bertrand, Cournot, and Stackelberg models. Mechanism design: auctions, contracts. Examples from engineering problems. Prerequisites: MATH 51 and exposure to probability such as 120 or EE 178. Recommended: 211, concurrent enrollment in 241 or ECON 202.

3 units, Win (Erhun Oguz, F)

MS&E 247S. International Investments—International financial markets, their comparative behavior and interrelations. Focus is on assets traded in liquid markets: currencies, equities, bonds, swaps, and derivatives. Topics: institutional arrangements, taxation and regulation, international arbitrage and parity conditions, valuation of target firms for cross-border acquisitions, direct foreign investment, international diversification and portfolio management, derivative instruments and dynamic investment strategies, international performance analysis, international capital flows and financial crises, and topics of current relevance and importance. Prerequisite: basic finance theory (equivalent to 242 or 245G).

3 units, Sum (Fu, Y)

MS&E 248. Economics of Natural Resources—Intertemporal economic analysis of natural resource use, particularly energy, and including air, water, and other depletable mineral and biological resources. Emphasis is on an integrating theory for depletable and renewable resources. Stock-flow relationships; optimal choices over time; short- and long-run equilibrium conditions; depletion/extinction conditions; market failure mechanisms (common-property, public goods, discount rate distortions, rule-of-capture); policy options. Prerequisite: 241 or ECON 51.

3-4 units, Aut (Sweeney, J)

MS&E 249. Growth and Development—What generates economic growth. Emphasis is on theory accompanied by intuition, illustrated with country cases. Topics: the equation of motion of an economy; optimal growth theory; calculus of variations and optimal control approaches; deriving the Euler and Pontriaguine equations from economic reasoning. Applications: former planned economies in Russia and E. Europe; the financial crises in E. Asia and Argentina; a comparative study of India and China. The links between economic growth and civilization; the causes of the rise and decline of civilizations; lessons for the future.

3 units, Sum (De La Grandville, O)

DECISION AND RISK ANALYSIS

MS&E 250A. Engineering Risk Analysis—The techniques of analysis of engineering systems for risk management decisions involving trade-offs (technical, human, environmental aspects). Elements of decision analysis; probabilistic risk analysis (fault trees, event trees, systems dynamics); economic analysis of failure consequences (human safety and long-term economic discounting); and case studies such as space systems, nuclear power plants, and medical systems. Public and private sectors. Prerequisites: 120 or STATS 116, and ENGR 60, or equivalents.

2-3 units, Win (Paté-Cornell, E)

MS&E 250B. Project Course in Engineering Risk Analysis—Students, individually or in groups, choose, define, formulate, and resolve a real risk management problem, preferably from a local firm or institution. Oral presentation and report required. Scope of the project is adapted to the number of students involved. Three phases: risk assessment, communication, and management. Emphasis is on the use of probability for the treatment of uncertainties and sensitivity to problem boundaries. Limited enrollment. Prerequisite: 250A, consent of instructor.

3 units, Spr (Paté-Cornell, E)

MS&E 251. Stochastic Decision Models—Efficient formulation and computational solution of sequential decision problems under uncertainty. Markov decision chains and stochastic programming. Maximum expected present value and rate of return. Optimality of simple policies: myopic, linear, index, acceptance limit, and (s,S). Optimal stationary and periodic infinite-horizon policies. Applications to investment, options, overbooking, inventory, production, purchasing, selling, quality, repair, sequencing, queues, capacity, transportation. MATLAB is used. Prerequisites: probability, linear programming.

3 units, Win (Veinott, A)

MS&E 252. Decision Analysis I: Foundations of Decision Analysis—Coherent approach to decision making, using the metaphor of developing a structured conversation having desirable properties, and producing actional thought that leads to clarity of action. Socratic instruction; computational problem sessions. Emphasis is on creation of distinctions, representation of uncertainty by probability, development of alternatives, specification of preference, and the role of these elements in creating a normative approach to decisions. Information gathering opportunities in terms of a value measure. Relevance and decision diagrams to represent inference and decision. Principles are applied to decisions in business, technology, law, and medicine. See 352 for continuation.

3-4 units, Aut (Howard, R)

MS&E 254. The Ethical Analyst—The ethical responsibility for consequences of professional analysts who use technical knowledge in support of any individual, organization, or government. The means to form ethical judgments; questioning the desirability of physical coercion and deception as a means to reach any end. Human action and relations in society in the light of previous thought, and research on the desired form of social interactions. Attitudes toward ethical dilemmas through an explicit personal code.

1-3 units, Spr (Howard, R)

MS&E 256. Technology Assessment and Regulation of Medical Devices—(Formerly 475.) Regulatory approval and reimbursement for new medical technologies as a key component of product commercialization. The regulatory and payer environment in the U.S. and abroad, and common methods of health technology assessment. Framework to identify factors relevant to adoption of new medical devices, and the management of those factors in the design and development phases. Case studies; guest speakers from government (FDA) and industry.

1-3 units, Spr (Pietzsch, J)

PRODUCTION OPERATIONS, SERVICES, AND MANUFACTURING

MS&E 260. Analysis of Production and Operating Systems—(Undergraduates register for 160.) Businesses add value through production and delivery of products and services; operations managers are responsible for designing, running, and improving systems and processes to meet demand for goods and services. Techniques to analyze an operating system. Topics include determination of optimal facility location, production lot sizing, optimal timing and sizing of capacity expansion, and inventory control. Prerequisites: probability and optimization.

4 units, Aut (Ozer, A)

MS&E 261. Inventory Control and Production Systems—Topics in the planning and control of manufacturing systems. The functions of inventory, determination of order quantities and safety stocks, alternative inventory replenishment systems, item forecasting, production-inventory systems, materials requirements planning (MRP), just-in-time systems, master and operations scheduling, supply chain management, and service operations. Limited enrollment. Prerequisite: 120, or STATS 116, or equivalent.

3 units, Win (Hausman, W)

MS&E 262. Supply Chain Management—Definition of a supply chain; coordination difficulties; pitfalls and opportunities in supply chain management; inventory/service tradeoffs; performance measurement and incentives. Global supply chain management; mass customization; supplier management. Design and redesign of products and processes for supply chain management; tools for analysis; industrial applications; current industry initiatives. Enrollment limited to 50. Prerequisite: 260 or 261.

3 units, Spr (Hausman, W)

MS&E 263. Internet-Enabled Supply Chains—E-businesses have changed traditional supply chain interactions by creating a web-like structure and more flexible relationships, and it is no longer possible operationally or strategically to ignore the information-based virtual value chains for any business. How information technologies advanced supply chain integration; e-markets including auctions and exchanges; dynamic pricing; bundling; strategic implications of lock-in and switching costs; compatibility choices; and standardization efforts.

3 units (Erhun Oguz, F) not given this year

MS&E 263B. Demand and Supply Chain Analytics—Tools to efficiently manage supply and demand networks. Topics include service and inventory trade offs, stock allocation, pricing, and contracts and coordination. TImely product distribution to market while avoiding excess inventories; allocating adequate resources to the most profitable products. Selling the right product to the right customer at the right price at the right time.

3 units, Spr (Ozer, A)

MS&E 264. Manufacturing Systems Design—Multidisciplinary. The concepts and techniques of designing and improving performance and productivity in systems composed of and influenced by people, organizational factors, environmental factors, and technology. Emphasis is on the design of high-performance manufacturing systems. Use of simulation as a tool for design evaluation.

3-4 units, Aut (Erhun Oguz, F)

MS&E 265. Supply Chain Logistics—Student teams redesign the manufacturing and distribution system of a medium-sized manufacturer. Focus is on the transportation system, inventory policies for a regional warehouse, design of a national distribution system, improvements of work flow, and layout of the manufacturing plant. The redesign is at a detailed operational level consistent with a strategy of integrating the functions of manufacturing and distribution. Analytical and game software is used. Knowledge of inventory theory, linear/integer programming, economic analysis, and applied probability is required. Emphasis is on group learning. Limited enrollment. Prerequisites: senior or graduate standing, 160, ENGR 60 and 62, or consent of instructor.

4 units (Staff) alternate years, not given this year

MS&E 266. Management of New Product Development—Techniques of managing or leading the process of new product development that have been found effective. Emphasis is placed on how much control is desirable and how that control can be exercised in a setting where creativity has traditionally played a larger role than discipline. Topics: design for manufacturability, assessing the market, imposing discipline on the new product development process, selecting the appropriate portfolio of new product development projects, disruptive technology, product development at internet speed, uncertainty in product development, role of experimentation in new product development, creating an effective development organization, and developing products to hit cost targets.

3-4 units, Win (Staff)

MS&E 267. Innovations in Manufacturing—Major innovations including mass production, quality movement, lean manufacturing, outsourcing, and sustainable manufacturing; underlying changes in how products are made, who makes them, and why they are designed and marketed as they are; and key metrics such as cost, quality, speed of delivery, product variety, and social or environmental responsibility. Economic, social, and political factors influencing product, process, and organizational changes.

3-4 units, Aut (Bailey, D)

MS&E 268. Operations Strategy—The development and implementation of the operations functional strategy. The integration of operations strategy with business and corporate strategies of a manufacturing-based firm. Topics: types and characteristics of manufacturing technologies, quality management, capacity planning and facilities choice, organization and control of operations, and operations' role in corporate strategy. Prerequisites: 260 or 261, or equivalent experience.

3 units (Carlson, R) given next year

MS&E 269. Quality Control and Management—(Undergraduates register for 169.) Topics include the cost of quality, inspection, sampling plans, statistical process control, uncertainty in the supply process, Bayesian decision methods, reliability, robust quality, quality function deployment, quality in services, and approaches to quality management. Case studies. Class project involving local industry required for fourth unit. Prerequisites: 120 and STATS 110.

3-4 units (Staff) not given this year

STRATEGY, ENTREPRENEURSHIP, AND MARKETING

MS&E 270. Strategy in Technology-Based Companies—For graduate students only. Introduction to the basic concepts of strategy, with emphasis on high technology firms. Topics: competitive positioning, resource-based perspectives, co-opetition and standards setting, and complexity/evolutionary perspectives. Limited enrollment.

3-4 units, Win (Katila, R)

MS&E 271. Global Entrepreneurial Marketing—Skills needed to market new technology-based products to customers around the world. Case method discussions. Cases include startups and global high tech firms. Course themes: marketing toolkit, targeting markets and customers, product marketing and management, partners and distribution, sales and negotiation, and outbound marketing. Team-based take-home final exam. Limited enrollment.

4 units, Win, Spr (Kosnik, T; Novitsky, D; Ramfelt, L; Smith, L)

MS&E 272. Entrepreneurial Finance—Primarily for graduate engineering students. Introduction to the concepts in and around the financing of entrepreneurial companies. Focus is on teaching future general managers how to use financial perspective to make better decisions in entrepreneurial settings, including selecting financial partners, evaluating financing vehicles, and financing companies through all growth stages, from startup through initial public offering. Limited enrollment. Prerequisites: 140 and ENGR 60, or equivalents. Recommended: 242 or 245G.

3 units, Spr (Staff)

MS&E 273. Technology Venture Formation—Open to graduate students interested in high-technology entrepreneurship.The process of starting venture scale high-tech businesses. Assessing opportunities, sizing markets, evaluating sales channels, developing R&D and operations plans, raising venture capital, managing legal issues, and building a team. Teaching team includes entrepreneurs, venture capitalists, and guest speakers. Student teams write a business plan and make a formal presentation to a group of first tier venture capitalists. Enrollment limited. Recommended: 140, 270, 271, 272, or equivalent.

3-4 units, Aut (Lyons, M; MacLean, A; Blank, S)

MS&E 274. Dynamic Entrepreneurial Strategy—Primarily for graduate students. How entrepreneurial strategy focuses on creating structural change or responding to change induced externally. Grabber-holder dynamics as an analytical framework for developing entrepreneurial strategy to increase success in creating and shaping the diffusion of new technology or product innovation dynamics. Topics: First mover versus follower advantage in an emerging market; latecomer advantage and strategy in a mature market; strategy to break through stagnation; and strategy to turn danger into opportunity. Modeling, case studies, and term project.

3 units, Win (Tse, E)

MS&E 277. Creativity and Innovation—Factors that promote and inhibit creativity of individuals, teams, and organizations. Creativity tools, assessment metrics, and exercises; workshops, field trips, and case studies. Each student completes an individual creativity portfolio and participates in a long-term team project. Enrollment limited to 32. See http://creativity.stanford.edu.

4 units, Spr (Seelig, T)

ORGANIZATIONAL BEHAVIOR, MANAGEMENT, AND WORK

MS&E 280. Organizational Behavior: Evidence in Action—Organization theory; concepts and functions of management; behavior of the individual, work group, and organization. Emphasis is on cases and related discussion. Enrollment limited; priority to MS&E students.

3-4 units, Win (Sutton, R), Spr (Siino, R)

MS&E 281. Management and Organization of Research and Development—The organization of R&D in industry and the problems of the technical labor force. Relevant theoretical perspectives from sociology, anthropology, and management theory on the social and pragmatic issues that surround technical innovation and the employment of scientists and engineers. Possible topics: organization of scientific and technical communities, industrialization of research, the nature of scientific and technical work, strategies for fostering innovation, careers of scientists and engineers, and managerial problems characteristic of R&D settings.

3 units, Aut (Nelson, A)

MS&E 282. Innovation and Implementation in Complex Organizations—The difficulty of moving new ideas through large organizations. Executives from large companies describe cases; student teams analyze the cases and provide recommendations. Final project. Enrollment limited to 12. Prerequisites: master's standing and consent of instructors.

3 units, Win (Sutton, R; Dearing, M)

MS&E 282B. Creative Product Marketing—Continuation of 282; project-based. Implementation of new product designs in complex organizations and markets. Design projects in online publishing and advertising and the home and personal care businesses. Prerequisite: 282.

3 units, Spr (Sutton, R; Dearing, M)

MS&E 285. Negotiation—(Same as CEE 151/251, ME 207.) Negotiation styles and processes to help students conduct and review negotiations. Workshop format integrating intellectual and experiential learning. Exercises, live and field examples, individual and small group reviews. Application required before first day of class; see http://www.stanford.edu/class/msande285/. Enrollment limited to 50.

3 units, Spr (Christensen, S)

MS&E 286. Interpersonal Influence and Leadership—(Same as IPER 286, GSBGEN 374, LAW 628.) How one's actions affect and influence others and the ability to work with them. Foundational skills such as the ability to work through difficult issues, give and receive feedback, and work in groups. How to work with different people. The art of learning from experience. Prerequisiste: consent of instructor.

3-4 units, Win (Robin, C)

MS&E 288. Creating Infectious Action—Offered by the d.school. Teams of master's students from disciplines including engineering, design, business, behavioral sciences, and education attempt to spread positive behavior through projects that include spreading the adoption of the Firefox web browser, applying methods from hip hop to fuel the spread of fads, and spreading financially responsible individual behavior. Industry experts and academics provide guidance.

3-4 units, Spr (Sutton, R)

MS&E 289. Clicks and Bricks: Creating Customer Experiences—Project-based; offered by the d.school. Interdisciplinary student teams develop and build prototype solutions to improve offline and online customer service experiences.

3 units (Sutton, R) not given this year

PUBLIC POLICY ANALYSIS

MS&E 292. Health Policy Modeling—Primarily for master's students; also open to undergraduates and doctoral students. The application of mathematical, statistical, economic, and systems models to problems in health policy. Areas include: disease screening, prevention, and treatment; assessment of new technologies; bioterrorism response; and drug control policies.

3 units, Win (Brandeau, M)

MS&E 293. Technology and National Security—(Undergraduates register for 193; see 193; same as 193W.)

3 units, Aut (Perry, W; Hecker, S)

MS&E 294. Climate Policy Analysis—Design and application of formal analytical methods in climate policy development. Issues include instrument design, technology development, resource management, multiparty negotiation, and dealing with complexity and uncertainty. Links among art, theory, and practice. Emphasis is on integrated use of modeling tools from diverse methodologies and requirements for policy making application. Recommended: background in economics, optimization, and decision analysis.

3 units, Win (Weyant, J), alternate years, not given next year

MS&E 296. Transportation Systems and Urban Development—(Undergraduates register for 196; see 196.)
3 units, Win (Chiu, S)

MS&E 299. Designing A Free Society—Ethical theory, feasibility, and desirability of a social order in which coercion by individuals and government is minimized and people pursue ends on a voluntary basis. Topics: efficacy and ethics; use rights for property; contracts and torts; spontaneous order and free markets; crime and punishment based on restitution; guardian-ward theory for dealing with incompetents; the effects of state action-hypothesis of reverse results; applications to help the needy, armed intervention, victimless crimes, and environmental protection; transition strategies to a voluntary society.
1-3 units, Win (Howard, R)

PRIMARILY FOR DOCTORAL STUDENTS

GENERAL AND SYSTEMS ANALYSIS METHODS

MS&E 300. Ph.D. Qualifying Tutorial or Paper—Restricted to Ph.D. students assigned tutorials as part of the MS&E Ph.D. qualifying process. Enrollment optional.
1-3 units, Aut, Win, Spr, Sum (Staff)

MS&E 301. Dissertation Research—Prerequisite: doctoral candidacy.
1-15 units, Aut, Win, Spr, Sum (Staff)

OPTIMIZATION

MS&E 310. Linear Programming—Formulation of standard linear programming models. Theory of polyhedral convex sets, linear inequalities, alternative theorems, and duality. Variants of the simplex method and the state of art interior-point algorithms. Sensitivity analyses, economic interpretations, and primal-dual methods. Relaxations of harder optimization problems and recent convex conic linear programs. Applications include game equilibrium facility location. Prerequisite: MATH 113 or consent of instructor.
3 units, Aut (Ye, Y)

MS&E 311. Optimization—Applications, theories, and algorithms for finite-dimensional linear and nonlinear optimization problems with continuous variables. Elements of convex analysis, first- and second-order optimality conditions, sensitivity and duality. Algorithms for unconstrained optimization, and linearly and nonlinearly constrained problems. Modern applications in communication, game theory, auction, and economics. Prerequisites: MATH 113, 115, or equivalent.
3 units, Win (Ye, Y)

MS&E 312. Advanced Methods in Numerical Optimization—(Same as CME 334.) Topics include interior-point methods, relaxation methods for nonlinear discrete optimization, sequential quadratic programming methods, optimal control and decomposition methods. Topic chosen in first class; different topics for individuals or groups possible. Individual or team projects. May be repeated for credit.
3 units, Aut (Murray, W)

MS&E 313. Vector Space Optimization—Optimization theory from the unified framework of vector space theory: treating together problems of mathematical programming, calculus of variations, optimal control, estimation, and other optimization problems. Emphasis is on geometric interpretation. Duality theory. Topics: vector spaces including function spaces; Hilbert space and the projection theorem; dual spaces and the separating hyperplane theorem; linear operators and adjoints; optimization of functionals, including theory of necessary conditions in general spaces, and convex optimization theory; constrained optimization including Fenchel duality theory. Prerequisite: MATH 115.
3 units (Luenberger, D) alternate years, not given this year

MS&E 314. Linear and Conic Optimization with Applications—(Same as CME 336.) Linear, semidefinite, conic, and convex nonlinear optimization problems as generalizations of classical linear programming. Algorithms include the interior-point, barrier function, and cutting plane methods. Related convex analysis, including the separating hyperplane theorem, Farkas lemma, dual cones, optimality conditions, and conic inequalities. Complexity and/or computation efficiency analysis. Applications to combinatorial optimization, sensor network localization, support vector machine, and graph realization. Prerequisite: MS&E 211 or equivalent.
3 units (Ye, Y) alternate years, not given this year

MS&E 315. Numerical Optimization—(Same as CME 304.) Solution of nonlinear equations; unconstrained optimization; linear programming; quadratic programming; global optimization; general linearly and nonlinearly constrained optimization. Theory and algorithms to solve these problems. Prerequisite: background in analysis and numerical linear algebra.
3 units, Win (Murray, W)

MS&E 316. Discrete Mathematics and Algorithms—(Same as CME 305.) Topics: enumeration such as Cayley's theorem and Prufer codes, SDR, flows and cuts (deterministic and randomized algorithms), probabilistic methods and random graphs, asymptotics (NP-hardness and approximation algorithms). Topics illustrated with EE, CS, and bioinformatics applications. Prerequisites: MATH 51 or 103 or equivalents.
3 units, Win (Saberi, A)

MS&E 318. Large-Scale Numerical Optimization—(Same as CME 338.) The main algorithms and software for constrained optimization emphasizing the sparse-matrix methods needed for their implementation. Iterative methods for linear equations and least squares. Interior methods. The simplex method. Factorization and updates. The reduced-gradient, augmented Lagrangian, and SQP methods. Recommended: MS&E 310, 311, 312, 314, or 315; CME 108 or 302.
3 units, Spr (Saunders, M)

MS&E 319. Approximation Algorithms—Combinatorial and mathematical programming techniques to derive approximation algorithms for NP-hard optimization problems. Prossible topics include: greedy algorithms for vertex/set cover; rounding LP relaxations of integer programs; primal-dual algorithms; semidefinite relaxations. May be repeated for credit. Prerequisites: 112 or CS 161.
3 units (Saberi, A) alternate years, not given this year

PROBABILITY AND STOCHASTIC SYSTEMS

MS&E 321. Stochastic Systems—Topics in stochastic processes, emphasizing applications. Markov chains in discrete and continuous time; Markov processes in general state space; Lyapunov functions; regenerative process theory; renewal theory; martingales, Brownian motion, and diffusion processes. Application to queueing theory, storage theory, reliability, and finance. Prerequisites: 221 or STATS 217; MATH 113, 115.
3 units, Spr (Glynn, P)

MS&E 322. Stochastic Calculus and Control—Ito integral, existence and uniqueness of solutions of stochastic differential equations (SDEs), diffusion approximations, numerical solutions of SDEs, controlled diffusions and the Hamilton-Jacobi-Bellman equation, and statistical inference of SDEs. Applications to finance and queueing theory. Prerequisites: 221 or STATS 217: MATH 113, 115.
3 units, Win (Glynn, P), alternate years, not given next year

MS&E 323. Stochastic Simulation—Emphasis is on the theoretical foundations of simulation methodology. Generation of uniform and non-uniform random variables. Discrete-event simulation and generalized semi-Markov processes. Output analysis (autoregressive, regenerative, spectral, and stationary times series methods). Variance reduction techniques (antithetic variables, common random numbers, control variables, discrete-time, conversion, importance sampling). Stochastic optimization (likelihood ratio method, perturbation analysis, stochastic approximation). Simulation in a parallel environment. Prerequisite: MS&E 221 or equivalent.
3 units (Glynn, P) alternate years, not given this year

INFORMATION SCIENCE AND TECHNOLOGY

MS&E 332. Security and Risk in Computer Networks—Risk management of large scale computing and networking systems with respect to security, data integrity, performance collapse, and service disruption. Qualitative and analytical basis for assessment, modeling, control, and mitigation of network risks. Stochastic risk models. Contact process. Random fields on networks. Virus and worm propagation dynamics and containment. Denial of service attacks. Intruder detection technologies. Distributed network attacks and countermeasures. Disaster recovery networks. Network protection services and resource placement. Autonomic self-defending networks. Economics of risk management. Emphasis is on analytics and quantitative methods.
3 units, Spr (Bambos, N)

MS&E 335. Queuing Systems and Processing Networks—Advanced stochastic modeling and control of systems involving queueing and scheduling operations. Stability analysis of queueing systems. Key results on single queues and queueing networks. Controlled queueing systems. Dynamic routing and scheduling in processing networks. Applications to modeling, analysis and performance engineering of computing systems, communication networks, flexible manufacturing, and service systems. Prerequisite: 221 or equivalent.
3 units, Aut (Bambos, N)

MS&E 336. Topics in Game Theory with Engineering Applications—Seminar. Recent research applying economic methods to engineering problems. Recent topics include: incentives in networked systems; mechanism design in engineered systems; and dynamics and learning in games. Prerequisites: mathematics at the level of MATH 115; game theory at the level of 246 or ECON 203; probability at the level of 220; optimization at the level of 211. May be repeated for credit.
3 units, Spr (Johari, R)

MS&E 337. Information Networks—(Same as CME 337.) Network structure of the Internet and the web. Modeling, scale-free graphs, small-world phenomenon. Algorithmic implications in searching and inter-domain routing; the effect of structure on performance. Game theoretic issues, routing games, and network creation games. Security issues, vulnerability, and robustness. Prerequisite: basic probability and graph theory.
3 units, Aut (Saberi, A), alternate years, not given next year

MS&E 338. Advanced Topics in Information Science and Technology—Prerequisite: consent of instructor.
3 units (Van Roy, B) not given this year

MS&E 339. Approximate Dynamic Programming—Approximation algorithms for large-scale dynamic programming. Real-time dynamic programming and reinforcement learning algorithms. Generalizations of value iteration, policy iteration, and linear programming approaches. Recent research topics. Prerequisite: 251, 351, CS 221, CS 228, or CS 229.
3 units (Van Roy, B) not given this year

ECONOMICS, FINANCE, AND INVESTMENT

MS&E 341. Advanced Economic Analysis—Builds on 241 concepts. Market structure and industrial organization (oligopoly, strategic behavior of firms, game theoretic models); economics of uncertainty; general equilibrium theory and economic efficiency (formulation, Walras' Law, existence, uniqueness, duality between efficiency and general equilibrium; trade); intertemporal equilibrium and asset markets; public goods, externalities. Background for advanced economics. Prerequisite: 241.
3 units, Spr (Weber, T)

MS&E 342. Advanced Investment Science—Topics: forwards and futures contracts, continuous and discrete time models of stock price behavior, geometric Brownian motion, Ito's lemma, basic options theory, Black-Scholes equation, advanced options techniques, models and applications of stochastic interest rate processes, and optimal portfolio growth. Computational issues and general theory. Teams work on independent projects. Prerequisite: 242.
3 units, Win (Luenberger, D)

MS&E 344. Applied Information Economics—The strategic acquisition, pricing, transfer, and use of information. Theoretical findings applied to real-world settings. Topics: optimal risk bearing, adverse selection, signaling, screening, nonlinear and state-contingent pricing, design of contests, incentives and organizations, strategic information transmission, long-run relationships, negative information value, research and invention, leakage and espionage, imperfect competition, information sharing, search and advertising, learning, and real-option exercise games. Prerequisites: 211, 220, 241. Recommended: 341.
3 units (Weber, T) not given this year

MS&E 345. Advanced Topics in Financial Engineering—Derivative pricing theory from an engineering perspective. Underlying principles that apply to all derivative securities; general frameworks to model and price derivative securities on equities, interest rates, and credit. Topics in hedging and risk management. Prerequisites: derivative pricing and stochastic differential equations; and 220, 221, 242, 342, or consent of instructor. Recommended: Matlab.
3 units, Win (Primbs, J)

MS&E 347. Credit Risk: Modeling and Management—Credit risk modeling, valuation, and hedging emphasizing underlying economic, probabilistic, and statistical concepts. Point processes and their compensators. Structural, incomplete information and reduced form approaches. Single name products: corporate bonds, equity, equity options, credit and equity default swaps, forwards and swaptions. Multiname modeling: index and tranche swaps and options, collateralized debt obligations. Implementation, calibration and testing of models. Industry and market practice. Data and implementation driven group projects that focus on problems in the financial industry. Prerequisites: stochastic processes at the level of MSE 321, 322 or equivalent, and financial engineering at the level of MSE 342, MATH 180, MATH 240, FINANCE 622 or equivalent.
3 units, Spr (Giesecke, K)

MS&E 348. Optimization of Uncertainty and Applications in Finance—How to make optimal decisions in the presence of uncertainty, solution techniques for large-scale systems resulting from decision problems under uncertainty, and applications in finance. Decision trees, utility, two-stage and multi-stage decision problems, approaches to stochastic programming, model formulation; large-scale systems, Benders and Dantzig-Wolfe decomposition, Monte Carlo sampling and variance reduction techniques, risk management, portfolio optimization, asset-liability management, mortgage finance. Projects involving the practical application of optimization under uncertainty to financial planning.
3 units, Win (Infanger, G)

MS&E 349. Capital Deployment—Methods for efficiently allocating capital among alternatives, constructing business plans, determining the value of risky projects, and creating alternatives that enhance value. Prerequisites: 242, 342.
3 units, Spr (Luenberger, D), alternate years, not given next year

DECISION AND RISK ANALYSIS

MS&E 351. Dynamic Programming and Stochastic Control—Markov population decision chains in discrete and continuous time. Risk posture. Present value and Cesaro overtaking optimality. Optimal stopping. Successive approximation, policy improvement, and linear programming methods. Team decisions and stochastic programs; quadratic costs and certainty equivalents. Maximum principle. Controlled diffusions. Examples from inventory, overbooking, options, investment, queues, reliability, quality, capacity, transportation. MATLAB. Prerequisites: MATH 113, 115; Markov chains; linear programming.
3 units, Spr (Veinott, A)

MS&E 352. Decision Analysis II: Professional Decision Analysis—How to organize the decision conversation, the role of the decision analysis cycle and the model sequence, assessing the quality of decisions, framing decisions, the decision hierarchy, strategy tables for alternative development, creating spare and effective decision diagrams, biases in assessment, knowledge maps, uncertainty about probability. Sensitivity analysis, approximations, value of revelation, joint information, options, flexibility, bidding, assessing and using corporate risk attitude, risk sharing and scaling, and decisions involving health and safety. See 353 for continuation. Prerequisite: 252.

3-4 units, Win (Howard, R)

MS&E 353. Decision Analysis III: Frontiers of Decision Analysis—The concept of decision composite; probabilistic insurance and other challenges to the normative approach; the relationship of decision analysis to classical inference and data analysis procedures; the likelihood and exchangeability principles; inference, decision, and experimentation using conjugate distributions; developing a risk attitude based on general properties; alternative decision aiding practices such as analytic hierarchy and fuzzy approaches. Student presentations on current research. Goal is to prepare doctoral students for research. Prerequisite: 352.

3 units, Spr (Howard, R)

MS&E 355. Influence Diagrams and Probabilistics Networks—Network representations for reasoning under uncertainty: influence diagrams, belief networks, and Markov networks. Structuring and assessment of decision problems under uncertainty. Learning from evidence. Conditional independence and requisite information. Node reductions. Belief propagation and revision. Simulation. Linear-quadratic-Gaussian decision models and Kalman filters. Dynamic processes. Bayesian meta-analysis. Prerequisites: 220, 252, or equivalents, or consent of instructor.

3 units, Win (Shachter, R), alternate years, not given next year

PRODUCTION OPERATIONS, SERVICES, AND MANUFACTURING

MS&E 361. Supply Chain Optimization—Characterization and computation of optimal and nearly optimal multiperiod supply chain policies with known or uncertain demands using dynamic, lattice, network, and convex and concave programming. Cooperation: sharing benefits of alliances. Competition. Leontief-substitution and network-flow models. Lattice programming: comparison of optima; existence and comparison of equilibria of non-cooperative games. Stochastic comparison. Invariant properties of optimal flows: graphical optimization of supply chains. Optimality of myopic policies. Prerequisites: MATH 115, optimization theory, probability.

3 units (Veinott, A) alternate years, not given this year

MS&E 362. Advanced Models in Production and Operations—The design and operation of production-inventory systems. Topics include production scheduling, capacity planning, sequencing, assembly-line balancing, dynamic scheduling, and multigoal optimizations. Readings primarily from journal articles. Prerequisite: 260.

3 units (Carlson, R) alternate years, not given this year

MS&E 363. Advanced Models in Management Science—Primarily for doctoral students. Content varies. Topics based on recent literature and working papers. See http://www.stanford.edu/~ozalp/ for information. May be repeated for credit. Prerequisite: consent of instructor.

3 units (Ozer, A) not given this year

MS&E 364. Multi-echelon Inventory Models—Theoretical treatment of control problems arising in inventory management, production, and distribution systems. Inventory control for single and multi-location systems. Emphasis is on operating characteristics, performance measures, and optimal operating and control policies. Dynamic programming and applications in inventory control. Prerequisite: STATS 217 or equivalent, linear programming.

3 units, Spr (Ozer, A), alternate years, not given next year

MS&E 365B. Game Theoretic Models in Operations Management—Formal analysis of strategic interactions among decision makers such as suppliers, manufacturers, retailers, and consumers; the resulting dynamics in a market environment. Game theory as the main tool of analysis. Readings primarily from journal articles. May be repeated for credit. Prerequisite: 246 or equivalent.

3 units, Win (Erhun Oguz, F), alternate years, not given next year

MS&E 366. Advanced Models in Supply Chain Management—Primarily for doctoral students. Content varies. Topics based on recent literature and working papers. May be repeated for credit. Prerequisite: consent of instructor.

3 units (Hausman, W) alternate years, not given this year

MS&E 369. Supply Chain Risk and Flexibility Management—Methods and analytic tools for quantifying and managing the impact of uncertainty in supply and demand on the operating and financial performance of firms and networks of firms. Design and delivery of products and services to provide competitive differentiation by enabling cost, value, risk and flexibility to be balanced and managed across supply networks. Case study applications by leading companies to procurement, manufacturing, outsourcing, and sales relationships. Tools, processes, and internal crossfunctional coordination required to operationalize approaches in core planning and execution systems and processes. Prerequisite: 262.

3-4 units, Spr (Johnson, B)

STRATEGY, ENTREPRENEURSHIP, AND MARKETING

MS&E 371. Innovation and Strategic Change—Doctoral research seminar, limited to Ph.D. students. Current research on innovation strategy. Topics: scientific discovery, innovation search, organizational learning, evolutionary approaches, and incremental and radical change. Topics change yearly. Recommended: course in statistics or research methods.

2-3 units, Win (Katila, R), alternate years, not given next year

MS&E 374. Dynamic Corporate Strategy—Restricted to Ph.D. students. Research on the creation and shaping of disruptive industry dynamics and how companies can formulate and implement strategies to excel in such changing environments. Dynamic system model approach; case studies. Prerequisites: 201 or equivalent, 274.

3 units (Tse, E) alternate years, not given this year

MS&E 376. Strategy and Organization Doctoral Research Seminar—Current research at the interface of strategy policy and organization theory. Topics vary annually. Limited enrollment. Prerequisites: SOC 360 or equivalent, and consent of instructor.

3 units, Spr (Eisenhardt, K)

ORGANIZATIONAL BEHAVIOR, MANAGEMENT, AND WORK

MS&E 380. Doctoral Research Seminar in Organizations—Limited to Ph.D. students. Topics from current published literature and working papers. Content varies. Prerequisite: consent of instructor.

3 units, Win (Sutton, R)

MS&E 381A. Doctoral Research Seminar in Work, Technology, and Organization: Theoretical Underpinnings—Enrollment limited to Ph.D. students. Topics from current published literature and working papers. Content varies. Prerequisite: consent of instructor.

2-3 units (Barley, S) alternate years, not given this year

MS&E 381B. Doctoral Research Seminar in Work, Technology, and Organization: The Study of Work—Enrollment limited to Ph.D. students. Topics from current published literature and working papers. Prerequisite: consent of instructor.

2-3 units (Bailey, D) alternate years, not given this year

MS&E 381C. Doctoral Research Seminar in Work, Technology, and Organization: The Study of Technology—Enrollment limited to Ph.D. students. Topics from current literature and working papers. Prerequisite: consent of instructor.

2-3 units, Aut (Bailey, D), alternate years, not given next year

MS&E 383. Doctoral Seminar on Ethnographic Research—For graduate students; upper-level undergraduates with consent of instructor. Ethnosemantic interviewing and participant observation. Techniques for taking, managing, and analyzing field notes and other qualitative data. 15 hours per week outside class collecting and analyzing own data. Methods texts and ethnographies offer examples of how to analyze and communicate ethnographic data. Prerequisite: consent of instructor.

5-6 units (Barley, S) not given this year

MS&E 384. Groups and Teams—Research on groups and teams in organizations from the perspective of organizational behavior and social psychology. Topics include group effectiveness, norms, group composition, diversity, conflict, group dynamics, temporal issues in groups, geographically distributed teams, and intergroup relations.

3 units, Win (Hinds, P), alternate years, not given next year

MS&E 386. Behavioral Aspects of Computer Supported Cooperative Work—For Ph.D. students. Research on behavioral aspects of computer supported cooperative work. Topics include knowledge management, awareness and awareness systems, group decision support, cooperation and collaboration, effects of computer mediated communications on interpersonal relationships, and geographically distributed work.

3 units (Hinds, P) not given this year

PROJECT COURSES, SEMINARS, AND WORKSHOPS

MS&E 406. Mathematical Modeling Seminar—Mathematical modeling issues in participants' current research. Topics such as modularity, variable endogenization, parameter estimation, and orders of effect. Students share their models for discussion. Limited enrollment. Recommended: 206.

1 unit, Aut (Kieffel, H), alternate years, not given next year

MS&E 408. Directed Reading and Research—Directed study and research on a subject of mutual interest to student and faculty member. Prerequisite: faculty sponsor.

1-15 units, Aut, Win, Spr, Sum (Staff)

MS&E 430. Tools for Experience Design—Interdisciplinary, project-based, studio course to create innovative tools for designers and for future d.school use. Focus is on empathy with the experience of designers. Field visits, guest speakers, case studies.

3-4 units (Hinds, P) not given this year

MS&E 444. Investment Practice—Theory of real options, soft derivatives, and related ideas. Problems from financial engineering and risk management. Examples from industry. Small group projects formulate and design solutions to actual industry problems. Enrollment limited to 30.

3-4 units, Spr (Giesecke, K)

MS&E 446. Policy and Economics Research Roundtable (PERR)—Research in progress or contemplated in policy and economics areas. Emphasis depends on research interests of participants, but is likely to include energy, environment, transportation, or technology policy and analysis. May be repeated for credit.

1 unit, Aut, Win, Spr (Sweeney, J)

MS&E 450. Lessons in Decision Making—Entrepreneurs, senior management consultants, and executives from Fortune 500 companies share real-world stories and insights from their experience in decision making.

1 unit, Spr (Howard, R)

MS&E 451. Decision Systems I: Professional Secrets and Tricks of the Trade—Professional tricks for designing decision systems that help in facing decisions such as buying a car, bidding on the Internet, hiring NFL players, making charitable donations, or choosing medical treatment. Demonstrations; small project. Topics: automatic decision diagram formulation, decision-class analysis, and dynamic sensitivity analysis. No programming required.

2-3 units, Win (Holtzman, S)

MS&E 452. Decision Systems II: Business, Consumer, and Medical Applications—Students design a system to help business, consumer, medical, or other decision makers. Previous student teams have designed systems for auction bidding, cancer treatment, sailing tactics, automobile purchasing, network design, Mars exploration, flu treatment, platoon tactics, high-tech manufacturing, and oil-and-gas exploration. No programming required. Satisfies MS&E project course requirement. Prerequisite: 252 or equivalent. Recommended: 451.

3 units, Spr (Holtzman, S)

MS&E 453A. Medical Decision Making Seminar—Decision making models and methods to address complex, uncertain medical decisions. Experts present best practices and research on current topics such as mathematical modeling of bioterrorism, HIV screening and prevention, flu pandemic interventions, personal medical procedure decisions, and decision support for cancer care delivery.

1 unit, Aut (Robinson, B)

MS&E 453B. Energy Decision Making Seminar—Decision making models and methods to address complex, uncertain energy decisions. Experts present best practices and research on current topics such as traditional versus alternative energy supply, global demand forecasts, mathematical modeling of energy economics, energy policy and consumer behavior, and geopolitical energy considerations.

1 unit, Win (Robinson, B)

MS&E 453C. Environmental Decision Making Seminar—Decision making models and methods to address complex, uncertain environmental decisions. Experts present best practices and research on current topics such as climate change science and policy, mathematical modeling of environmental strategy consequences, marine resource preservation, groundwater contamination, and international agricultural crop decisions.

1 unit, Spr (Robinson, B)

MS&E 454. Decision Analysis Seminar—Current research and related topics presented by doctoral students and invited speakers. May be repeated for credit. Prerequisite: 252.

1 unit, Aut, Win, Spr (Howard, R)

MS&E 455. Decision Making in Organizations: Avoiding Traps, Motivating People, and Improving Process—Lectures and war stories from management consultants experienced in applying decision analysis. Student teams critique decisions from news articles, case studies, and interviews with leaders of local organizations. Topics: roles people play, normative versus descriptive approaches, avoiding traps and failure modes, decision process and content quality, biases, expert judgments, economic analysis, creativity, organizational behavior, leadership styles, decision psychology, mutual learning models, advocacy and inquiry, new venture investing, and portfolio evaluation.

2 units, Aut (Robinson, B)

MS&E 456. Decision Analysis Applications: Making Business Strategy and Public Policy Decisions—How decision analysis models and methods are applied to make technically and organizationally complex decisions for private and public sector organizations. Student teams model, assess, and analyze real examples. Cases include C5 Corvette design, global competition for HDTV market, DRAM manufacturing, movie studio portfolios, pharmaceutical drug development, oil and gas exploration and production, financial derivatives, litigation strategy, electric power regulation, and marine resource preservation. Guest consultants.

2 units, Win (Robinson, B)

MS&E 457. Decision Analysis Projects: Helping Real Leaders Make Real Decisions—A virtual consulting firm directed by decision analysts. Student teams help local businesses, governments, or other institutions make a current strategy or policy decision. Projects typically include start-up venture funding, R&D portfolio planning, new product/market entry, acquisition or partnering, cost reduction, program design, or regulatory policy decisions. Emphasis is on developing clarity of action and delivering insights to clients. Satisfies MS&E project course requirement. Prerequisite: 252 or equivalent.

3 units, Spr (Robinson, B)

MS&E 458. Professional Decision Consulting: Marketing Services, Delivering Results, and Balancing Lifestyle—Management consultants share lessons about professional services marketing, pricing to value, leading and managing consulting projects, communicating with diverse audiences, and delivering insights that exceed client expectations. What it looks like from inside a consulting firm, the client's view, and the consulting industry perspective. Student teams develop answers to frequently asked questions, prepare marketing materials, and present proposals for consulting services to decision makers in local organizations.

2 units, Aut (Robinson, B)

MS&E 464. Global Project Coordination—Students engage in projects that are global in nature, and related to the planning, design, and operations of supply chains, marketing, manufacturing, and product development. Project teams from Stanford and an overseas university work on common projects using telephones, faxes, email, Internet, video conferences, and face-to-face meetings. As part of the project, students travel to Hong Kong. Applications due in November. See http://www.stanford.edu/class/msande464/.
3-4 units, Win (Gillai, B)

MS&E 472. Entrepreneurial Thought Leaders' Seminar—Entrepreneurial leaders share lessons from real-world experiences across entrepreneurial settings. ETL speakers include entrepreneurs, leaders from global technology companies, venture capitalists, and best-selling authors. Half-hour talks followed by half hour of class interaction. Required web discussion. May be repeated for credit.
1 unit, Aut, Win, Spr (Byers, T; Kosnik, T; Seelig, T)

MS&E 474. Business and Environmental Issues—(Same as GSBGEN 547.) Overlap and synergies between business and environmental fields. Guest speakers from for-profit and nonprofit sectors. Past speakers have included business executives, alternative energy experts, environmental consultants, and professors. Group assignments.
2 units, Spr (Plambeck, E, Matson, P, Sweeney, J)

MS&E 485. Crosscultural Design—Project-based. The design of products and services for a global world. How to design products or services to be used across cultures, how to design for a culture other than one's own, and how the process of design is approached in different cultures.
3-4 units (Hinds, P) not given this year

MS&E 491. Real-World Clean Energy Project Development—Student teams prepare and present a development plan for a clean energy project of their choice, specifying the resource, technology, market, end-use, and policy and regulatory factors. Management plan and financial and economic evaluation. Readings and presentations on topics in clean energy. Guest speakers involved in project development.
3 units, Spr (Borison, A; Hamm, G)

COGNATE COURSES (GRADUATE)

See respective department listings for course descriptions. See degree requirements above or the department's student services office for applicability of these courses to a major or minor program.

AA 253. Aerospace Product and Systems Development
3 units, Spr (Weiss, S)

CS 364A. Game Theory in the Internet
3 units, not given this year

EE 284. Introduction to Computer Networks
3-4 units, Aut (Tobagi, F)

EE 384S. Network Architectures and Performance Engineering
3 units, Spr (Bambos, N)

EE 402A. Topics in International Technology Management
1 unit, Aut (Dasher, R)

EE 402T. Entrepreneurship in Asian High Tech Industries
1 unit, Spr (Dasher, R)

LAW 206. Core Legal Concepts: Thinking Like a Lawyer—(Same as GSBGEN 382.)
3 units, Aut (Kelman, M; Kramer, L)

LAW 611. International Conflict Resolution Colloquium—(Same as POLISCI 403, PSYCH 283.)
2-5 units, Win (Weiner, A)

STATS 252. Data Mining and Electronic Business
3 units, Sum (Staff)

STS 279. Technology, Policy, and Management in Newly-Industrializing Countries
2-4 units, Spr (Forbes, N), offered occasionally

OVERSEAS STUDIES

Courses approved for the Management Science and Engineering major and taught overseas can be found in the "Overseas Studies" section of this bulletin, in the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu.

BEIJING

OSPBEIJ 33. Designing Products for the Chinese Context
4 units, Aut (Hinds, P)

OSPBEIJ 36. Globally Distributed Work
4 units, Aut (Hinds, P)

OXFORD

OSPOXFRD 28. Technology and Work
3 units, Win (Barley, S)

OSPOXFRD 29. Issues in Technology and Work for a Post-Industrial Economy
3 units, Aut (Barley, S)

MATERIALS SCIENCE AND ENGINEERING

Emeriti: (Professors) Clayton W. Bates, Jr., Richard H. Bube, Theodore H. Geballe,* Stig B. Hagstrom,* Robert A. Huggins, William D. Nix,* Oleg D. Sherby, John C. Shyne, William A. Tiller, Robert L. White*; *(Professor, Research)* Robert S. Feigelson*

Chair: Robert Sinclair

Associate Chair: Reinhold H. Dauskardt

Professors: David M. Barnett, Arthur I. Bienenstock, John C. Bravman, Bruce M. Clemens, Reinhold H. Dauskardt, Friedrich B. Prinz, Robert Sinclair, Shan X. Wang

Associate Professors: Michael D. McGehee, Paul C. McIntyre

Assistant Professors: Mark L. Brongersma, Yi Cui, Sarah Heilshorn, Aaron M. Lindenberg, Nicholas Melosh, Alberto Salleo

Courtesy Professors: Stacey Bent, Curtis W. Frank, James S. Harris, Yoshio Nishi, James D. Plummer, Krishna Saraswat, Jonathan F. Stebbins, Joachim Stohr

Courtesy Assistant Professors: Ian Fisher, Harindran Manoharan

Lecturers: Ann Marshall, Arturas Vailionis

Acting Assistant Professor: Seung Min Han

Consulting Professors: Robert E. Fontana, Turgut Gur, Michael A. Kelly, Rene Meyer, Baylor Triplett, Robert M. White, Wendelin J. Wright

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* Recalled to active duty.

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Phone: (650) 723-2534
Email: matsciengr@stanford.edu
Web Site: http://mse.stanford.edu

Courses in Materials Science and Engineering have the subject code MATSCI. For a complete list of subject codes, see Appendix.

The Department of Materials Science and Engineering is concerned with the relation between the structure and properties of materials, factors that control the internal structure of solids, and processes for altering their structure and properties. The undergraduate program, described under the "School of Engineering" section of this bulletin, provides training for the materials engineer and also preparatory training for graduate work in materials science. Capable students are encouraged to take at least one year of graduate study to extend their course work to obtain a coterminal degree. Coterminal degree programs are encouraged both for undergraduate majors in Materials Science and Engineering and for undergraduate majors in related disciplines. Graduate programs lead to the degrees of Master of Science, Engineer, and Doctor of Philosophy.

FACILITIES

The department is based in the Thomas F. Peterson Engineering Laboratory (Building 550), with extensive facilities in the Jack A. McCullough building and the Gordon and Betty Moore Materials Research Building. These buildings house offices for the chair and most of the faculty, for the administrative and technical staff, and for most graduate students, along with lecture and seminar rooms. Facilities for teaching and research are also available, including equipment for electrical measurements; mechanical testing of bulk and thin film materials; fracture and fatigue of advanced materials; metallography; optical, scanning, transmission electron microscopy, and atomic force microscopy; UHV sputter deposition; vacuum annealing treatments; wet chemistry; and x-ray diffraction. The McCullough/Moore Complex is also the home for the Center for Magnetic Nanotechnology, with corresponding facilities for magnetic measurements. The Rapid Prototyping Laboratory (RPL), housing material deposition and removal stations, is a joint facility with Mechanical Engineering, and is housed next to the Peterson Labs in Building 530. The department maintains two microcomputer clusters for its students, both of which are linked to the Internet.

Depending on the needs of their programs, students and faculty also conduct research in a number of other departments and independent laboratories. Chief among these are the Center for Integrated Systems (CIS), the Geballe Laboratory for Advanced Materials (GLAM), and the Stanford Synchrotron Radiation Laboratory (SSRL).

The Center for Integrated Systems (CIS) is a laboratory joining government and industrially funded research on microelectronic materials, devices, and systems. It houses a 10,000 square foot, class 100 clean room for Si and GaAs integrated circuit fabrication; a large number of electronic test, materials analysis, and computer facilities; and office space for faculty, staff, and students. In addition, CIS provides startup research funds and maintains a Fellow-Mentor program with industry.

For information on GLAM and SSRL, see the "Geballe Laboratory for Advanced Materials" and "Stanford Synchrotron Radiation Laboratory" sections of this bulletin.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The undergraduate program provides training in solid state fundamentals and materials engineering. Students desiring to specialize in this field during their undergraduate period may do so by following the curriculum outlined in the "School of Engineering" section of this bulletin as well as the *School of Engineering Undergraduate Handbook*. The University's basic requirements for the bachelor's degree are discussed in the "Undergraduate Degrees" section of this bulletin. Electives are available so that students with broad interests can combine materials science and engineering with work in another science or engineering department.

For information about the minor, see the "School of Engineering" section of this bulletin.

COTERMINAL B.S./M.S. PROGRAM

Stanford undergraduates who wish to continue their studies for the Master of Science degree in the coterminal program may apply for admission after they have earned 120 units toward graduation (UTG) as shown on the undergraduate unofficial transcript; applicants must submit their application no later than the quarter prior to the expected completion of their undergraduate degree. The application must give evidence that the student possesses the potential for strong academic performance at the graduate level. Scores from the Graduate Record Exam (GRE) General Test must be reported before action can be taken on an application. Materials science is a highly integrated and interdisciplinary subject, and so applications from students of any engineering or science undergraduate major are encouraged. Information forms pertaining to the coterminal program may be obtained from the department's student services manager, Room 551F.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

Graduate students can specialize in any of the areas of materials science and engineering.

MASTER OF SCIENCE

The University's basic requirements for the M.S. degree are discussed in the "Graduate Degrees" section of this bulletin. The following are specific departmental requirements.

The Department of Materials Science and Engineering requires a minimum of 45 units for a master's degree to be taken in residence at Stanford. Master's Program Proposal forms should be filled out, signed by the student's academic adviser, and submitted to the department's student services manager by the end of the student's first quarter of study. Final changes to the master's program must be submitted no later than one academic quarter prior to degree conferral. Stanford Materials Science undergraduates who are pursuing or who plan to pursue a coterminal M.S. degree may have more flexibility in their programs and should consult with their academic advisers regarding appropriate core course and elective choices.

Degree requirements are as follows:

1. A minimum of 30 units of Materials Science course work, including core and lab courses specified below, taken for a letter grade. Research units, one-unit seminars, and courses in other departments (i.e., where students cannot enroll in a class with a MATSCI subject code) cannot be counted for this requirement.
2. Three core courses: 203; 204; 207.
3. Lab courses: MATSCI 171, 172, 173. *Note:* students who have had equivalent lab courses at other universities, equivalent practical experience, a materials related degree or background, or passed the Ph.D. qualifying exam, are expected to file a petition with the department's student services manager to have this requirement waived and to substitute other appropriate technical courses for the lab units.
4. 15 units of approved course electives that result in a technically coherent program. Of the 15 units of elective courses:
   - a) 12 of the 15 units must be taken for a letter grade (except for those submitting an M.S. report).
   - b) a maximum of three units may be seminars.
   - c) if writing a master's research report, a minimum of six and a maximum of 15 units of Materials Science research units (MATSCI 200) may be counted. M.S. research units may only be counted if writing an M.S. research report.
   - d) a maximum of three units may be undergraduate units (offered at Stanford University).
   - e) a maximum of five units may be used for a foreign language course (not including any remedial English courses or courses in the student's native language if other than English).
   - f) the combination of seminar, undergraduate, and language units may not exceed six units total.
   - g) the combination of research, seminar, undergraduate, and language units may not exceed 15 units total.
   - h) activity units may not be counted toward a graduate degree.
5. A minimum grade point average (GPA) of 2.75 for degree course work taken at Stanford.

All proposed degree programs are subject to approval by the department's student services manager and the Academic Degree Committee, which has responsibility for assuring that each proposal is a technically coherent program.

MASTER'S RESEARCH REPORT

Students wishing to take this option must include 6-15 Materials Science research units on their program proposal and the name of the faculty member who will be supervising the research. Students using 15 units of research toward the degree must participate in a more complex and demanding research project than those using fewer units.

The report must be approved by two faculty members. One faculty member is the student's research adviser. The other faculty member must be approved by the department's student services manager. Three copies of the report (one copy for each approving faculty member and one for the department file), in final form and signed by the two faculty members, must be submitted to the department's student services manager one week before final examinations of the final quarter of the program. The report is not an official University thesis but rather is intended to demonstrate to department faculty an ability to conduct and report directed research. Refer to the *Materials Science and Engineering Student Handbook* for further clarification concerning this report.

In cases where students decide to pursue research after the initial program submission deadline, they should submit a revised M.S. Program Proposal at least two quarters before the degree is granted. The total combined units of Materials Science research units, seminars, language courses, and undergraduate courses cannot exceed 15. If a master's research report is not to be submitted, units of MATSCI 200 cannot be applied to the department's requirement of 45 units for the master's degree.

HONORS COOPERATIVE PROGRAM

Some of the department's graduate students participate in the Honors Cooperative Program (HCP), which makes it possible for academically qualified engineers and scientists in industry to be part-time graduate students in Materials Science while continuing professional employment. Prospective HCP students follow the same admissions process and must meet the same admissions requirements as full-time graduate students. For information regarding the Honors Cooperative Program, see the "School of Engineering" section of this bulletin.

PETITION PROCESS FOR TRANSFER FROM M.S. TO PH.D. DEGREE PROGRAM

Students admitted to the graduate program are admitted specifically into either the M.S. or the Ph.D. program. A student admitted to the M.S. program should not assume admission to the Ph.D. program. Admission to the Ph.D. program is required for the student to be eligible to work towards the Ph.D. degree.

A student in the M.S. program may petition to be admitted to the Ph.D. program by filing an M.S. to Ph.D. Transfer Petition. This petition must be accompanied by a one-page statement of purpose stating the reasons why the student wishes to transfer to the Ph.D. program, an updated transcript, and two letters of recommendation from members of the Stanford faculty, including one from the student's prospective adviser and at least one from a Materials Science faculty member belonging to the Academic Council. The M.S. to Ph.D. Transfer Petition is due to the student services manager by the end of the second week of Spring Quarter during the student's first year in the M.S. program. Only students enrolled in the 200 series core course sequence are eligible to petition, and a grade point average (GPA) of 3.50 or better in the core courses is required.

Transferring to the Ph.D. program is a competitive process and only fully qualified M.S. students are admitted. Faculty consider the student's original application to the graduate program as well as the material provided with the transfer petition.

ENGINEER

The University's basic requirements for the degree of Engineer are outlined in the "Graduate Degrees" section of this bulletin.

A student wishing to enter the Engineer program must have completed the requirements of the M.S. in Materials Science and Engineering, and must file a petition requesting admission to the program, stating the type of research to be done and the proposed supervising professor. Once approved, the Application for Candidacy must be submitted to the department's student services manager by the end of the second quarter in the Engineer program. Final changes in the Application for Candidacy form must be submitted no later than one academic quarter prior to degree conferral.

The 90-unit program must include 9 units of graduate courses in Materials Science with a MATSCI subject code (exclusive of research units, seminars, colloquia, and MATSCI 400, Participation in Teaching) beyond the requirements for the M.S. degree, and additional research or other units to meet the 90-unit University minimum requirement. A grade point average (GPA) of 3.0 must be maintained for all degree course work taken at Stanford.

Completion of an acceptable thesis is required. The Engineer thesis must be approved by two Academic Council faculty members, one of whom must be a member of the department, and submitted in triplicate.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree are outlined in the "Graduate Degrees" section of this bulletin.

Degree requirements are as follows:

1. Submit a Ph.D. program consisting of at least 135 units,† which contains a minimum of 57 technical course units. Of these 57 units:
   - a) at least 54 of the 57 units must be for a letter grade
   - b) 33 units must be taken as Materials Science courses with a MATSCI subject code for a letter grade
   - c) students must take six core courses for a letter grade*
     - 1) 203, 204, and 207 are required of first-year students
     - 2) students must take three additional core courses in their first year from the following: 202, 205, 206, 208, 209, 210.
   - d) a minimum of 12 units of 300-level Materials Science courses (not including MATSCI 300, Ph.D. Research, or MATSCI 400, Participation in Materials Science Teaching)

   e) a minimum of 12 units of courses taken from one of the following lists of advanced specialty courses (see below). Some or all of these courses can be the same as the courses used to meet the requirement of 12 units of 300-level courses; however, the units may not be counted twice toward the 57 technical or 135 total degree units.
   f) elective technical courses to bring the total units up to 57
   g) the remaining units beyond the 57 units of technical course work may consist of Ph.D. research, seminars, and teaching experience.
2. First-year Ph.D. students are required to take the Materials Science Colloquium, MATSCI 230, each quarter of their first year (not counted as technical course units).
3. Ph.D. students are required to obtain an M.S. degree in Materials Science normally by the end of their second year. Paperwork must be submitted prior to taking the qualifying examination. Courses taken for the 57 technical units of Ph.D. work may count to meet the M.S. degree requirements.
4. A departmental oral qualifying examination must be passed by the end of January of their second year. A grade point average (GPA) of 3.25 from the six core classes taken is required for admission to the Ph.D. qualifying exam. Students who have passed the departmental oral examination are required to complete the Application for Candidacy for the Ph.D. Degree by the end of the quarter in which they pass the exam. Final changes in the Application for Candidacy form must be submitted no later than one academic quarter prior to degree conferral.
5. Maintain a GPA of 3.0 in all degree courses taken at Stanford.
6. Present the result of the dissertation at the University oral examination.

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* Students may, if they have sufficient background, petition out of some of the required core courses. To petition, students must have prior consent from their academic adviser, and consent from the instructor of the particular core course. That instructor provides an oral or written examination that the petitioning student must pass.

† At least 90 units must be taken in residence at Stanford. Students entering with an M.S. degree in Materials Science from another university may request to transfer up to 45 units of equivalent work toward the total of 135 required units.

ADVANCED SPECIALTY COURSES

1. Biomaterials: APPPHYS 292; BIOPHYS 228; CHEMENG 260, 310, 355, 444; ME 284A,B, 381, 385, 386, 457; MATSCI 380, 381
2. Electronic Materials Processing: EE 212, 216, 217, 311, 316, 410; MATSCI 312
3. Materials Characterization: APPPHYS 216, 218; CHEMENG 345; EE 329; MATSCI 320, 321, 322, 323, 325, 326
4. Mechanical Behavior of Solids: AA 252, 256; MATSCI 251, 270, 352, 353, 358; ME 335A,B,C, 338, 340, 340B, 345
5. Physics of Solids and Computation: APPPHYS 218, 272, 273; CHEMENG 444; EE 222, 223, 228, 327, 328, 329, 335; MATSCI 330, 343, 347; ME 344A,B, 444B
6. Soft Materials: CHEMENG 260, 310, 460; MATSCI 343; ME 455.

PH.D. MINOR

The University's basic requirements for the Ph.D. minor are outlined in the "Graduate Degrees" section of this bulletin. A minor requires 20 units of graduate work of quality and depth to be approved by the Advanced Degree Committee of the department. Individual programs must be submitted to the Student Services Manager at least one quarter prior to degree conferral and approved as are other academic plans.

COURSES

PRIMARILY FOR UNDERGRADUATES

MATSCI 70N. Building the Future: Invention and Innovation with Engineering Materials—Stanford Introductory Seminar. Preference to freshmen. The technological importance of materials in human civilization is captured in historical names such as the Stone, Bronze, and Iron Ages. The present Information Age could rightly be called the Silicon Age. The pivotal roles of materials in the development of new technologies. Quantitative problem sets, field trips, and formal presentations of small-group projects. GER:DB-EngrAppSci, Write-2

5 units, Spr (Bravman, J)

MATSCI 100. Undergraduate Independent Study—Independent study in materials science under supervision of a faculty member.

1-3 units, Aut, Win, Spr, Sum (Staff)

MATSCI 150. Undergraduate Research—Participation in a research project.

3-6 units, Aut, Win, Spr, Sum (Staff)

MATSCI 151. Microstructure and Mechanical Properties—(Same as 251.) Primarily for students without a materials background. Mechanical properties and their dependence on microstructure in a range of engineering materials. Elementary deformation and fracture concepts, strengthening and toughening strategies in metals and ceramics. Topics: dislocation theory, mechanisms of hardening and toughening, fracture, fatigue, and high-temperature creep. Prerequisite: ENGR 50 or equivalent. GER:DB-EngrAppSci

4 units, Aut (Dauskardt, R)

MATSCI 152. Electronic Materials Engineering—Materials science and engineering for electronic device applications. Kinetic molecular theory and thermally activated processes; band structure and electrical conductivity of metals and semiconductors; intrinsic and extrinsic semiconductors; diffusion; elementary p-n junction theory; operating principles of metal-oxide-semiconductor field effect transistors. Semiconductor processing including crystal growth, oxidation kinetics, ion implantation, thin film deposition, etching, and photolithography. Prerequisite: ENGR 50 or equivalent. GER:DB-EngrAppSci

4 units, Spr (Han, S)

MATSCI 153. Nanostructure and Characterization—The structure of materials at the nanoscale is in most cases the same crystalline form as the natural phase. Structures of materials such as semiconductors, ceramics, metals, and nanotubes; classification of these materials according to the principles of crystallography. Primary methods of structural characterization, X-ray diffraction, and electron microscopy; their applications to study such nanostructures. GER:DB-EngrAppSci

4 units, Win (Sinclair, R; Solorzano, G)

MATSCI 154. Solid State Thermodynamics—The principles of thermodynamics and relationships between thermodynamic variables. Equilibrium in thermodynamic systems. Thermodynamics of multicomponent systems. Prerequisite: physical chemistry or introductory thermodynamics. GER:DB-EngrAppSci

4 units, Aut (Barnett, D)

MATSCI 155. Nanomaterials Synthesis—The science of synthesis of nanometer scale materials. Examples including solution phase synthesis of nanoparticles, the vapor-liquid-solid approach to growing nanowires, formation of mesoporous materials from block-copolymer solutions, and formation of photonic crystals. Relationship of the synthesis phenomena to the materials science driving forces and kinetic mechanisms. Materials science concepts including capillarity, Gibbs free energy, phase diagrams, and driving forces. Prerequisite: ENGR 50, and MATSCI 154 or CHEMENG 110. GER:DB-EngrAppSci

4 units, Spr (Clemens, B)

MATSCI 156. Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution—Operating principles and applications of emerging technological solutions to the energy demands of the world. The scale of global energy usage and requirements for possible solutions. Basic physics and chemistry of solar cells, fuel cells, and batteries. Performance issues, including economics, from the ideal device to the installed system. The promise of materials research for providing next generation solutions.

4 units, Aut (Clemens, B)

MATSCI 157. Quantum Mechanics for Materials Scientists—Introduction to quantum mechanics and its application to the properties of materials. The Schrödinger equation, uncertainty principle, bound states and periodic potentials, angular momentum, quantum statistics, and perturbation theory. Applications to electronic band structure in semiconductors, metals, and nanostructures; vibrational properties of solids; light/matter interaction and lasers; bonding; magnetic materials; nanotechnology. Prerequisites: working knowledge of calculus and high school physics.

4 units, Win (Lindenberg, A)

MATSCI 159Q. Japanese Companies and Japanese Society—(Same as ENGR 159Q.) Stanford Introductory Seminar. Preference to sophomores. The structure of a Japanese company from the point of view of Japanese society. Visiting researchers from Japanese companies give presentations on their research enterprise. The Japanese research ethic. The home campus equivalent of a Kyoto SCTI course. GER:DB-SocSci

3 units, Spr (Sinclair, R)

MATSCI 160. Nanomaterials Laboratory—Preference to sophomores and juniors. Hands-on approach to synthesis and characterization of nanoscale materials. How to make, pattern, and analyze the latest nanotech materials, including nanoparticles, nanowires, and self-assembled monolayers. Techniques such as soft lithography, self-assembly, and surface functionalization. The VLS mechanism of nanowire growth, nanoparticle size control, self-assembly mechanisms, and surface energy considerations. Laboratory projects. Enrollment limited to 24. GER:DB-EngrAppSci

4 units, Spr (Melosh, N)

MATSCI 161. Nanocharacterization Laboratory—(Same as 171.) The development of standard lab procedures for materials scientists emphasizing microscopy, metallography, and technical writing. Techniques: optical, scanning-electron, atomic-force microscopy; and metallographic specimen preparation. The relationships among microscopic observation, material properties, and processing. Prerequisite: ENGR 50 or equivalent. GER:DB-EngrAppSci, WIM

4 units, Win (Han, S)

MATSCI 162. X-Ray Diffraction Laboratory—(Same as 172.) Experimental x-ray diffraction techniques for microstructural analysis of materials, emphasizing powder and single-crystal techniques. Diffraction from epitaxial and polycrystalline thin films, multilayers, and amorphorous materials using medium and high resolution configurations. Determination of phase purity, crystallinity, relaxation, stress, and texture in the materials. Advanced experimental x-ray diffraction techniques: reciprocal lattice mapping, reflectivity, and grazing incidence diffraction. Enrollment limited to 20. GER:DB-EngrAppSci

4 units, Win (Vailionis, A)

MATSCI 163. Mechanical Behavior Laboratory—(Same as 173.) Experimental techniques for the study of the mechanical behavior of engineering materials in bulk and thin film form, including tension testing, nanoindentation, and wafer curvature stress analysis. Metallic and polymeric systems will be studied. Prerequisites: 198/208, 151/251, ME 80 or equivalent. GER:DB-EngrAppSci

4 units, Aut (Gage, D)

MATSCI 164. Electronic and Photonic Materials and Devices Laboratory—Lab course. Current electronic and photonic materials and devices. Device physics and micro-fabrication techniques. Students design, fabricate, and perform physical characterization on the devices they have fabricated. Established techniques and materials such as photolithography, metal evaporation, and Si technology; and novel ones such as soft lithography and organic semiconductors. Prerequisites: 152 and 199, or consent of instructor. GER:DB-EngrAppSci

4 units, Aut (Salleo, A)

MATSCI 171. Nanocharacterization Laboratory—(For graduate students; see 161.)

3 units, Win (Han, S)

MATSCI 172. X-Ray Diffraction Laboratory—(For graduate students; see 162)

3 units, Win (Vailionis, A)

MATSCI 173. Mechanical Behavior Laboratory—(For graduate students; see 163.)

3 units, Aut (Gage, D)

MATSCI 190. Organic Materials—(For undergraduates; see 210.) GER:DB-EngrAppSci

4 units, Aut (McGehee, M)

MATSCI 192. Materials Chemistry—(For undergraduates; see 202.) GER:DB-EngrAppSci

4 units, Aut (Cui, Y)

MATSCI 193. Atomic Arrangements in Solids—(For undergraduates; see 203.) GER:DB-EngrAppSci

4 units, Aut (Sinclair, R)

MATSCI 194. Thermodynamics and Phase Equilibria—(For undergraduates; see 204.) GER:DB-EngrAppSci

4 units, Win (Salleo, A)

MATSCI 195. Waves and Diffraction in Solids—(For undergraduates; see 205.) GER:DB-EngrAppSci

4 units, Win (Clemens, B)

MATSCI 196. Imperfections in Crystalline Solids—(For undergraduates; see 206.) GER:DB-EngrAppSci

4 units, Spr (Nix, W)

MATSCI 197. Rate Processes in Materials—(For undergraduates; see 207.) GER:DB-EngrAppSci

4 units, Spr (McIntyre, P)

MATSCI 198. Mechanical Properties of Materials—(For undergraduates; see 208.) GER:DB-EngrAppSci

4 units, Win (Dauskardt, R)

MATSCI 199. Electronic and Optical Properties of Solids—(For undergraduates; see 209.) GER:DB-EngrAppSci

4 units, Spr (Brongersma, M)

PRIMARILY FOR GRADUATE STUDENTS

MATSCI 200. Master's Research—Participation in a research project.

1-15 units, Aut, Win, Spr, Sum (Staff)

MATSCI 202. Materials Chemistry—(Same as 192.) Chemical principles of materials: atomic and molecular bonding; acid and base chemistry; redox and electrochemistry; colloidal and surface chemistry; materials synthesis; and nanoscale chemistry.

3 units, Aut (Cui, Y)

MATSCI 203. Atomic Arrangements in Solids—(Same as 193.) Atomic arrangements in perfect and imperfect crystalline solids, especially important metals, ceramics, and semiconductors. Elements of formal crystallography, including development of point groups and space groups.

3 units, Aut (Sinclair, R)

MATSCI 204. Thermodynamics and Phase Equilibria—(Same as 194.) The principles of heterogeneous equilibria and their application to phase diagrams. Thermodynamics of solutions; chemical reactions; non-stoichiometry in compounds; first order phase transitions and metastability; thermodynamics of surfaces, elastic solids, dielectrics, and magnetic solids. Prerequisite: 192/202 or consent of instructor.

3 units, Win (Salleo, A)

MATSCI 205. Waves and Diffraction in Solids—(Same as 195.) The elementary principals of x-ray, vibrational, and electron waves in solids. Basic wave behavior including Fourier analysis, interference, diffraction, and polarization. Examples of wave systems, including electromagnetic waves from Maxwell's equations. Diffracted intensity in reciprocal space and experimental techniques such as electron and x-ray diffraction. Lattice vibrations in solids, including vibrational modes, dispersion relationship, density of states, and thermal properties. Free electron model. Basic quantum mechanics and statistical mechanics including Fermi-Dirac and Bose-Einstein statistics. Prerequisite: 193/203 or consent of instructor.

3 units, Win (Clemens, B)

MATSCI 206. Imperfections in Crystalline Solids—(Same as 196.) The relation of lattice defects to the physical and mechanical properties of crystalline solids. Introduction to point imperfections and their relationship to transport properties in metallic, covalent, and ionic crystals. Geometric, crystallographic, elastic, and energetic properties of dislocations. Relations between dislocations and the mechanical properties of crystals. The structure and properties of interfaces in solids. Prerequisite: 193/203.

3 units, Spr (Nix, W)

MATSCI 207. Rate Processes in Materials—(Same as 197.) Diffusion and phase transformations in solids. Diffusion topics: Fick's laws, atomic theory of diffusion, and diffusion in alloys. Phase transformation topics: nucleation, growth, diffusional transformations, spinodal decomposition, and interface phenomena. Material builds on the mathematical, thermodynamic, and statistical mechanical foundations in the prerequisites. Prerequisites: 194/204.

3 units, Spr (McIntyre, P)

MATSCI 208. Mechanical Properties of Materials—(Same as 198.) Introduction to the mechanical behavior of solids, emphasizing the relationships between microstructure and mechanical properties. Elastic, anelastic, and plastic properties of materials. The relations between stress, strain, strain rate, and temperature for plastically deformable solids. Application of dislocation theory to strengthening mechanisms in crystalline solids. The phenomena of creep, fracture, and fatigue and their controlling mechanisms. Prerequisites: 193/203.

3 units, Win (Dauskardt, R)

MATSCI 209. Electronic and Optical Properties of Solids—(Same as 199.) The concepts of electronic energy bands and transports applied to metals, semiconductors, and insulators. The behavior of electronic and optical devices including p-n junctions, MOS-capacitors, MOSFETs, optical waveguides, quantum-well lasers, light amplifiers, and metallo-dielectric light guides. Emphasis is on relationships between structure and physical properties. Elementary quantum and statistical mechanics concepts are used. Prerequisite: 195/205 or equivalent.

3 units, Spr (Brongersma, M)

MATSCI 210. Organic Materials—(Same as 190.) Unique physical and chemical properties of organic materials and their uses.The relationship between structure and physical properties, and techniques to determine chemical structure and molecular ordering. Examples include liquid crystals, dendrimers, carbon nanotubes, hydrogels, and biopolymers such as lipids, protein, and DNA.

3 units, Aut (McGehee, M)

MATSCI 230. Materials Science Colloquium—May be repeated for credit.

1 unit, Aut (Salleo, A; Lindenberg, A), Win (Cui, Y; Sinclair, R), Spr (Dauskardt, R; Heilshorn, S)

MATSCI 251. Microstructure and Mechanical Properties—(For graduate students; see 151.)

3 units, Aut (Dauskardt, R)

MATSCI 299. Practical Training—Educational opportunities in high-technology research and development labs in industry. Qualified graduate students engage in internship work and integrate that work into their academic program. Following the internship, students complete a research report outlining their work activity, problems investigated, key results, and any follow-on projects they expect to perform. Student is responsible for arranging own employment. See department student services manager before enrolling.

3 units, Aut, Win, Spr, Sum (Staff)

MATSCI 300. Ph.D. Research—Participation in a research project.

1-15 units, Aut, Win, Spr, Sum (Staff)

MATSCI 302. Solar Cells—Theory of conventional p-n junction and excitonic solar cells. Design, fabrication, and characterization of crystalline silicon, amorphous silicon, CdTe, CIGS, and tandem and organic solar cells. Emerging solar cell concepts such as intermediate band gap and bioinspired solar cells. Emphasis is on the materials science aspects of solar cells research. Module design and economic hurdles that must be overcome for solar cell technology to generate a significant fraction of the world's electricity. Group project to explore one solar cell approach in depth. SITN/SCPD televised.

3 units, Spr (McGehee, M)

MATSCI 311. Lasers in Materials Processing—Principles of laser operation. Optically and electrically pumped lasers. Materials for solid-state lasers. Fundamentals of laser/materials interactions. Applications in thin film technology and microfabrication; laser annealing of defects and crystallization of amorphous films. Laser-induced shock waves. Extreme non-equilibrium laser processing; ultra-fast (femtosecond) lasers and their novel uses; micro- and nanofabrication of fluidic and photonic devices; intracellular nano-surgery.

3 units, Spr (Salleo, A)

MATSCI 312. New Methods in Thin Film Synthesis—Materials base for engineering new classes of coatings and devices. Techniques to grow thin films at atomic scale and to fabricate multilayers/superlattices at nanoscale. Vacuum growth techniques including evaporation, molecular beam epitaxy (MBE), sputtering, ion beam assisted deposition, laser ablation, chemical vapor deposition (CVD), and electroplating. Future direction of material synthesis such as nanocluster deposition and nanoparticles self-assembly. Relationships between deposition parameters and film properties. Applications of thin film synthesis in microelectronics, nanotechnology, and biology. SITN/SCPD televised.

3 units, Aut (Wang, S)

MATSCI 316. Nanoscale Science, Engineering, and Technology—Sample application areas: renewable energy including nanoscaled photovoltaic cells, hydrogen storage, fuel cells, and nanoelectronics. Nanofabrication techniques including: self-assembly of amphiphilic molecules, block copolymers, organic-inorganic mesostructures, colloidal crystals, organic monolayers, proteins, DNA and abalone shells; biologically inspired growth of materials; photolithography, electron beam lithography, and scanning probe lithography; and synthesis of carbon nanotubes, nanowire, and nanocrystals. Other nanotechnology topics may be explored through a group project. SITN/SCPD televised.

3 units, Win (Cui, Y)

MATSCI 320. Nanocharacterization of Materials—Current methods of directly examining the microstructure of materials. Topics: optical microscopy, scanning electron and focused ion beam microscopy, field ion microscopy, transmission electron microscopy, scanning probe microscopy, and microanalytical surface science methods. Emphasis is on the electron-optical techniques. Recommended: 193/203.

3 units, Win (Sinclair, R; Evans, C), alternate years, not given next year

MATSCI 321. Transmission Electron Microscopy—Image formation and interpretation. The contrast phenomena associated with perfect and imperfect crystals from a physical point of view and from a formal treatment of electron diffraction theory. The importance of electron diffraction to systematic analysis and recent imaging developments. Recommended: 193/203, 195/205, or equivalent.

3 units, alternate years, not given this year

MATSCI 322. Transmission Electron Microscopy Laboratory—Experimental application of electron microscopy to typical materials science studies. Topics include microscope operation and alignment, diffraction modes and analysis, bright-field/dark-field analysis of defects, high resolution imaging, and analytical techniques for compositional analysis (EDAX). Enrollment limited to 12. Prerequisites: 321, consent of instructor.

3 units, Spr (Marshall, A)

MATSCI 323. Thin Film and Interface Microanalysis—The science and technology of microanalytical techniques, including Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), secondary ion mass spectroscopy (SIMS), ion scattering spectroscopy

(ISS), and x-ray photoelectron spectroscopy (XPS or ESCA). Generic processes such as sputtering and high-vacuum generation. Prerequisite: some prior exposure to atomic and electronic structure of solids. SITN/SCPD televised.

3 units, not given this year (Brongersma, M)

MATSCI 325. X-Ray Diffraction—Diffraction theory and its relationship to structural determination in solids. Focus is on applications of x-rays; concepts can be applied to neutron and electron diffraction. Topics: Fourier analysis, kinematic theory, Patterson functions, diffraction from layered and amorphous materials, single crystal diffraction, dynamic theory, defect determination, surface diffraction, techniques for data analysis, and determination of particle size and strain. Prerequisites: 193/203, 195/205.

3 units, alternate years, not given this year (Clemens, B)

MATSCI 326. X-Ray Science and Techniques—X-ray interaction with matter; diffraction from ordered and disordered materials; x-ray absorption, photoemission, and coherent scattering; x-ray microsocopy. Sources including synchrontrons, high harmonic generation, x-ray lasers. Time-resolved techniques and detector technology.

3 units, Aut (Lindenberg, A)

MATSCI 343. Organic Semiconductors for Electronics and Photonics—The science of organic semiconductors and their use in electronic and photonic devices. Topics: methods for fabricating thin films and devices; relationship between chemical structure and molecular packing on properties such as band gap, charge carrier mobility and luminescence efficiency; doping; field-effect transistors; light-emitting diodes; lasers; biosensors; photodetectors and photovoltaic cells. SITN/SCPD televised.

3 units, Win (McGehee, M; Peumans, P)

MATSCI 346. Nanophotonics—(Same as EE 336.) Recent developments in micro- and nanophotonic materials and devices. Basic concepts of photonic crystals. Integrated photonic circuits. Photonic crystal fibers. Superprism effects. Optical properties of metallic nanostructures. Sub-wavelength phenomena and plasmonic excitations. Meta-materials. Prerequisite: electromagnetic theory at the level of 242. SITN/SCPD televised.

3 units, Win (Fan, S; Brongersma, M)

MATSCI 347. Introduction to Magnetism and Magnetic Nanostructures—Atomic origins of magnetic moments, magnetic exchange and ferromagnetism, types of magnetic order, magnetic anisotropy, domains, domain walls, hysteresis loops, hard and soft magnetic materials, demagnetization factors, and applications of magnetic materials, especially magnetic nanostructures and nanotechnology. Tools include finite-element and micromagnetic modeling. Design topics include electromagnet and permanent magnet, electronic article surveillance, magnetic inductors, bio-magnetic sensors, and magnetic drug delivery. Design projects, team work, and computer-aided design. Prerequisites: PHYSICS 29 and 43, or college-level electricity and magnetism.

3 units, Spr (Wang, S; White, R)

MATSCI 352. Stress Analysis in Thin Films and Layered Composite Media—Introduction to methods of stress analysis of layered dissimilar media, including thin films deposited on substrates, composite laminates, and stratified anisotropic elastic materials based on techniques pioneered by Stroh. Stress states generated by thermal and elastic mismatch and local stress concentrations at interfacial cracks or corners, with applications to integrated circuit devices, aircraft materials, and geophysical media. Prerequisites: introductory course on the strength of materials or the theory of elasticity; familiarity with matrix algebra.

3 units, not given this year (Barnett, D)

MATSCI 353. Mechanical Properties of Thin Films—The mechanical properties of thin films on substrates. The mechanics of thin films and of the atomic processes which cause stresses to develop during thin film growth. Experimental techniques for studying stresses in and mechanical properties of thin films. Elastic, plastic, and diffusional deformation of thin films on substrates as a function of temperature and microstructure. Effects of deformation and fracture on the processing of thin film materials. Prerequisite: 198/208.

3 units, not given this year (Nix, W)

MATSCI 358. Fracture and Fatigue of Materials and Thin Film Structures—Linear-elastic and elastic-plastic fracture mechanics from a materials science perspective, emphasizing microstructure and the micromechanisms of fracture. Plane strain fracture toughness and resistance curve behavior. Mechanisms of failure associated with cohesion and adhesion in bulk materials, composites, and thin film structures. Fracture mechanics approaches to toughening and subcritical crack-growth processes, with examples and applications involving cyclic fatigue and environmentally assisted subcritical crack growth. SITN/SCPD televised. Prerequisite: 151/251, 198/208, or equivalent.

3 units, Spr (Dauskardt, R)

MATSCI 359. Crystalline Anisotropy—(Same as ME 336.) Matrix and tensor analysis with applications to the effects of crystal symmetry on elastic deformation, thermal expansion, diffusion, piezoelectricity, magnetism, thermodynamics, and optical properties of solids, on the level of J. F. Nye's *Physical Properties of Crystals*. Homework sets use Mathematica.

3 units, not given this year (Barnett, D)

MATSCI 380. Nano-Biotechnology—Literature based. Principles that make nanoscale materials unique, applications to biology, and how biological systems can create nanomaterials. Molecular sensing, drug delivery, bio-inspired synthesis, self-assembling systems, and nanomaterial based therapies. Interactions at the nanoscale. Applications and opportunities for new technology.

3 units, Aut (Melosh, N)

MATSCI 381. Biomaterials in Regenerative Medicine—(Same as BIOE 361.) How materials interact with cells through their micro- and nanostructure, mechanical properties, degradation characteristics, surface chemistry, and biochemistry. Examples include novel materials for drug and gene delivery, materials for stem cell proliferation and differentiation, and tissue engineering scaffolds. Prerequisites: undergraduate chemistry, and cell/molecular biology or biochemistry.

3 units, Win (Heilshorn, S; Cochran, J)

MATSCI 399. Graduate Independent Study—Under supervision of a faculty member.

1-10 units, Aut, Win, Spr, Sum (Staff)

MATSCI 400. Participation in Materials Science Teaching—May be repeated for credit.

1-3 units, Aut, Win, Spr (Staff)

MATSCI 405. Seminar in Applications of Transmission Electron Microscopy—May be repeated for credit.

1 unit, not given this year (Sinclair, R)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

AA 252. Techniques of Failure Analysis

3 units, Spr (Murray, S)

AA 256. Mechanics of Composites

3 units, Win (Chang, F)

APPPHYS 218. X-Ray and Neutron Scattering in the 21st Century

3 units, Win (Greven, M), alternate years, not given next year

APPPHYS 270. Magnetism and Long Range Order in Solids

3 units, Aut (Fisher, I)

APPPHYS 272. Solid State Physics I

3 units, Win (Kivelson, S)

APPPHYS 273. Solid State Physics II
3 units, Spr (Kivelson, S)

CHEMENG 444. Quantum Simulations of Molecules and Materials
3 units, Aut (Musgrave, C)

CHEMENG 460. Polymer Surfaces and Interfaces
3 units, alternate years, not given this year

EE 212. Integrated Circuit Fabrication Processes
3 units, Aut (Plummer, J)

EE 216. Principles and Models of Semiconductor Devices
3 units, Aut (Harris, J), Win (Saraswat, K; Pease, R)

EE 228. Basic Physics for Solid State Electronics
3 units, Aut (Peumans, P)

EE 311. Advanced Integrated Circuit Fabrication Processes
3 units, Spr (Saraswat, K)

EE 312. Micromachined Sensors and Actuators
3 units, Win (Kovacs, G)

EE 316. Advanced VLSI Devices
3 units, Win (Wong, P)

EE 327. Properties of Semiconductor Materials
3 units, not given this year

EE 328. Physics of Advanced Semiconductor Devices
3 units, Spr (Harris, J)

EE 329. The Electronic Structure of Surfaces and Interfaces
3 units, not given this year

EE 335. Introduction to Information Storage Systems
3 units, Win (Wang, S)

EE 410. Integrated Circuit Fabrication Laboratory
3-4 units, Win (Saraswat, K)

ENGR 31. Chemical Principles with Application to Nanoscale Science and Technology
4 units, Aut (McIntyre, P)

ENGR 50. Introduction to Materials Science, Nanotechnology Emphasis
4 units, Win (Melosh, N), Spr (Sinclair, R)

ENGR 50M. Introduction to Materials Science, Biomaterials Emphasis
4 units, Aut (Heilshorn, S)

ME 329. Physical Solid Mechanics
3 units, alternate years, not given this year

ME 340. Elasticity in Microscopic Structures
3 units, Spr (Cai, W)

ME 345. Fatigue Design and Analysis
3 units, Win (Nelson, D)

MECHANICAL ENGINEERING

Emeriti: (Professors) James L. Adams, Peter Bradshaw, Daniel B. DeBra, Robert H. Eustis, George Herrmann, Thomas J. R. Hughes, James P. Johnston,* Thomas R. Kane, William M. Kays, Joseph B. Keller, Robert McKim, Robert J. Moffat,* M. Godfrey Mungal, J. David Powell, Rudolph Sher, Charles R. Steele,* Milton D. Van Dyke, Douglass J. Wilde*; (*Professors, Research*) Elliot Levinthal, Richard M. Christensen, Sidney Self, Felix Zajac

Mechanical Engineering Executive Committee: Mark Cappelli (Student Services and Undergraduate Curriculum), Mark R. Cutkosky, John K. Eaton (Vice Chairman), Kenneth E. Goodson, (Graduate Admissions), Christian Gerdes (Graduate Curriculum), Drew Nelson (Student Services and Undergraduate Curriculum), Friedrich B. Prinz (Chairman, Mechanical Engineering)

Group Chairs: Thomas P. Andriacchi (Biomechanical Engineering), Craig T. Bowman (Thermosciences), Mark R. Cutkosky (Design), Parviz Moin (Flow Physics and Computation Engineering), Peter M. Pinsky (Mechanics and Computation)

Laboratory Directors: David W. Beach (Product Realization Laboratory), J. Edward Carryer (Smart Product Design Laboratory), Mark R. Cutkosky (Manufacturing Sciences Lab), John K. Eaton (Heat Transfer and Turbulence Mechanics), Charbel Farhat (Army High Performance Computing Research Center, AHPCRC), Kosuke Ishii (Manufacturing Modeling Laboratory), Christopher Jacobs (Veterans Affairs Rehabilitation R&D Center), Larry J. Leifer (Center for Design Research), Reginald E. Mitchell (High Temperature Gas Dynamics), Parviz Moin (Center for Turbulence Research), Friedrich B. Prinz (Rapid Prototyping Laboratory)

Professors: Thomas P. Andriacchi, David M. Barnett, Craig T. Bowman, Brian J. Cantwell, Mark A. Cappelli, Dennis R. Carter, Mark R. Cutkosky, Scott Delp, John K. Eaton, Charbel Farhat, Kenneth E. Goodson, Ronald K. Hanson, Kosuke Ishii, David M. Kelley, Thomas W. Kenny, Charles H. Kruger, Larry J. Leifer, Sanjiva Lele, Parviz Moin, Drew V. Nelson, Peter M. Pinsky, Friedrich B. Prinz, Bernard Roth, Eric Shaqfeh, Sheri D. Sheppard

Associate Professors: Christopher Edwards, J. Christian Gerdes, Marc Levenston, Reginald E. Mitchell, Juan G. Santiago, Charles Taylor

Assistant Professors: Wei Cai, Eric Darve, Gianluca Iaccarino, Ellen Kuhl, Adrian Lew, Gunter Niemeyer, Heinz Pitsch, Beth Pruitt, Xiaolin Zheng

Professor (Research): Kenneth Waldron

Associate Professor (Research): Christopher Jacobs

Professor (Teaching): David W. Beach

Courtesy Professors: Fu-Kuo Chang, Ralph Greco, Kenneth Salisbury, George S. Springer, Robert T. Street, Paul Yock

Senior Lecturers: Vadim Khayms, J. Craig Milroy

Lecturer: Matthew R. Ohline

Consulting Professors: Gary S. Beaupre, David M. Golden, Barry M. Katz, Victor D. Scheinman, Stephen Walch, Edith Wilson

Consulting Associate Professors: J. Edward Carryer, Gary D. Lichtenstein, Paul Mitiguy, William Moggridge, Carol B. Muller, Charles J. Petrie, Sunil Puria, Paul Saffo, George Toye, Machiel Van der Loos

Consulting Assistant Professors: Michael Barry, Mark Bolas, Brendan J. Boyle, Dennis Boyle, William Burnett, Dev Patnaik, Sara Little Turnbull

Student Services: Building 530, Room 125
Mail Code: 94305-3030
Student Services Phone: (650) 725-7695
Web Site: http://me.stanford.edu

Courses given in Mechanical Engineering have the subject code ME. For a complete list of subject codes, see Appendix.

The programs in the Department of Mechanical Engineering (ME) emphasize a mix of applied mechanics, biomechanical engineering, computer simulations, design, and energy science and technology. Since

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* Recalled to active duty.

mechanical engineering is a broad discipline, the undergraduate program can be a springboard for graduate study in business, law, medicine, political science, and other professions where understanding technology is important. Both undergraduate and graduate programs provide technical background for work in biomechanical engineering, environmental pollution control, ocean engineering, transportation, and other multidisciplinary problems that concern society. In all programs, emphasis is placed on developing systematic procedures for analysis, communication of work and ideas, practical and aesthetic aspects in design, and responsible use of technology.

The department has five groups: Biomechanical Engineering; Design; Flow Physics and Computation; Mechanics and Computation; and Thermosciences. Each maintains its own labs, shops, and offices.

The Biomechanical Engineering (BME) Group has teaching and research activities which focus primarily on musculoskeletal biomechanics, neuromuscular biomechanics, cardiovascular biomechanics, and rehabilitation engineering. Research in other areas including hearing, ocean, plant, and vision biomechanics exists in collaboration with associated faculty in biology, engineering, and medicine. The group has strong research interactions with the Mechanics and Computation and the Design groups, and the departments of Neurology, Radiology, and Surgery in the School of Medicine.

The Design Group emphasizes cognitive skill development for creative design. It is concerned with automatic control, computer-aided design, creativity, design aesthetics, design for manufacturability, design research, experimental stress analysis, fatigue and fracture mechanics, finite element analysis, human factors, kinematics, manufacturing systems, microcomputers in design, micro-electromechanics systems (MEMS), robotics, and vehicle dynamics. The group offers undergraduate and graduate programs in Product Design (jointly with the Department of Art and Art History) and is centrally involved in the Institute of Design; for further information, see http://dschool.stanford.edu.

The Flow Physics and Computation Group (FPC) is developing new theories, models, and computational tools for accurate engineering design analysis and control of complex flows (including acoustics, chemical reactions, interactions with electromagnetic waves, plasmas, and other phenomena) of interest in aerodynamics, electronics cooling, environment engineering, materials processing, planetary entry, propulsion and power systems, and other areas. FPC research emphasizes modeling and analysis of physical phenomena in engineering systems. Students and research staff are developing new methods and tools for generation, access, display, interpretation and post-processing of large databases resulting from numerical simulations of physical systems. Research in FPC ranges from advanced simulation of complex turbulent flows to active flow control. Faculty teach graduate and undergraduate courses in acoustics, aerodynamics, computational fluid mechanics, computational mathematics, fluid mechanics, combustion, and thermodynamics and propulsion.

The Mechanics and Computational Group covers biomechanics, continuum mechanics, dynamics, experimental and computational mechanics, finite element analysis, fluid dynamics, fracture mechanics, micromechanics, nanotechnology, and simulation based design. Qualified students can work as research project assistants, engaging in thesis research in association with the faculty director and fellow students. Projects include analysis, synthesis, and control of systems; biomechanics; flow dynamics of liquids and gases; fracture and micro-mechanics, vibrations, and nonlinear dynamics; and original theoretical, computational, and experimental investigations in the strength and deformability of elastic and inelastic elements of machines and structures.

The Thermosciences Group conducts experimental and analytical research on both fundamental and applied topics in the general area of thermal and fluid systems. Research strengths include high Reynolds number flows, microfluidics, combustion and reacting flows, multiphase flow and combustion, plasma sciences, gas physics and chemistry, laser diagnostics, microscale heat transfer, convective heat transfer, and energy systems. Research motivation comes from applications including air-breathing and space propulsion, bioanalytical systems, pollution control, electronics fabrication and cooling, stationary and mobile energy systems, biomedical systems, and materials processing. Emphasis is on fundamental experiments leading towards advances in modeling, optimization, and control of complex systems.

Mission Statement—The goal of Stanford's undergraduate program in Mechanical Engineering is to provide each student with a balance of intellectual and practical experiences, accumulation of knowledge, and self-discovery to prepare the graduate to address societal needs. The program prepares each student for entry-level work as a mechanical engineer, graduate study in engineering, or graduate study in another field where a broad engineering background provides a foundation. With grounding in the principles and practice of mechanical engineering, graduates are ready to engage in learning about and employing new concepts, technologies, and methodologies.

FACILITIES

The department groups maintain modern laboratories that support undergraduate and graduate instruction and graduate research work.

The Structures and Composites Laboratory, a joint activity with the Department of Aeronautics and Astronautics, studies structures made of fiber-reinforced composite materials. Equipment for fabricating structural elements includes autoclave, filament winder, and presses. X-ray, ultrasound, and an electron microscope are available for nondestructive testing. The lab also has environmental chambers, a high speed impactor, and mechanical testers. Lab projects include designing composite structures, developing novel manufacturing processes, and evaluating environmental effects on composites.

Experimental facilities are available through the interdepartmental Structures and Solid Mechanics Research Laboratory, which includes an electrohydraulic materials testing system, a vehicle crash simulator, and a shake table for earthquake engineering and related studies, together with highly sophisticated auxiliary instrumentation. Facilities to study the micromechanics of fracture areas are available in the Micromechanics/Fracture Laboratory, and include a computer-controlled materials testing system, a long distance microscope, an atomic force microscope, and other instrumentation. Additional facilities for evaluation of materials are available through the Center for Materials Research, Center for Integrated Circuits, and the Ginzton Laboratory. Laboratories for biological experimentation are accessible through the School of Medicine. Individual accommodation is available for the work of each research student.

Major experimental and computational laboratories engaged in bioengineering work are located in the Biomechanical Engineering Group. Other Biomechanical Engineering Group activities and resources are associated with the Rehabilitation Research and Development Center of the Veterans Administration Palo Alto Health Care System. This major national research center has computational and prototyping facilities. In addition, the Rehabilitation Research and Development Center houses the Electrophysiology Laboratory, Experimental Mechanics Laboratory, Human Motor Control Laboratory, Rehabilitation Device Design Laboratory, and Skeletal Biomechanics Laboratory. These facilities support graduate course work as well as Ph.D. student research activities.

Computational and experimental work is also conducted in various facilities throughout the School of Engineering and the School of Medicine, particularly the Advanced Biomaterials Testing Laboratory of the Department of Materials Science and Engineering, the Orthopaedic Research Laboratory in the Department of Functional Restoration, and the Vascular Research Laboratory in the Department of Surgery. In collaboration with the School of Medicine, facilities throughout the Stanford Medical Center and the Veterans Administration Palo Alto Health Care System conduct biological and clinical work.

The Design Group has facilities for lab work in experimental mechanics and experimental stress analysis. Additional facilities, including MTS electrohydraulic materials test systems, are available in the Solid Mechanics Research Laboratory. Design Group students also have access to Center for Integrated Systems (CIS) and Ginzton Lab microfabrication facilities.

The group also maintains the Product Realization Laboratory (PRL), a teaching facility offering students integrated experiences in market definition, product design, and prototype manufacturing. The PRL provides coaching, design manufacturing tools, and networking opportunities to students interested in product development. The ME 310 Design Project Laboratory has facilities for CAD, assembly, and testing of original designs by master's students in the engineering design program. A Smart Product Design Laboratory supports microprocessor application projects. The Center for Design Research (CDR) has an excellent facility for concurrent engineering research, development, and engineering curriculum creation and assessment. Resources include a network of high-performance workstations. For worldwide web mediated concurrent engineering by virtual, non-collocated, design development teams, see the CDR web site at http://cdr.stanford.edu. In addition, CDR has several industrial robots for student projects and research. These and several NC machines are part of the CDR Manufacturing Sciences Lab. The Manufacturing Modeling Laboratory (MML) addresses various models and methods that lead to competitive manufacturing. MML links design for manufacturing (dfM) research at the Department of Mechanical Engineering with supply chain management activities at the Department of Management Science and Engineering. The Rapid Prototyping Laboratory consists of seven processing stations including cleaning, CNC milling, grit blasting, laser deposition, low temperature deposition, plasma deposition, and shot peening. Students gain experience by using ACIS and Pro Engineer on Hewlett Packard workstations for process software development. The Design Group also has a Product Design Loft in which students in the Joint Program in Design develop graduate thesis projects.

The Flow Physics and Computation Group has a 32 processor Origin 2000, 48-node and 85-node Linux cluster with high performance interconnection and an array of powerful workstations for graphics and data analysis. Several software packages are available, including all the major commercial CFD codes. FPC is strongly allied with the Center for Turbulence Research (CTR), a research consortium between Stanford and NASA, and the Center for Integrated Turbulence Simulations (CITS), which is supported by the Department of Energy (DOE) under its Accelerated Strategic Computing Initiative (ASCI). The Center for Turbulence Research has direct access to major national computing facilities located at the nearby NASA-Ames Research Center, including massively parallel super computers. The Center for Integrated Turbulence Simulations has access to DOE's vast supercomputer resources. The intellectual atmosphere of the Flow Physics and Computation Group is greatly enhanced by the interactions among CTR's and CITS's postdoctoral researchers and distinguished visiting scientists.

The Mechanics and Computation Group has a Computational Mechanics Laboratory that provides an integrated computational environment for research and research-related education in computational mechanics and scientific computing. The laboratory houses Silicon Graphics, Sun, and HP workstations and servers, including an 8-processor SGI Origin2000 and a 16-processor networked cluster of Intel-architecture workstations for parallel and distributed computing solutions of computationally intensive problems. Software is available on the laboratory machines, including commercial packages for engineering analysis, parametric geometry and meshing, and computational mathematics. The laboratory supports basic research in computational mechanics as well as the development of related applications such as simulation-based design technology.

The Thermosciences Group has four major laboratory facilities. The Heat Transfer and Turbulence Mechanics Laboratory concentrates on fundamental research aimed at understanding and improved prediction of turbulent flows and high performance energy conversion systems. The laboratory includes two general-purpose wind tunnels, a pressurized high Reynolds number tunnel, two supersonic cascade flow facilities, three specialized boundary layer wind tunnels, and several other flow facilities. Extensive diagnostic equipment is available including multiple particle-image velocimetry and laser-Doppler anemometry systems.

The High Temperature Gas Dynamics Laboratory includes research on sensors, plasma sciences, cool and biomass combustion and gas pollutant formation, and reactive and non-reactive gas dynamics. Research facilities include diagnostic devices for combustion gases, a spray combustion facility, laboratory combustors including a coal combustion facility and supersonic combustion facilities, several advanced laser systems, a variety of plasma facilities, a pulsed detonation facility, and four shock tubes and tunnels. The Thermosciences Group and the Design Group share the Microscale Thermal and Mechanical Characterization laboratory (MTMC). MTMC is dedicated to the measurement of thermal and mechanical properties in thin-film systems, including microfabricated sensors and actuators and integrated circuits, and features a nanosecond scanning laser thermometry facility, a laser interferometer, a near-field optical microscope, and an atomic force microscope. The activities at MTMC are closely linked to those at the Heat Transfer Teaching Laboratory (HTTL), where undergraduate and master's students use high-resolution probe stations to study thermal phenomena in integrated circuits and thermally-actuated microvalves. HTTL also provides macroscopic experiments in convection and radiative exchange.

The Energy Systems Laboratory is a teaching and research facility dedicated to the study of energy conversion systems. The lab includes three dynamometers for engine testing, a computer-controlled variable engine valve controller, a fuel-cell experimental station, a small rocket testing facility, and a small jet engine thrust stand.

The Guidance and Control Laboratory, a joint activity with the Department of Aeronautics and Astronautics and the Department of Mechanical Engineering, specializes in construction of electromechanical systems and instrumentation, particularly where high precision is a factor. Work ranges from robotics for manufacturing to feedback control of fuel injection systems for automotive emission control. The faculty and staff work in close cooperation with both the Design and Thermosciences Groups on device development projects of mutual interest.

Many computation facilities are available to department students. Three of the department's labs are equipped with super-minicomputers. Numerous smaller minicomputers and microcomputers are used in the research and teaching laboratories.

Library facilities at Stanford beyond the general library include Engineering, Mathematics, and Physics department libraries.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

Specializing in Mechanical Engineering (ME) during the undergraduate period may be done by following the curriculum outlined under the "School of Engineering" section of this bulletin. The University's basic requirements for the bachelor's degree are discussed in the "Undergraduate Degrees" section of this bulletin. Courses taken for the departmental major (math; science; science, technology, and society; engineering fundamentals; and engineering depth) must be taken for a letter grade if the instructor offers the option.

A Product Design program offered by the Design Group leads to the B.S. in Engineering (Product Design). An individually designed major in Biomechanical Engineering offered by the Biomechanical Engineering Group leads to the B.S. in Engineering (Biomechanical Engineering); this may be appropriate for students preparing for medical school or graduate bioengineering studies.

Grade Requirements—To be recommended by the department for a B.S. in Mechanical Engineering, a student must achieve the minimum grade point average (GPA) set by the School of Engineering (2.0 in engineering fundamentals and mechanical engineering depth).

For information about an ME minor, see the "School of Engineering" section of this bulletin.

HONORS PROGRAM

The Department of Mechanical Engineering offers a program leading to a B.S. in Mechanical Engineering with honors. This program offers a unique opportunity for qualified undergraduate engineering majors to conduct independent study and research at an advanced level with a faculty mentor.

Mechanical Engineering majors who have a grade point average (GPA) of 3.5 or higher in the major may apply for the honors program. Students who meet the eligibility requirement and wish to be considered for the honors program must submit a written application to the Mechanical Engineering student services office no later than the second week of the Autumn Quarter in the senior year. The application to enter the program can be obtained from the ME student services office, and must contain a one-page statement describing the research topic and include an unofficial Stanford transcript. In addition, the application must be approved by a Mechanical Engineering faculty member who agrees to serve as the thesis adviser for the project. Thesis advisers must be members of Stanford's Academic Council.

In order to receive department honors, students admitted to the program must:

1. maintain the 3.5 GPA required for admission to the honors program.
2. under the direction of the thesis adviser, complete at least 9 units of ME 191H, Honors Thesis, during the senior year.
3. submit a completed thesis draft to the adviser by mid-May. Further revisions and final endorsement by the adviser are to be finished by the first week of June, when two bound copies are to be submitted to the Mechanical Engineering student services office.
4. present the thesis at the Mechanical Engineering Poster Session held in mid-April.

COTERMINAL B.S./M.S. PROGRAM

Stanford undergraduates who wish to continue their studies for the Master of Science degree in the coterminal program must have earned a minimum of 120 units towards graduation. This includes allowable Advanced Placement (AP) and transfer credit. Applicants must submit their application no later than the quarter prior to the expected completion of their undergraduate degree. This is normally the Winter Quarter (February 5 is the deadline) prior to the Spring Quarter graduation. The application must provide evidence of potential for strong academic performance as a graduate student. The department graduate admissions committee makes decisions on each application. Typically, a GPA of at least 3.5 in engineering, science, and math is expected. Applicants must have completed two of 80, 112, 113, 131A, and 131B, and must take the Graduate Record Examination (GRE) before action is taken on the application. Coterminal information, applications deadlines, and forms can be obtained from the ME student services office.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

ADMISSION AND FINANCIAL ASSISTANCE

To be eligible for admission to the department, a student must have a B.S. degree in engineering, physics, or a comparable science program. To apply for the Ph.D. degree, applicants must have already completed an M.S. degree. Applications for Ph.D. and HCP programs are accepted throughout the year. M.S. applications for fellowship aid must be received by the first Tuesday in December. The department annually awards, on a competitive basis, a limited number of fellowships, teaching assistantships, and research assistantships to incoming graduate students. Research assistantships are used primarily for post-master's degree students and are awarded by individual faculty research supervisors, not by the department.

Mechanical engineering is a varied profession, ranging from primarily aesthetic aspects of design to highly technical scientific research. Disciplinary areas of interest to mechanical engineers include biomechanics, energy conversion, fluid mechanics, materials, nuclear reactor engineering, propulsion, rigid and elastic body mechanics, systems engineering, scientific computing, and thermodynamics, to name a few. No mechanical engineer is expected to have a mastery of the entire spectrum.

A master's degree program leading to the M.S. is offered in Mechanical Engineering, and a master's degree program leading to the M.S. is offered in Engineering with a choice of the following fields of study: Biomechanical Engineering, Product Design, and an individually designed major. Fields of study are declared on Axess.

The following sections list requirements for the master's degrees listed above.

MASTER OF SCIENCE

The basic University requirements for the M.S. degree are discussed in the "Graduate Degrees" section of this bulletin.

The master's program consists of 45 units of course work taken at Stanford. No thesis is required, although many students become involved in research projects during the master's program, particularly to explore their interests in working towards a Ph.D. degree. Students whose undergraduate backgrounds are entirely devoid of some of the major subject disciplines of engineering (for example, applied mechanics, applied thermodynamics, fluid mechanics, ordinary differential equations) may need to take some undergraduate courses to fill obvious gaps and prepare themselves to take graduate courses in these areas. Such students may require more than three quarters to fulfill the master's degree requirements, as the makeup courses may not be used for other than the unrestricted electives (see item 4 below) in the M.S. degree program. However, it is not the policy to require fulfillment of mechanical engineering B.S. degree requirements to obtain an M.S. degree.

MECHANICAL ENGINEERING

The master's degree program requires 45 units of course work taken as a graduate student at Stanford. No thesis is required. However, students who want some research experience during the master's program may participate in research through ME 391 and 392.

Requirements are subject to change and students are encouraged to refer to the most recent *Mechanical Engineering Graduate Student Handbook* provided by the student services office. The department's requirements for the M.S. in Mechanical Engineering are as follows:

1. *Mathematical fundamentals:* two math courses for a total of at least 6 units from the following list are required: ME 300A, 300B, 300C; CME 302; MATH 106, 109; CS 205; EE 261, 263; STATS 110, 141; ENGR 155C. Other MATH and CME courses with catalog numbers of 200 and above also fulfill the math requirement. Mathematics courses must be taken for a letter grade.
2. *Depth in Mechanical Engineering:* a set of graduate-level courses in Mechanical Engineering to provide depth in one area. The faculty have approved these sets as providing depth in specific areas as well as a significant component of applications of the material in the context of engineering synthesis. These sets are outlined in the *Mechanical Engineering Graduate Student Handbook*. Depth courses must be taken for a letter grade.
3. *Breadth in Mechanical Engineering:* two additional graduate level courses (outside the depth) from the breadth chart listed in the *Mechanical Engineering Graduate Handbook.* Breadth courses must be taken for a letter grade.
4. *Sufficient Mechanical Engineering course work:* students must take a minimum of 24 units of course work in mechanical engineering topics. For the purposes of determining mechanical engineering topics, any course on approved lists for the math, depth, and breadth requirements counts towards these units. In addition, any graduate-level course with an ME course number is considered a mechanical engineering topic.
5. *Approved electives* (to bring the total number of units to at least 39): electives must be approved by an adviser. Graduate engineering, math, and science courses are normally approved. Approved electives must be taken for a letter grade. No more than 6 of the 39 units may come from ME 391/392, and no more than 3 may come from seminars. Students planning a Ph.D. should discuss with their advisers the option of taking 391 or 392 during the master's year. ME 391/392 may only be taken on a credit/no credit basis.
6. *Unrestricted electives* (to bring the total number of units submitted for the M.S. degree to 45): students are encouraged to take these units outside engineering, mathematics, or the sciences. Students should consult their advisers on course loads and on ways to use the unrestricted electives to make a manageable program. Unrestricted electives may be taken CR/NC.
7. Within the courses satisfying the requirements above, there must be at least one graduate-level course with a laboratory component. Courses which satisfy this requirement are: ENGR 206, 341; ME 210, 220,

218A,B,C,D, 310A,B,C, 317A,B, 318, 323, 324, 342A,B, 348, 354, 367, 382A,B, 385. ME 391/392 satisfies this requirement if 3 units are taken for work involving laboratory experiments.

Candidates for the M.S. in Mechanical Engineering are expected to have the approval of the faculty, and a minimum grade point average (GPA) of 2.75 in the 45 units presented for fulfillment of degree requirements. All courses used to fulfill mathematics, depth, breadth, approved electives, and lab studies must be taken for a letter grade (excluding seminars and courses for which a letter grade is not an option for any student).

Students falling below a GPA of 2.5 at the end of 20 units may be disqualified from further registration. Students failing to meet the complete degree requirements at the end of 60 units of graduate registration are disqualified from further registration. Courses used to fulfill deficiencies arising from inadequate undergraduate preparation for mechanical engineering graduate work may not be applied to the 60 units required for graduate registration.

PRODUCT DESIGN

The Joint Program in Design focuses on the synthesis of technology with human needs and values to create innovative product experiences. This program is a joint offering of the departments of Mechanical Engineering and Art and Art History. It provides a design education that integrates technical, human, aesthetic, and business concerns. The resulting two-year degree of M.S. in Engineering (Product Design subplan) is considered a terminal degree for the practice of design.

Subject and Catalog Number	*Units*
ARTSTUDI 60. Design I: Fundamental Visual Language	3
ARTSTUDI 160. Design II: The Bridge	3
ME203. Manufacturing and Design	4
ME216A. Advanced Product Design: Needfinding	4
ME216B. Advanced Product Design: Implementation	4
ME312. Advanced Product Design: Formgiving	4
ME313. Human Value and Innovation in Design	3
ME316A,B,C.* Product Design Master's Project	12
ARTSTUDI 360A,B,C.* Master's Project	6
Approved Electives†	17
Total Units	60

* ME 316A,B,C and ARTSTUDI 360A,B,C are taken concurrently for three quarters during the second year.

† Approved electives fulfill career objectives of the students. Students may focus their energy in engineering, business, psychology, or other areas relevant to design. Most students elect a broad approach that spans these domains and increases their cultural awareness. Approved electives must be discussed with the student's adviser.

Admission requirements are the same as for the M.S. in Mechanical Engineering described above, with additional requirements of a minimum of one year's experience after the bachelor's degree, and a portfolio showing strong evidence of design ability and aesthetic skills and sensitivity.

Students with non-engineering undergraduate degrees in design, art, architecture, or similar majors, may apply to the Department of Art and Art History for a similar graduate design program leading to an M.F.A. in Design. Students with non-engineering degrees who wish to earn the M.S. degree should consult with the program adviser.

BIOMECHANICAL ENGINEERING

Students interested in graduate studies in biomechanical engineering can choose one of the programs below.

1. *M.S. in Mechanical Engineering:* students who apply and are admitted to the M.S. in Mechanical Engineering program can elect to take biomechanical engineering courses as part of their requirements. These courses are usually applied towards the student's engineering breadth or technical electives.
2. *M.S. in Engineering, Biomechanical Engineering subplan*: this program allows students more flexibility in taking courses in the life sciences and generally emphasizes a more interdisciplinary curriculum. Minimum grade point average (GPA) requirements are the same as for the M.S. in Mechanical Engineering. Details of this program can be found in the *Mechanical Engineering Graduate Student Handbook.*

A Ph.D. in Biomechanical Engineering is not offered. Students from either master's degree path (Mechanical Engineering or Engineering, Biomechanical Engineering subplan) receive their Ph.D. degrees in Mechanical Engineering.

ENGINEERING

As described in the "School of Engineering" section of this bulletin, each department in the school may sponsor students in a more general degree, the M.S. in Engineering. Sponsorship by the Department of Mechanical Engineering (ME) requires (1) filing a petition for admission to the program by no later than the day before instruction begins, and (2) that the center of gravity of the proposed program lies in ME. No more than 18 units used for the proposed program may have been previously completed. The program must include at least 9 units of graduate-level work in the department other than ME 300A,B,C, seminars, and independent study. The petition must be accompanied by a statement explaining the program objectives and how it is coherent, contains depth, and fulfills a well-defined career objective. The grade requirements are the same as for the M.S. in Mechanical Engineering.

POST-MASTER'S DEGREE PROGRAMS

The department offers two post-master's degrees: Engineer and Doctor of Philosophy. Post-master's research generally requires some evidence that a student has research potential before a faculty member agrees to supervision and a research assistantship appointment. It is most efficient to carry out preliminary research during the M.S. degree program.

ENGINEER

The basic University requirements for the degree of Engineer are discussed in the "Graduate Degrees" section of this bulletin.

This degree represents an additional year of study beyond the M.S. degree and includes a research thesis. The program is designed for students who wish to do professional engineering work upon graduation and who want to engage in more specialized study than is afforded by the master's degree alone.

Admission standards are substantially the same as indicated under the master's degree. However, since thesis supervision is required and the availability of thesis supervisors is limited, admission is not granted until the student has personally engaged a faculty member to supervise a research project. This most often involves a paid research assistantship awarded by individual faculty members (usually from the funds of sponsored research projects under their direction) and *not* by the department. Thus, individual arrangement between student and faculty is necessary. Students studying for the M.S. degree at Stanford who wish to continue to the Engineer degree ordinarily make such arrangements during the M.S. degree program. Students holding master's degrees from other universities are invited to apply and may be admitted providing they are sufficiently well qualified and have made thesis supervision and financial aid arrangements.

Department requirements for the degree include a thesis; up to 18 units of credit are allowed for thesis work (ME 400). In addition to the thesis, 27 units of approved advanced course work in mathematics, science, and engineering are expected beyond the requirements for the M.S. degree; the choice of courses is subject to approval of the adviser. Students who have not fulfilled the Stanford M.S. degree requirements are required to do so, with allowance for approximate equivalence of courses taken elsewhere; up to 45 units may be transferable.

Candidates for the degree must have faculty approval and have a minimum grade point average (GPA) of 3.0 for all courses (exclusive of thesis credit) taken beyond those required for the master's degree.

DOCTOR OF PHILOSOPHY

The basic University requirements for the Ph.D. degree are discussed in the "Graduate Degrees" section of this bulletin. The Ph.D. degree is intended primarily for students who desire a career in research, advanced development, or teaching; for this type of work, a broad background in math and the engineering sciences, together with intensive study and research experience in a specialized area, are the necessary requisites.

The department allows but does not require a minor field from another department. However, if a minor is waived, the candidate must show breadth of training by taking courses in one or more related fields or departments as noted below.

Ph.D. students must have a master's degree, and must fulfill the requirements for the Stanford M.S. degree in Mechanical Engineering.

In special situations dictated by compelling academic reasons, Academic Council members who are not members of the department's faculty may serve as the principal dissertation adviser when approved by the department. In such cases, a member of the department faculty must serve as program adviser and as a member of the reading committee, and agree to accept responsibility that department procedures are followed and standards maintained.

Admission involves much the same consideration described under the Engineer degree. Since thesis supervision is required, admission is not granted until the student has personally engaged a member of the faculty to supervise a research project. Once a student has obtained a research supervisor, this supervisor becomes thereafter the student's academic adviser. Research supervisors may require that the student pass the departmental qualifying examination before starting research and before receiving a paid research assistantship. Note that research assistantships are awarded by faculty research supervisors and not by the department.

Prior to being formally admitted to candidacy for the Ph.D. degree, the student must demonstrate knowledge of engineering fundamentals by passing a qualifying examination. The academic level and subject matter of the examination correspond approximately to the M.S. program described above. Typically, the exam is taken shortly after the student completes the M.S. degree requirements. The student is required to have a minimum graduate Stanford GPA of 3.5 to be eligible for the exam. Once the student's faculty sponsor has agreed that the exam should be scheduled, the student must submit an application folder containing several items including a curriculum vitae, research project abstract, and preliminary dissertation proposal. Information, examination dates, and deadlines may be obtained from the department's student services office or at http://me.stanford.edu/current/grad1/phd_qual.html.

Ph.D. candidates must complete a minimum of 27 units of approved formal course work (excluding research, directed study, and seminars) in advanced study beyond the M.S. degree. The courses should consist primarily of graduate courses in engineering and sciences, although the candidate's adviser may approve a limited number of upper-level undergraduate courses and courses outside of engineering and sciences, as long as such courses contribute to a strong and coherent program. In addition to this 27-unit requirement, all Ph.D. candidates must participate each quarter in one of the following (or equivalent) seminars: ME 389, 390, 394, 395, 396 397; AA 297; ENGR 298, 311A.

The Ph.D. thesis normally represents at least one full year of research work and must be a substantial contribution to the field. Students may register for course credit for thesis work (ME 500) to help fulfill University academic unit requirements, but there is no minimum limit on registered dissertation units. Candidates should note that only completed course units are counted toward the requirement. Questions should be directed to the department student services manager.

The department has a breadth requirement for the Ph.D. degree. This may be satisfied either by a formal minor in another department or by course work that is approved by the principal dissertation adviser.

The final University oral examination (dissertation defense) is conducted by a committee consisting of a chair from another department and four faculty members of the department or departments with related interests. Usually, the committee includes the candidate's adviser and two faculty members chosen to read and sign the candidate's dissertation. The examination consists of two parts. The first is open to the public and is scheduled as a seminar talk, usually for one of the regular meetings of a seminar series. The second is conducted in private and covers subjects closely related to the dissertation topic.

PH.D. MINOR

Students who wish a Ph.D. minor in ME should consult the ME student services office. A minor in ME may be obtained by completing 20 units of approved graduate-level ME courses. Courses approved for the minor must form a coherent program and must be chosen from those satisfying requirement 2 for the M.S. in Mechanical Engineering.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

The department uses the following course numbering system:

10- 99	Freshman and Sophomore
100-199	Junior and Senior
200-299	Advanced Undergraduate and Beginning Graduate
300-399	Graduate
400-499	Advanced Graduate
500	Ph.D. Thesis

UNDERGRADUATE (FRESHMEN AND SOPHOMORES)

Note—Lab sections in experimental engineering are assigned in groups. If the lab schedule permits, students are allowed, with due regard to priority of application, to arrange their own sections and lab periods. Enrollment with the instructor concerned, on the day before instruction begins or the first day of University instruction, is essential in order that the lab schedule may be prepared. Enrollment later than the first week is not permitted.

ME 10N. Form and Function of Animal Skeletons—Stanford Introductory Seminar. Preference to freshmen. The biomechanics and mechanobiology of the musculoskeletal system in human beings and other vertebrates on the level of the whole organism, organ systems, tissues, and cell biology. Field trips to labs. GER:DB-EngrAppSci

3 units, Win (Carter, D)

ME 13N. Redesigning the Human Experience—Stanford Introductory Seminar. Preference to freshmen. Focus is on creative thinking skills such as observation of the human endeavor and how to transform concepts into products, services, and intellectual property. How the products people use shape, shade, and sometimes undermine the pursuit of well-being. Student teams work on hands-on projects. Web-based student idea logs. No prior design experience required. GER:DB-EngrAppSci

3 units, Win (Leifer, L)

ME 14N. How Stuff Is Made—Stanford Introductory Seminar. Preference to freshmen. The design and engineering of products and processes. Machined, fabric, food, and electrical goods. Tradeoffs in choice of serial, continuous, and batch fabrication. Final project: students research and create a web site about the engineering aspects of a product and its processes. Field trips to manufacturing facilities.

3 units, Spr (Pruitt, B)

ME 16N. The Science of Flames—Stanford Introductory Seminar. Preference to freshmen. The roles that chemistry and fluid dynamics play in governing the behaviors of flames. Emphasis is on factors that affect flame microstructure, external appearance, and on the fundamental physical and chemical processes that cause flames and fires to propagate. Topics: history, thermodynamics, and pollutant formation in flames. Trips to labs where flames are studied. Prerequisites: high school physics. GER:DB-EngrAppSci

3 units, Spr (Mitchell, R)

ME 18Q. Creative Teams and Individual Development—Stanford Introductory Seminar. Preference to sophomores. Roles on a problem solving team that best suit individual creative characteristics. Two teams are formed for teaching experientially how to develop less conscious abilities from teammates creative in those roles. Reinforcement teams have members with similar personalities; problem solving teams are composed of people with maximally different personalities. GER:DB-EngrAppSci

3 units, Aut (Wilde, D)

ME 19N. Robotics—Stanford Introductory Seminar. Preference to freshmen. Most people conjure up images of robots from science fiction movies or television shows. In real life, robots show up in factory automation, theme parks, at NASA, and in hospitals doing surgery. Do fiction and reality have anything in common? What really is a robot, what can they do,

and what can they not do? How are they built and how are they changing lives? Field trips and hands-on projects. GER:DB-EngrAppSci
3 units, Win (Niemeyer, G)

ME 24N. Designing the Car of the Future—Stanford Introductory Seminar. Preference to freshmen. Automotive design drawing from all areas of mechanical engineering. The state of the art in automotive design and the engineering principles to understand vehicle performance. Future technologies for vehicles. Topics include vehicle emissions and fuel consumption, possibilities of hydrogen, drive-by-wire systems, active safety and collision avoidance, and human-machine interface issues. GER:DB-EngrAppSci
3 units, Aut (Gerdes, C)

ME 70. Introductory Fluids Engineering—Elements of fluid mechanics as applied to engineering problems. Equations of motion for incompressible ideal flow. Hydrostatics. Control volume laws for mass, momentum, and energy. Bernoulli equation. Dimensional analysis and similarity. Flow in ducts. Boundary layer flows. Lift and drag. Lab experiment demonstrations. Prerequisites: ENGR 14 and 30. GER:DB-EngrAppSci
4 units, Win (Staff), Spr (Cappelli, M)

ME 80. Strength of Materials—Mechanics of materials and engineering properties of structural materials. Topics include static failure theories for ductile and brittle materials, stress concentrations, and buckling. Introduction to fracture, fatigue, corrosion, fretting, and wear. Prerequisite: ENGR 14. GER:DB-EngrAppSci
4 units, Aut (Cai, W), Spr (Levenston, M)

UNDERGRADUATE (JUNIORS AND SENIORS)

ME 101. Visual Thinking—Lecture/lab. Visual thinking and language skills are developed and exercised in the context of solving design problems. Exercises for the mind's eye. Rapid visualization and prototyping with emphasis on fluent and flexible idea production. The relationship between visual thinking and the creative process. Enrollment limited to 60. GER:DB-EngrAppSci
3 units, Aut (Northway, D), Win (Thomsen, D; Meissner, S), Spr (Northway, D)

ME 103D. Engineering Drawing and Design—Designed to accompany 203. The fundamentals of engineering drawing including orthographic projection, dimensioning, sectioning, exploded and auxiliary views, and assembly drawings. Homework drawings are of parts fabricated by the student in the shop. Assignments in 203 supported by material in 103D and sequenced on the assumption that the student is enrolled in both courses simultaneously.
1 unit, Aut, Win (Milroy, J)

ME 110A. Design Sketching—Freehand sketching, rendering, and design development, guided by instructors. Concurrent assignments in 115 and 216B,C provide subject matter, but open to anyone wanting to improve freehand drawing skills.
1 unit, Win, Spr (Scott, W; Li, W)

ME 110B. Advanced Design Sketching—Freehand sketching, rendering, design development, and some computer use, guided by instructors. Concurrent assignments in 116 provide subject matter. Prerequisite: 110A or consent of instructor based on drawing skill.
1 unit, Aut (Zmijewski, B)

ME 112. Mechanical Engineering Design—Characteristics of machine elements including gears, bearings, and shafts. Design for fatigue life. Electric motor fundamentals. Transmission design for maximizing output power or efficiency. Mechanism types, linkage analysis and kinematic synthesis. Team-based design projects emphasizing the balance of physical with virtual prototyping based on engineering analysis. Lab for dissection of mechanical systems and project design reviews. Prerequisites: 80, 101. Recommended: 203, ENGR 15. GER:DB-EngrAppSci
4 units, Win (Pruitt, B; Gerdes, C)

ME 113. Mechanical Engineering Design—Goal is to create designs and models of new mechanical devices. Design is experienced by students as they work on a team design project obtained from industry or other organizations. Prerequisites: 80, 101, 112. GER:DB-EngrAppSci
4 units, Spr (Nelson, D)

ME 115. Human Values in Design—The central philosophy of the product design program, emphasizing the relation between technical and human values, the innovation process, and design methodology. Lab exercises include development of simple product concepts visualized in rapidly executed three-dimensional mockups. Prerequisite: 101. GER:DB-EngrAppSci
3 units, Win (Boyle, B)

ME 116. Advanced Product Design: Formgiving—Small- and medium-scale design projects are carried to a high degree of aesthetic refinement. Emphasis is on form development and interaction design. Prerequisites: 115, ARTHIST 160. GER:DB-EngrAppSci
4 units, Aut (Burnett, W)

ME 120. History and Philosophy of Design—Major schools of 19th- and 20th-century design (Arts-and-Crafts movement, Bauhaus, Industrial Design, and postmodernism) are analyzed in terms of their continuing cultural relevance. The relation of design to art, technology, and politics; readings from principal theorists, practitioners, and critics; recent controversies in industrial and graphic design, architecture, and urbanism. Enrollment limited to 40. GER:DB-EngrAppSci
3-4 units, Spr (Katz, B)

ME 131A. Heat Transfer—The principles of heat transfer by conduction, convection, and radiation with examples from the engineering of practical devices and systems. Topics include transient and steady conduction, conduction by extended surfaces, boundary layer theory for forced and natural convection, boiling, heat exchangers, and graybody radiative exchange. Prerequisites: 70, ENGR 30. Recommended: intermediate calculus, ordinary differential equations. GER:DB-EngrAppSci
3-4 units, Aut (Goodson, K)

ME 131B. Fluid Mechanics: Compressible Flow and Turbomachinery—Engineering applications involving compressible flow: aircraft and rocket propulsion, power generation; application of mass, momentum, energy and entropy balance to compressible flows; variable area isentropic flow, normal shock waves, adiabatic flow with friction, flow with heat addition. Operation of flow systems: the propulsion system. Turbomachinery: pumps, compressors, turbines. Angular momentum analysis of turbomachine performance, centrifugal and axial flow machines, effect of blade geometry, dimensionless performance of turbomachines; hydraulic turbines; steam turbines; wind turbines. Compressible flow turbomachinery: the aircraft engine. Prerequisites: 70, ENGR 30. GER:DB-EngrAppSci
4 units, Win (Lele, S)

ME 140. Advanced Thermal Systems—Capstone course. Thermal analysis and engineering emphasizing integrating heat transfer, fluid mechanics, and thermodynamics into a unified approach to treating complex systems. Mixtures, humidity, chemical and phase equilibrium, and availability. Labs apply principles through hands-on experience with a turbojet engine, PEM fuel cell, and hybrid solid/oxygen rocket motor. Use of MATLAB as a computational tool. Prerequisites: ENGR 30, ME 70, and 131A,B. GER:DB-EngrAppSci
5 units, Spr (Bowman, C)

ME 161. Dynamic Systems—(Same as 261.) Modeling, analysis, and measurement of mechanical and electromechanical systems. Numerical and closed form solutions of ordinary differential equations governing the behavior of single and multiple degree of freedom systems. Stability, resonance, amplification and attenuation, and control system design. Demonstrations and laboratory experiments. Prerequisite: background in dynamics and calculus such as ENGR 15 and MATH 43. Recommended: CME 102, and familiarity with differential equations, linear algebra, and basic electronics. GER:DB-EngrAppSci
3-4 units, Aut (Mitiguy, P)

ME 190. Ethical Issues in Mechanical Engineering—Moral rights and responsibilities of engineers in relation to society, employers, colleagues, and clients; cost-benefit-risk analysis, safety, and informed consent; whistle blowing; engineers as expert witnesses, consultants, and managers; ethical issues in engineering design, manufacturing, and operations, and engineering work in foreign countries; and ethical implications of the social and environmental contexts of contemporary engineering. Case studies and field research. Enrollment limited to 25 Mechanical Engineering majors.

4 units, Spr (McGinn, R)

ME 191. Engineering Problems and Experimental Investigation—Directed study and research for undergraduates on a subject of mutual interest to student and staff member. Student must find faculty sponsor and have approval of adviser.

1-5 units, Aut, Win, Spr, Sum (Staff)

ME 191H. Honors Research—Student must find faculty honors adviser and apply for admission to the honors program.

1-5 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES (UNDERGRADUATE)

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the department's student services office for applicability of these courses to a major or minor program.

ARTSTUDI 60. Design I : Fundamental Visual Language

3-4 units, Aut, Win, Spr (Edmark, J)

ARTSTUDI 160. Design II: The Bridge

3-4 units, Win (Kahn, M), Spr (Edmark, J)

CS 106A. Programming Methodology—(Same as ENGR 70A.)

3-5 units, Aut (Sahami, M), Win, Spr (Young, P), Sum (Staff)

ENGR 14. Applied Mechanics: Statics

3 units, Aut (Farhat, C), Spr (Staff)

ENGR 15. Dynamics

3 units, Aut (Niemeyer, G), Spr (Lew, A)

ENGR 25. Biotechnology—(Same as CHEMENG 25.)

3 units, Spr (Wang, C)

ENGR 30. Engineering Thermodynamics

3 units, Aut (Edwards, C), Win (Mitchell, R)

ENGR 31. Chemical Principles with Application to Nanoscale Science and Technology

4 units, Aut (McIntyre, P)

ENGR 40. Introductory Electronics

5 units, Aut (Howe, R), Spr (Wong, S)

ENGR 102M. Technical/Professional Writing for Mechanical Engineers

1 unit, Aut, Win (Staff)

ENGR 105. Feedback Control Design

3 units, Win (Rock, S), Sum (Emami-Naeini, A)

ADVANCED UNDERGRADUATE AND BEGINNING GRADUATE

ME 201. Dim Sum of Mechanical Engineering—Introduction to research in mechanical engineering for M.S. students and upper-division undergraduates. Weekly presentations by current ME Ph.D. and second-year fellowship students to show research opportunities across the department. Strategies for getting involved in a research project.

1 unit, Aut (Kuhl, E; Gardella, I)

ME 203. Manufacturing and Design—Prototype development techniques as an intrinsic part of the design process. Machining, welding, and casting. Manufacturing processes. Design aspects developed in an individual term project chosen, designed, and fabricated by students. Labs, field trips. Undergraduates majoring in Mechanical Engineering or Product Design must take course for 4 units. Limited enrollment with consent of instructor. Corequisite: 103D or CAD experience. Corequisite for WIM for Mechanical Engineering and Product Design majors: ENGR 102M. Recommended: 101.

3-4 units, Aut, Win (Beach, D)

ME 204. Bicycle Design and Frame-Building—The engineering and artistic execution of designing and building a bicycle frame. Fundamentals of bicycle dynamics, handling, and sizing. Manufacturing processes. Films, guest lecturers, field trips. Each student designs and fabricates a custom bicycle frame. Limited enrollment. Prerequisite: 203 or equivalent.

3 units, Spr (Connolly, R)

ME 206A,B. Entrepreneurial Design for Extreme Affordability—(Same as OIT 333/334.) Project course jointly offered by School of Engineering and Graduate School of Business. Students apply engineering and business skills to design product prototypes, distribution systems, and business plans for entrepreneurial ventures in developing countries for a specified challenge faced by the world's poor. Topics include user empathy, appropriate technology design, rapid prototype engineering and testing, social technology entrepreneurship, business modeling, and project management. Weekly design reviews; final course presentation. Industry and adviser interaction. Limited enrollment via application; see http://www.stanford.edu/class/me206.

4 units, **A:** *Win,* **B:** *Spr (Beach, D; Patell, J)*

ME 207. Negotiation—(Same as CEE 151/251, MS&E 285.) Negotiation styles and processes to help students conduct and review negotiations. Workshop format integrating intellectual and experiential learning. Exercises, live and field examples, individual and small group reviews. Application required before first day of class; see http://www.stanford.edu/class/msande285/. Enrollment limited to 50.

3 units, Spr (Christensen, S)

ME 208. Patent Law and Strategy for Innovators and Entrepreneurs—The course will provide a foundation to understand the patent system, and strategies to build a patent portfolio and avoid patent infringement. Students will learn how to conduct their own patent search and how to file their own provisional patent application on an invention of their choice. Although listed as a ME course, the course is not specific to any discipline or technology.

2-3 units, Aut (Schox, J)

ME 210. Introduction to Mechatronics—Technologies involved in mechatronics (intelligent electro-mechanical systems), and techniques to apply this technology to mecatronic system design. Topics include: electronics (A/D, D/A converters, op-amps, filters, power devices); software program design, event-driven programming; hardware and DC stepper motors, solenoids, and robust sensing. Large, open-ended team project. Limited enrollment. Prerequisites: ENGR 40, CS 106, or equivalents.

4 units, Win (Staff)

ME 212. Calibrating the Instrument—For first-year graduate students in the Joint Program in Design. Means for calibrating the designer's mind/body instrument through tools including improvisation, brainstorming, creative imaging, educational kinesiology, and Brain Gym. Current design issues; guest speakers; shared stories; and goal setting.

1 unit, Aut (Edmark, J)

ME 216A. Advanced Product Design: Needfinding—Human needs that lead to the conceptualization of future products, environments, systems, and services. Field work in public and private settings; appraisal of personal values; readings on social ethnographic issues; and needfinding for a corporate client. Emphasis is on developing the flexible thinking skills that enable the designer to navigate the future. Prerequisite: 115, 203, 313, or consent of instructor.

3-4 units, Win (Barry, M; Patnaik, D)

ME 216B. Advanced Product Design: Implementation—Summary project using knowledge, methodology, and skills obtained in 115/313 and 216A. Students implement design concepts and present them to a professional jury. Prerequisite: 216A.
4 units, Spr (Burnett, W; Herron, M; Howard, R)

ME 218A. Smart Product Design Fundamentals—Team design project series on programmable electromechanical systems design. Topics: transistors as switches, basic digital and analog circuits, operational amplifiers, comparators, software design, programming in C. Lab fee. Limited enrollment.
4-5 units, Aut (Ohline, R)

ME 218B. Smart Product Design Applications—Second in team design project series on programmable electromechanical systems design. Topics: user I/O, timer systems, interrupts, signal conditioning, software design for embedded systems, sensors, actuators, noise, and power supplies. Lab fee. Limited enrollment. Prerequisite: 218A or passing the smart product design fundamentals proficiency examination.
4-5 units, Win (Ohline, R)

ME 218C. Smart Product Design Practice—Advanced level in series on programmable electromechanical systems design. Topics: inter-processor communication, system design with multiple microprocessors, architecture and assembly language programming for the PIC microcontroller, controlling the embedded software tool chain, A/D and D/A techniques, electronic manufacturing technology. Lab fee. Limited enrollment. Team project. Prerequisite: 218B.
4-5 units, Spr (Ohline, R)

ME 218D. Smart Product Design: Projects—Industrially sponsored project is the culmination of the Smart Product Design sequence. Student teams take on an industrial project requiring application and extension of knowledge gained in the prior three quarters, including prototyping of a final solution with hardware, software, and professional documentation and presentation. Lectures on electronic and software design, and electronic manufacturing techniques. Topics: chip level design of microprocessor systems, real time operating systems, alternate microprocessor architectures, and PCB layout and fabrication.
4 units, not given this year

ME 219. The Magic of Materials and Manufacturing—Methods for market-quantity manufacturing of parts and products from a product designer's point of view. Materials including metals, plastics, ceramics, fibers, and foams, and processes that manipulate, exploit, transform, and modify these materials. Manufacturing site visits and laboratory projects.
3 units, Spr (Beach, D)

ME 220. Introduction to Sensors—Sensors are widely used in scientific research and as an integral part of commercial products and automated systems. The basic principles for sensing displacement, force, pressure, acceleration, temperature, optical radiation, nuclear radiation, and other physical parameters. Performance, cost, and operating requirements of available sensors. Elementary electronic circuits which are typically used with sensors. Lecture demonstration of a representative sensor from each category elucidates operating principles and typical performance. Lab experiments with off-the-shelf devices.
3-4 units, Spr (Staff)

ME 222. Design for Sustainability—Goal is to translate green theory into product form through short projects that address materials, product function and co-function, and situational patterns or habits. How to blend ecological design processes with standard design methodologies.
2-3 units, Spr (Bishop, S; Boyle, B)

ME 227. Vehicle Dynamics and Control—The application of dynamics, kinematics, and control theory to the analysis and design of ground vehicle behavior. Simplified models of ride, handling, and braking, their role in developing intuition, and limitations in engineering design. Suspension design fundamentals. Performance and safety enhancement through automatic control systems. In-car laboratory assignments for model validation and kinesthetic understanding of dynamics. Limited enrollment. Prerequisites: ENGR 105, consent of instructor.
3 units, Spr (Gerdes, C)

ME 238. Patent Prosecution—Stages of the patent application process: identifying, capturing, and evaluating inventions; performing a patentability investigation, analyzing the documents, and the scope of the patent protection; composing claims that broadly cover the invention; creating a specification that supports the claims; filing a patent application with the U.S. Patent and Trademark Office; and analyzing an office action and preparing an appropriate response. Current rules and case law. Strategic decisions within each stagesuch as: how does a patent application advance the patent portfolio; and in what countries should a patent application be filed.
2 units, Win (Schox, J)

ME 260. Fuel Cell Science Technology—Emphasis is on proton exchange membrane (PEM) and solid oxide fuel cells (SOFC). Principles of electrochemical energy conversion. Topics in materials science, thermodynamics, and fluid mechanics. Limited enrollment.
3 units, Spr (Prinz, F)

ME 261. Dynamic Systems—(Same as 161; see 161.)
3-4 units, Aut (Mitiguy, P)

ME 280. Skeletal Development and Evolution—The mechanobiology of skeletal growth, adaptation, regeneration, and aging is considered from developmental and evolutionary perspectives. Emphasis is on the interactions between mechanical and chemical factors in the regulation of connective tissue biology. Prerequisites: 80, or Human Biology core, or Biological Sciences core.
3 units, Spr (Carter, D)

ME 281. Biomechanics of Movement—(Same as BIOE 281.) Experimental techniques to study human and animal movement including motion capture systems, EMG, force plates, medical imaging, and animation. The mechanical properties of muscle and tendon, and quantitative analysis of musculoskeletal geometry. Projects and demonstrations emphasize applications of mechanics in sports, orthopedics, and rehabilitation. GER:DB-EngrAppSci
3 units, Aut (Delp, S)

ME 284A. Cardiovascular Bioengineering—(Same as BIOE 284A.) Bioengineering principles applied to the cardiovascular system. Anatomy of human cardiovascular system, comparative anatomy, and allometric scaling principles. Cardiovascular molecular and cell biology. Overview of continuum mechanics. Form and function of blood, blood vessels, and the heart from an engineering perspective. Normal, diseased, and engineered replacement tissues.
3 units, Aut (Taylor, C)

ME 284B. Cardiovascular Bioengineering—(Same as BIOE 284B.) Continuation of ME 284A. Integrative cardiovascular physiology, blood fluid mechanics, and transport in the microcirculation. Sensing, feedback, and control of the circulation. Overview of congenital and adult cardiovascular disease, diagnostic methods, and treatment strategies. Engineering principles to evaluate the performance of cardiovascular devices and the efficacy of treatment strategies.
3 units, Win (Taylor, C)

ME 287. Soft Tissue Mechanics—Structure/function relationships and mechanical properties of soft tissues, including nonlinear elasticity, viscoelasticity, and poroelasticity.
3 units, Aut (Levenston, M)

ME 289. Biomechanical Engineering Research Semiar—BME research conducted at Stanford for incoming students. Graduate students and postdoctoral fellows present research emphasizing motivation of research questions, project design, methods, and preliminary results.
1 unit, not given this year

ME 294. Medical Device Design—In collaboration with the School of Medicine. Introduction to medical device design for undergraduate and graduate engineering students. Design and prototyping. Labs; medical device environments including hands on device testing; and field trips to operating rooms and local device companies. Limited enrollment. Prerequisite: 203.
3 units, Aut (Milroy, J; Doshi, R)

ME 297. Forecasting the Future of Engineering—Goal is to develop a 25-year forecast of the future of engineering including the challenges engineers are likely to be asked to solve, and how engineers can be prepared to meet these challenges. Students prepare a long-range forecast of a specific science/engineering sector and a proposed initiative tying new engineering capabilities with global challenges.
3 units, Win (Burnett, W; Saffo, P)

ME 298. Silversmithing and Design—Skills involved in working with precious metals at a small scale. Investment casting and fabrication techniques such as reticulation, granulations, filigree, and mokume gane.
3-4 units, Win (Shaughnessy, S; Knox, A)

ME 299A. Practical Training—For master's students. Educational opportunities in high technology research and development labs in industry. Students engage in internship work and integrate that work into their academic program. Following internship work, students complete a research report outlining work activity, problems investigated, key results, and follow-up projects they expect to perform. Meets the requirements for curricular practical training for students on F-1 visas. Student is responsible for arranging own internship/employment and faculty sponsorship. Register under faculty sponsor's section number. All paperwork must be completed by student and faculty sponsor, as the Student Services Office does not sponsor CPT. Students are allowed only one quarter of CPT per degree program.
1 unit, Aut, Win, Spr, Sum (Staff)

ME 299B. Practical Training—For Ph.D. students. Educational opportunities in high technology research and development labs in industry. Students engage in internship work and integrate that work into their academic program. Following internship work, students complete a research report outlining work activity, problems investigated, key results, and follow-up projects they expect to perform. Meets the requirements for curricular practical training for students on F-1 visas. Student is responsible for arranging own internship/employment and faculty sponsorship. Register under faculty sponsor's section number. All paperwork must be completed by student and faculty sponsor, as the student services office does not sponsor CPT. Students are allowed only one quarter of CPT per degree program.
1 unit, Aut, Win, Spr, Sum (Staff)

GRADUATE

ME 300A. Linear Algebra with Application to Engineering Computations—(Same as CME 200.) Solving matrix-vector systems. Direct and iterative solvers for non-singular linear systems of equations; their accuracy, convergence properties, and computational efficiency. Under- and over-determined systems, and nonlinear systems of equations. Eigenvalues, eigenvectors, and singular values; their application to engineering problems. Concepts such as basis, linear independence, column space, null space, rank, norms and condition numbers, projections, and matrix properties. Recommended: familiarity with computer programming; mathematics background equivalent to MATH 103, 130.
3 units, Aut (Moin, P)

ME 300B. Partial Differential Equations in Engineering—(Same as CME 204.) Geometric interpretation of partial differential equation (PDE) characteristics; solution of first order PDEs and classification of second-order PDEs; self-similarity; separation of variables as applied to parabolic, hyperbolic, and elliptic PDEs; special functions; eigenfunction expansions; the method of characteristics. If time permits, Fourier integrals and transforms, Laplace transforms. Prerequisite: CME 200/ME 300A, equivalent, or consent of instructor.
3 units, Win (Shaqfeh, E)

ME 300C. Introduction to Numerical Methods for Engineering—(Same as CME 206.) Numerical methods from a user's point of view. Lagrange interpolation, splines. Integration: trapezoid, Romberg, Gauss, adaptive quadrature; numerical solution of ordinary differential equations: explicit and implicit methods, multistep methods, Runge-Kutta and predictor-corrector methods, boundary value problems, eigenvalue problems; systems of differential equations, stiffness. Emphasis is on analysis of numerical methods for accuracy, stability, and convergence. Introduction to numerical solutions of partial differential equations; Von Neumann stability analysis; alternating direction implicit methods and nonlinear equations. Prerequisite: CME 200/ME 300A.
3 units, Spr (Moin, P)

ME 308. Spatial Motion—The geometry of motion in Euclidean space. Fundamentals of theory of screws with applications to robotic mechanisms, constraint analysis, and vehicle dynamics. Methods for representing the positions of spatial systems of rigid bodies with their inter-relationships; the formulation of Newton-Euler kinetics applied to serial chain systems such as industrial robotics.
3 units, alternate years, not given this year

ME 309. Finite Element Analysis in Mechanical Design—Basic concepts of finite elements, with applications to problems confronted by mechanical designers. Linear static, modal, and thermal formulations; nonlinear and dynamic formulations. Students implement simple element formulations. Application of a commercial finite element code in analyzing design problems. Issues: solution methods, modeling techniques, features of various commercial codes, basic problem definition. Individual projects focus on the interplay of analysis and testing in product design/development. Prerequisite: MATH 103, or equivalent. Recommended: 80, or equivalent in structural and/or solid mechanics; some exposure to principles of heat transfer.
3 units, Win (Kuhl, E; Levenston, M)

ME 310A. Tools for Team-Based Design—(Same as ENGR 310A.) For graduate students; open to limited SITN/global enrollment. Project-based, exposing students to the tools and methodologies for forming and managing an effective engineering design team in a business environment, including product development teams that may be spread around the world. Topics: personality profiles for creating teams with balanced diversity; computational tools for project coordination and management; real time electronic documentation as a critical design process variable; and methods for refining project requirements to ensure that the team addresses the right problem with the right solution. Computer-aided tools for supporting geographically distributed teams. Final project analyzes industry-sponsored design projects for consideration in 310B,C. Investigation includes benchmarking and meetings with industrial clients. Deliverable is a detailed document with project specifications and optimal design team for subsequent quarters. Limited enrollment.
3-4 units, Aut (Cutkosky, M; Leifer, L)

ME 310B,C. Design Project Experience with Corporate Partners—(Same as ENGR 310B,C.) Two quarter project for graduate students with design experience who want involvement in an entrepreneurial design team with real world industrial partners. Products developed are part of the student's portfolio. Each team functions as a small startup company with a technical advisory board of the instructional staff and a coach. Computer-aided tools for project management, communication, and documentation; budget provided for direct expenses including technical assistants and conducting tests. Corporate liaisons via site visits, video conferencing, email, fax, and phone. Hardware demonstrations, peer reviews, scheduled documentation releases, and a team environment provide the mechanisms and culture for design information sharing. Enrollment by consent of instructor; depends on a pre-enrollment survey in December and recommendations by project definition teams in 310A. For some projects, 217 and 218 may be prerequisites or corequisites; see http://me310.stanford.edu for admission guidelines.
B: *3-5 units, Win (Cutkosky, M; Leifer, L)*
C: *3-4 units, Spr (Leifer, L; Cutkosky, M)*

ME 310X. Tools for Team-Based Design Global Teaming Lab—(Same as ENGR 310X.) Participation in a global design team with students in Sweden or Japan. Limited enrollment. May be repeated for credit. Prerequisite: consent of instructor. Corequisite: ENGR 310A,B,C.
1-5 units, Aut, Win, Spr, Sum (Leifer, L; Cutkosky, M)

ME 312. Advanced Product Design: Formgiving—Small- and medium-scale design projects carried to a high degree of aesthetic refinement. Emphasis is on generating appropriate forms to the task and setting. Prerequisites: 203, 313, ARTHIST 160.
3-4 units, Win (Burnett, W; Kembel, G)

ME 313. Human Values and Innovation in Design—Introduction to the philosophy, spirit, and tradition of the product design program. Hands-on design projects used as vehicles for design thinking, visualization, and methodology. The relationships among technical, human, aesthetic, and business concerns. Drawing, prototyping, and design skills. Focus is on tenets of design philosophy: point of view, user-centered design, design methodology, and iterative design.
3 units, Aut (Kelley, D), Win (Kembel, G)

ME 314. Good Products, Bad Products—The characteristics of industrial products that cause them to be successes or failures: the straightforward (performance, economy, reliability), the complicated (human and cultural fit, compatibility with the environment, craftsmanship, positive emotional response of the user), the esoteric (elegance, sophistication, symbolism). Engineers and business people must better understand these factors to produce more successful products. Projects, papers, guest speakers, field trips.
3-4 units, Win (Beach, D)

ME 315. The Designer in Society—For graduate students. Career objectives and psychological orientation compared with existing social values and conditions. Emphasis is on assisting individuals in assessing their roles in society. Readings on political, social, and humanistic thought are related to technology and design. Experiential, in-class exercises, and term project. Enrollment limited to 24.
3 units, Spr (Roth, B)

ME 316A,B,C. Product Design Master's Project—For graduate Product Design or Design (Art) majors only. Students create and present two master's theses under the supervision of engineering and art faculty. Theses involve the synthesis of aesthetics and technological concerns in the service of human need and possibility. Product Design students register for 4 units; Art students for 2 units. Corequisite: ARTHIST 360.
2-4 units, **A:** *Aut (Kelley, D; Burnett, W),* **B:** *Win (Kelley, D; Burnett, W),* **C:** *Spr (Edmark, J; Barry, M)*

ME 317A. Design for Manufacturability: Product Definition for Market Success—Systematic methodologies to define, develop, and produce world-class products. Student team projects to identify opportunities for improvement and develop a comprehensive product definition. Topics include value engineering, quality function deployment, design for assembly and producibility, design for variety and supply chain, design for life-cycle quality, and concurrent engineering. Students must take 317B to complete the project and obtain a letter grade. On-campus enrollment limited to 28; no limit on SCPD class size, but each site must have at least 3 students to form a project team.
4 units, Win (Ishii, K; Beiter, K)

ME 317B. Design for Manufacturability: Quality by Design for Customer Value—(Formerly 217B.) Building on 317A, focus is on the implementation of competitive product design. Student groups apply structured methods to optimize the design of an improved product, and plan for its manufacture, testing, and service. The project deliverable is a comprehensive product and process specification. Topics: concept generation and selection (Pugh's Method), FMEA applied to the manufacturing process, design for robustness, Taguchi Method, SPC and six sigma process, tolerance analysis, flexible manufacturing, product testing, rapid prototyping. Enrollment limited to 40, not including SCPD students. Minimum enrollment of two per SCPD viewing site; single student site by prior consent of instructor. On-campus class limited to 25. For SCPD students, no enrollment limit, but each site must have a minimum of three students to form a project team and define a project on their own. Prerequisite: 317A.
4 units, Spr (Ishii, K)

ME 318. Computer-Aided Product Creation—Design course focusing on an integrated suite of computer tools: rapid prototyping, solid modeling, computer-aided machining, computer numerical control manufacturing. Students choose, design, and manufacture individual products, emphasizing product definition, user benefits, and computer design tools. Manufacturing focuses on CNC machining. Stanford Product Realization Lab's relationship to the outside world. Structured lab experiences build a basic CAD/CAM/CNC proficiency. Limited enrollment.
4 units, Aut, Win, Spr (Milroy, J)

ME 322. Kinematic Synthesis of Mechanisms—The rational design of linkages. Techniques to determine linkage proportions to fulfill design requirements using analytical, graphical, and computer based methods.
3 units, Win (Roth, B)

ME 323. Modeling and Identification of Mechanical Systems for Control—The art and science behind developing mathematical models for control system design. Theoretical and practical system modeling and parameter identification. Frequency domain identification, parametric modeling, and black-box identification. Analytical work and laboratory experience with identification, controller implementation, and the implications of unmodeled dynamics and non-linearities. Prerequisites: linear algebra and system simulation with MATLAB/SIMULINK; ENGR 105.
3 units, Aut (Gerdes, C)

ME 324. Precision Engineering—Advances in engineering are often enabled by more accurate control of manufacturing and measuring tolerances. Concepts and technology enable precision such that the ratio of overall dimensions to uncertainty of measurement is large relative to normal engineering practice. Typical application areas: non-spherical optics, computer information storage devices, and manufacturing metrology systems. Application experience through design and manufacture of a precision engineering project, emphasizing the principles of precision engineering. Structured labs; field trips. Prerequisite: consent of instructors.
4 units, Spr (Beach, D; DeBra, D)

ME 325. Interdisciplinary Interaction Design—(Same as CS 447.) Small teams develop technology prototypes combining product and interaction design. Focus is on software and hardware interfaces, interaction, design aesthetics, and underpinnings of successful design including a reflective, interactive design process, group dynamics of interdisciplinary teamwork, and working with users. Prerequisite: CS 247A.
3-4 units, not given this year

ME 326. Telerobotics and Human-Robot Interactions—Focus is on dynamics and controls. Evaluation and implementation of required control systems. Topics include master-slave systems, kinematic and dynamic similarity; control architecture, force feedback, haptics, sensory substitutions; stability, passivity, sensor resolution, servo rates; time delays, prediction, wave variables. Hardware-based projects encouraged, which may complement ongoing research or inspire new developments. Limited enrollment. Prerequisites: ENGR 205, 320 or CS 223A, or consent of instructor.
3 units, Win (Niemeyer, G)

ME 329. Physical Solid Mechanics—Quantum mechanics, statistical mechanics, and solid state physics for engineering students. The theory describes physical processes at nanoscale in solid materials. Atomic structures of solids and their electronic structures. Statistical mechanics provides a theoretical framework for thermodynamics to connect the nanoscale processes to macroscopic properties of solids.
3 units, alternate years, not given this year

ME 330. Advanced Kinematics—Kinematics from mathematical viewpoints. Introduction to algebraic geometry of point, line, and plane elements. Emphasis is on basic theories which have potential application to mechanical linkages, computational geometry, and robotics.
3 units, Aut (Roth, B)

ME 331A. Classical Dynamics—(Same as AA 242A.) Accelerating and rotating reference frames. Kinematics of rigid body motion; Euler angles, direction cosines. D'Alembert's principle, equations of motion. Inertia properties of rigid bodies. Dynamics of coupled rigid bodies. Lagrange's equations and their use. Dynamic behavior, stability, and small departures from equilibrium. Prerequisite: ENGR 15 or equivalent.

3 units, Aut (West, M)

ME 331B. Advanced Dynamics—(Same as AA 242B.) Formulation of equations of motion with Newton/Euler equations; angular momentum principle; D'Alembert principle; power, work, and energy; Kane's method; and Lagrange's equations. Numerical solutions of nonlinear algebraic and dfferential equations govering the behavior of multiple degree of freedom systems. Computed torque control.

3 units, Win (Mitiguy, P)

ME 333. Mechanics—Goal is a common basis for advanced mechanics courses. Formulation of the governing equations from a Lagrangian perspective. Examples include systems of particles and linear elastic solids. Waves in discrete and continuous media. Linear elasticity formulation in the static and dynamic cases, and elementary measures of stress and strain. Tensor and variational calculus.

3 units, Aut (Lew, A)

ME 334. Introduction to Statistical Mechanics—Concepts and tools of classical statistical mechanics and applications to molecular systems. Thermodynamics and probability theory. Statistical ensembles. Information and entropy. Free energy and transition between metastable states. Brownian motion, Langevin dynamics, and Fokker-Planck equation. Non-equilibrium systems: correlation and response functions, fluctuation-dissipation theorem. Applications to self-assembly, thin film growth, and structural transformation of proteins.

3 units, Win (Cai, W)

ME 335A,B,C. Finite Element Analysis

ME 335A. Finite Element Analysis—Fundamental concepts and techniques of primal finite element methods. Method of weighted residuals, Galerkin's method, and variational equations. Linear elliptic boundary value problems in one, two, and three space dimensions; applications in structural, solid, and fluid mechanics and heat transfer. Properties of standard element families and numerically integrated elements. Implementation of the finite element method. Active column equation solver, assembly of equations, and element routines. The mathematical theory of finite elements.

3 units, Aut (Pinsky, P)

ME 335B. Finite Element Analysis—Finite element methods for linear dynamic analysis. Eigenvalue, parabolic, and hyperbolic problems. Mathematical properties of semi-discrete (t-continuous) Galerkin approximations. Modal decomposition and direct spectral truncation techniques. Stability, consistency, convergence, and accuracy of ordinary differential equation solvers. Asymptotic stability, over-shoot, and conservation laws for discrete algorithms. Mass reduction. Applications in heat conduction, structural vibrations, and elastic wave propagation. Computer implementation of finite element methods in linear dynamics. Implicit, explicit, and implicit-explicit algorithms and code architectures.

3 units, Win (Pinsky, P)

ME 335C. Finite Element Analysis—Nonlinear continuum mechanics. Galerkin formulation of nonlinear elliptic, parabolic, and hyperbolic problems. Explicit, implicit, and implicit-explicit algorithm in nonlinear transient analysis. Stability of ordinary differential equation solvers for nonlinear problem classes; energy-conserving algorithms. Automatic time-step selection strategies. Methods of solving nonlinear algebraic systems. Newton-type methods and quasi-Newton updates. Iterative procedures. Arc-length methods. Architecture of computer codes for nonlinear finite element analysis. Applications from structural and solid mechanics such as nonlinear elasticity.

3 units, Spr (Pinsky, P)

ME 336. Crystalline Anisotropy—(Same as MATSCI 359.) Matrix and tensor analysis with applications to the effects of crystal symmetry on elastic deformation, thermal expansion, diffusion, piezoelectricity, magnetism, thermodynamics, and optical properties of solids, on the level of J. F. Nye's *Physical Properties of Crystals*. Homework sets use Mathematica.

3 units, not given this year

ME 337. Mechanics of Growth—Introdution to continuum theory and numerical solutions or biomechanical problems. Kinematics of finite growth. Balance equations in open system thermodynamics. Constitutive equations for biological tissues. Enhanced finite element models in biomechanics. Analytical solutions for simple model problems. Numerical solutions for more advanced problems such as: bone remodeling; wound healing; muscle regeneration; tumor growth; atherosclerosis; in-stent restenosis; and tissue engineering.

3 units, Spr (Kuhl, E)

ME 338A. Continuum Mechanics—Nonlinear continuum mechanics for solids and fluids. Kinematics of finite deformations. Measures of strain and stress. Finite rotations. Linearized kinematics and infinitesimal measures of deformations. Rates. Conservation laws for mass, momenta, and energy. Boundary value problem in continuum mechanics. Prerequisites: 333 and 300, or equivalent background with consent of instructor.

3 units, Win (Lew, A)

ME 338B. Continuum Mechanics—Constitutive theory; equilibrium constitutive relations; material frame indifference and material symmetry; finite elasticity; formulation of the boundary value problem; linearization and well-posedness; symmetries and configurational forces; numerical considerations.

3 units, alternate years, not given this year

ME 339. Mechanics of the Cell—Kinematical description of basic structural elements used to model parts of the cell: rods, ropes, membranes, and shells. Formulation of constitutive equations: nonlinear elasticity and entropic contributions. Elasticity of polymeric networks. Applications to model basic filaments of the cytoskeleton: actin, microtubules, intermediate filaments, and complete networks. Applications to biological membranes.

3 units, Aut (Kuhl, E; Jacobs, C)

ME 340. Elasticity in Microscopic Structures—Introduction to elasticity theory and application to material structures at microscale. Theories: stress, strain, and energy; equilibrium and compatibility conditions; boundary value problem. Solution methods: stress function, Green's function, Fourier transformation. Numerical exercises using Matlab. Applications to defects in solids, thin films, and biomembranes.

3 units, Spr (Cai, W)

ME 340B. Elasticity in Microscopic Structures—Elasticity theory and applications to structures in micro devices, material defects, and biological systems. Theoretical basis: stress, strain, and energy; equilibrium and compatibility conditions; boundary value problem formulation. Solution methods: stress function, Green's function, and Fourier transformation; moderate numerical exercises using Matlab. Methods and solutions applied to the elastic behaviors of thin films and MEMS structures, cracks and dislocations, and cell filaments and membranes.

3 units, not given this year

ME 341. Biomechanics of Hearing, Speech, and Balance—Theory and practice of building mathematical models to understand physical phenomena; integration of imaging, physiology, and biomechanics. Journal club style discussions of research literature, examples from hearing science, speech production, and the vestibular system. Dualisms in modeling include: general principles versus detailed models; analytic versus computational models; forward versus inverse approaches; and the interplay between theory and experiments.

3 units, Spr (Puria, S)

ME 343. An Introduction to Waves in Elastic Solids—One-dimensional motion of an elastic continuum, the linearized theory of elasticity and elastodynamic theory, elastic waves in an unbounded medium, plane harmonic waves in elastic half-spaces including reflection and refraction, slowness, energy velocity and anisotropic effects. Text is first five chapters of Achenbach's *Wave Propagation in Elastic Solids*.

3 units, not given this year

ME 345. Fatigue Design and Analysis—The mechanism and occurrences of fatigue in service. Methods for predicting fatigue life and for protecting against premature fatigue failure. Use of elastic stress and inelastic strain analyses to predict crack initiation life. Use of linear elastic fracture mechanics to predict crack propagation life. Effects of stress concentrations, manufacturing processes, load sequence, irregular loading, multi-axial loading. Subject is treated from the viewpoints of the engineer seeking up-to-date methods of life prediction and the researcher interested in improving understanding of fatigue behavior. Prerequisite: undergraduate mechanics of materials.

3 units, Win (Nelson, D)

ME 346A. Introduction to Molecular Simulations—(Same as CME 346A.) Algorithms of molecular simulations and underlying theories. Molecular dynamics, Monte Carlo, energy minimization, and transition path search algorithms. Classical dynamics in Hamiltonian and Lagrangian form. Elementary statistical mechanics: ensembles, Boltzmann's distribution, and free energy. Measure and control of temperature and stress in molecular systems. Length and time scale limits of simulation methods. Applications in solids, liquids, and biomolecules. Programming in Matlab.

3 units, Spr (Darve, E)

ME 347. Mathematical Theory of Dislocations—The mathematical theory of straight and curvilinear dislocations in linear elastic solids. Stress fields, energies, and Peach-Koehler forces associated with these line imperfections. Anisotropic effects, Green's function methods, and the geometrical techniques of Brown and Indenborn-Orlov for computing dislocation fields and for studying dislocation interactions. Continuously distributed dislocations and cracks and inclusions.

3 units, not given this year

ME 348. Experimental Stress Analysis—Theory and applications of photoelasticity, strain gages, and holographic interferometry. Comparison of test results with theoretical predictions of stress and strain. Other methods of stress and strain determination (optical fiber strain sensors, thermoelasticity, Moire, residual stress determination).

3 units, Spr (Nelson, D)

ME 351A. Fluid Mechanics—Exact and approximate analysis of fluid flow covering kinematics, global and differential equations of mass, momentum, and energy conservation. Forces and stresses in fluids. Euler's equations and the Bernoulli theorem applied to inviscid flows. Vorticity dynamics. Topics in irrotational flow: stream function and velocity potential for exact and approximate solutions; superposition of solutions; complex potential function; circulation and lift. Some boundary layer concepts.

3 units, Aut (Iaccarino, G)

ME 351B. Fluid Mechanics—Laminar viscous fluid flow. Governing equations, boundary conditions, and constitutive laws. Exact solutions for parallel flows. Creeping flow limit, lubrication theory, and boundary layer theory including free-shear layers and approximate methods of solution; boundary layer separation. Introduction to stability theory and transition to turbulence, and turbulent boundary layers. Prerequisite: 351A.

3 units, Win (Eaton, J)

ME 352A. Radiative Heat Transfer—The fundamentals of thermal radiation heat transfer; blackbody radiation laws; radiative properties of non-black surfaces; analysis of radiative exchange between surfaces and in enclosures; combined radiation, conduction, and convection; radiative transfer in absorbing, emitting, and scattering media. Advanced material for students with interests in heat transfer, as applied in high-temperature energy conversion systems. Take 352B,C for depth in heat transfer. Prerequisites: graduate standing and undergraduate course in heat transfer. Recommended: computer skills.

3 units, not given this year

ME 352B. Fundamentals of Heat Conduction—Physical description of heat conduction in solids, liquids, and gases. The heat diffusion equation and its solution using analytical and numerical techniques. Data and microscopic models for the thermal conductivity of solids, liquids, and gases, and for the thermal resistance at solid-solid and solid-liquid boundaries. Introduction to the kinetic theory of heat transport, focusing on applications for composite materials, semiconductor devices, micromachined sensors and actuators, and rarefied gases. Prerequisite: consent of instructor.

3 units, Win (Goodson, K)

ME 352C. Convective Heat Transfer—Prediction of heat and mass transfer rates based on analytical and numerical solutions of the governing partial differential equations. Heat transfer in fully developed pipe and channel flow, pipe entrance flow, laminar boundary layers, and turbulent boundary layers. Superposition methods for handling non-uniform wall boundary conditions. Approximate models for turbulent flows. Comparison of exact and approximate analyses to modern experimental results. General introduction to heat transfer in complex flows. Prerequisite: 351B or equivalent.

3 units, Spr (Eaton, J)

ME 354. Experimental Methods in Fluid Mechanics—Experimental methods associated with the interfacing of laboratory instruments, experimental control, sampling strategies, data analysis, and introductory image processing. Instrumentation including point-wise anemometers and particle image tracking systems. Lab. Prerequisites: previous experience with computer programming and consent of instructor. Limited enrollment.

4 units, Aut (Santiago, J)

ME 357. Gas Turbine and Internal Combustion Engines—Principles and analysis of power generation gas turbines, propulsion gas turbines, and piston engines. Cycle analysis of stationary gas turbines, turbojets, turboprops, turbofans. Turbomachinery flows and compressor maps. Spark ignition, diesel, and HCCI engines. Combustion processes and fuels. Prerequisites: undergraduate fluid mechanics and thermodynamics.

3 units, Win (Pitsch, H)

ME 358. Heat Transfer in Microdevices—Application-driven introduction to the thermal design of electronic circuits, sensors, and actuators that have dimensions comparable to or smaller than one micrometer. The impact of thin-layer boundaries on thermal conduction and radiation. Convection in microchannels and microscopic heat pipes. Thermal property measurements for microdevices. Emphasis is on Si and GaAs semiconductor devices and layers of unusual, technically-promising materials such as chemical-vapor-deposited (CVD) diamond. Final project based on student research interests. Prerequisite: consent of instructor.

3 units, Spr (Goodson, K)

ME 359A. Advanced Design and Engineering of Space Systems I—The application of advanced theory and concepts to the development of spacecraft and missile subsystems; taught by experts in their fields. Practical aspects of design and integration. Mission analysis, systems design and verification, radiation and space environments, orbital mechanics, space propulsion, electrical power and avionics subsystems, payload communications, and attitude control. Subsystem-oriented design problems focused around a mission to be completed in groups. Tours of Lockheed Martin facilities. Limited enrollment. Prerequisites: undergraduate degree in related engineering field or consent of instructor.

4 units, not given this year

ME 359B. Advanced Design and Engineering of Space Systems II—Continuation of 359A. Topics include aerospace materials, mechanical environments, structural analysis and design, finite element analysis, mechanisms, thermal control, probability and statistics. Tours of Lockheed Martin facilities. Limited enrollment. Prerequisites: undergraduate degree in related field, or consent of instructor.

4 units, not given this year

ME 361. Turbulence—Governing equations. Averaging and correlations. Reynolds equations and Reynolds stresses. Free shear flows, turbulent jet, turbulent length and time scales, turbulent kinetic energy and kinetic energy dissipation, and kinetic energy budget. Kolmogorov's hypothesis and energy spectrum. Wall bounded flows, channel flow and boundary layer, viscous scales, and law of the wall. Turbulence modeling, gradient transport and eddy viscosity, mixing length model, two-equation models, Reynolds-stress model, and large-eddy simulation.

3 units, Spr (Pitsch, H)

ME 362A. Physical Gas Dynamics—Concepts and techniques for description of high-temperature and chemically reacting gases from a molecular point of view. Introductory kinetic theory, chemical thermodynamics, and statistical mechanics as applied to properties of gases and gas mixtures. Transport and thermodynamic properties, law of mass action, and equilibrium chemical composition. Maxwellian and Boltzmann distributions of velocity and molecular energy. Examples and applications from areas of current interest such as combustion and materials processing.

3 units, Aut (Cappelli, M)

ME 362B. Nonequilibrium Processes in High-Temperature Gases—Chemical kinetics and energy transfer in high-temperature gases. Collision theory, transition state theory, and unimolecular reaction theory. Prerequisie: 362A or consent of instructor.

3 units, not given this year

ME 363. Partially Ionized Plasmas and Gas Discharges—Introduction to partially ionized gases and the nature of gas discharges. Topics: the fundamentals of plasma physics emphasizing collisional and radiative processes, electron and ion transport, ohmic dissipation, oscillations and waves, interaction of electromagnetic waves with plasmas. Applications: plasma diagnostics, plasma propulsion and materials processing. Prerequisite: 362A or consent of instructor.

3 units, not given this year

ME 364. Optical Diagnostics and Spectroscopy—The spectroscopy of gases and laser-based diagnostic techniques for measurements of species concentrations, temperature, density, and other flow field properties. Topics: electronic, vibrational, and rotational transitions; spectral lineshapes and broadening mechanisms; absorption, fluorescence, Rayleigh and Raman scattering methods; collisional quenching. Prerequisite: 362A or equivalent.

3 units, Win (Hanson, R)

ME 367. Optical Diagnostics and Spectroscopy Laboratory—Principles, procedures, and instrumentation associated with optical measurements in gases and plasmas. Absorption, fluorescence and emission, and light-scattering methods. Measurements of temperature, species concentration, and molecular properties. Lab. Enrollment limited to 16. Prerequisite: 362A or 364.

4 units, Spr (Hanson, R)

ME 370A. Energy Systems I: Thermodynamics—Thermodynamic analysis of energy systems emphasizing systematic methodology for and application of basic principles to generate quantitative understanding. Availability, mixtures, reacting systems, phase equilibrium, chemical availability, and modern computational methods for analysis. Prerequisites: undergraduate engineering thermodynamics and computer skills such as Matlab.

3 units, Aut (Mitchell, R)

ME 370B. Energy Systems II: Modeling and Advanced Concepts—Development of quantitative device models for complex energy systems, including fuel cells, reformers, combustion engines, and electrolyzers, using thermodynamic and transport analysis. Student groups work on energy systems to develop conceptual understanding, and high-level, quantitative and refined models. Advanced topics in thermodynamics and special topics associated with devices under study. Prerequisite: 370A.

4 units, Win (Edwards, C)

ME 370C. Energy Systems III: Projects—Refinement and calibration of energy system models generated in ME 370B carrying the models to maturity and completion. Integration of device models into a larger model of energy systems. Prerequisites: 370A,B, consent of instructor.

3-5 units, Spr (Edwards, C)

ME 371. Combustion Fundamentals—Heat of reaction, adiabatic flame temperature, and chemical composition of products of combustion; kinetics of combustion and pollutant formation reactions; conservation equations for multi-component reacting flows; propagation of laminar premixed flames and detonations. Prerequisite: 362A or 370A, or consent of instructor.

3 units, Win (Zheng, X)

ME 372. Combustion Applications—The role of chemical and physical processes in combustion; ignition, flammability, and quenching of combustible gas mixtures; premixed turbulent flames; laminar and turbulent diffusion flames; combustion of fuel droplets and sprays. Prerequisite: 371.

3 units, Spr (Zheng, X)

ME 374A. Biodesign Innovation: Needs Finding and Concept Creation—(Same as BIOE 374A, OIT 384, MED 272A.) Two quarter sequence. Strategies for interpreting clinical needs, researching literature, and searching patents. Clinical and scientific literature review, techniques of intellectual property analysis and feasibility, basic prototyping, and market assessment. Student entrepreneurial teams create, analyze, and screen medical technology ideas, and select projects for development.

3-4 units, Win (Yock, P; Zenios, S; Brinton; Milroy, C)

ME 374B. Biodesign Innovation: Concept Development and Implementation—(Same as BIOE 374B, OIT 385, MED 272B.) Two quarter sequence. Concept development and implementation. Early factors for success; how to prototype inventions and refine intellectual property. Lectures, guest medical pioneers, and entrepreneurs about strategic planning, ethical considerations, new venture management, and financing and licensing strategies. Cash requirements; regulatory (FDA), reimbursement, clinical, and legal strategies, and business or research plans.

3-4 units, Spr (Yock, P; Zenios, S; Brinton; Milroy, C)

ME 377. Experiences in Innovation and Design Thinking—Immersive experiences in innovation and design thinking, blurring the boundaries among technology, business, and human values. Tenets of design thinking including being human-centered, prototype-driven, and mindful of process. Topics include design processes, innovation methodologies, need finding, human factors, rapid prototyping, team dynamics, storytelling, and project management. Hands-on projects, in-class exercises, and guest lectures. Students and faculty from areas including business, earth sciences, education, engineering, humanities and sciences, law, and medicine. Preparation for advanced d.school courses. Limited enrollment. Application required. See http://dschool.stanford.edu/projects/classes/me377.html.

3 units, Win (Kembel, G; Kelley, D; Kazaks, A)

ME 381. Orthopaedic Bioengineering—Engineering approaches applied to the musculoskeletal system in the context of surgical and medical care. Fundamental anatomy and physiology. Material and structural characteristics of hard and soft connective tissues and organ systems, and the role of mechanics in normal development and pathogenesis. Engineering methods used in the evaluation and planning of orthopaedic procedures, surgery, and devices.

3 units, Aut (Carter, D)

ME 382A. Medical Device Design—Real world problems and challenges of biomedical device design and evaluation. Students engage in industry sponsored projects resulting in new designs, physical prototypes, design analyses, computational models, and experimental tests, gaining experience in: the formation of design teams; interdisciplinary communication skills; regulatory issues; biological, anatomical, and physiological considerations; testing standards for medical devices; and intellectual property.
4 units, Win (Andriacchi, T)

ME 382B. Medical Device Design—Continuation of industry sponsored projects from 382A. With the assistance of faculty and expert consultants, students finalize product designs or complete detailed design evaluations of new medical products. Bioethics issues and strtegies for funding new medical ventures.
4 units, Spr (Andriacchi, T)

ME 385. Tissue Engineering Lab—Hands-on experience in the fabrication of living engineered tissues. Techniques include sterile technique, culture of mammalian cells, creation of cell-seeded scaffolds, and the effects of mechanical loading on the metabolism of living engineered tissues. Theory, background, and practical demonstration for each technique. Lab.
1-2 units, Win (Jacobs, C)

ME 389. Bioengineering and Biodesign Forum—(Same as BIOE 393.) Guest speakers present research topics at the interfaces of biology, medicine, physics, and engineering. May be repeated for credit.
1 unit, Aut (Yock, P; Taylor, C), Win (Taylor, C), Spr (Muendermann, A)

ME 390. Thermosciences Research Project Seminar—Review of work in a particular research program and presentations of related work.
1 unit, not given this year

ME 391. Engineering Problems—Directed study for graduate engineering students on subjects of mutual interest to student and staff member. May be used to prepare for experimental research during a later quarter under 392. Faculty sponsor required.
1-5 units, Aut, Win, Spr, Sum (Staff)

ME 392. Experimental Investigation of Engineering Problems—Graduate engineering students undertake experimental investigation under guidance of staff member. Previous work under 391 may be required to provide background for experimental program. Faculty sponsor required.
1-5 units, Aut, Win, Spr, Sum (Staff)

ME 393. Topics in Biologically Inspired or Human Interactive Robotics—Application of observations from human and animal physiology to robotic systems. Force control of motion including manipulation, haptics, and locomotion. Weekly literature review forum led by student. May be repeated for credit.
1 unit, Aut, Win (Cutkosky, M; Niemeyer, G), Spr (Cutkosky, M)

ME 394. Design Forum—Introduction to the design faculty and research labs. Faculty describe their work and research interests.
1 unit, Aut (Niemeyer, G)

ME 395. Seminar in Solid Mechanics—Required of Ph.D. candidates in solid mechanics. Guest speakers present research topics related to mechanics theory, computational methods, and applications in science and engineering. May be repeated for credit. See http://mc.stanford.edu.
1 unit, Aut, Win, Spr (Pruitt, B; Kuhl, E)

ME 396. Design and Manufacturing Forum—Guest speakers address issues of interest to design and manufacturing engineers. Sponsored by Stanford Engineering Club for Automation and Manufacturing (SECAM). May be repeated for credit
1 unit, Win, Spr (Reis, R)

ME 397. Design Theory and Methodology Seminar—What do designers do when they do design? How can their performance be improved? Topics change each quarter. May be repeated for credit.
1-3 units, Aut, Win (Leifer, L; Mabogunje, A; Sonalkar, N), Spr (Staff)

ADVANCED GRADUATE

ME 400. Thesis (Engineer Degree)—Investigation of some engineering problems. Required of Engineer degree candidates.
2-15 units, Aut, Win, Spr, Sum (Staff)

ME 406. Turbulence Physics and Modeling Using Numerical Simulation Data—Prerequisite: consent of instructor.
2 units, Sum (Moin, P)

ME 408. Spectral Methods in Computational Physics—Data analysis, spectra and correlations, sampling theorem, nonperiodic data, and windowing; spectral methods for numerical solution of ordinary and partial differential equations; accuracy and computational cost; fast Fourier transform, Galerkin, collocation, and Tau methods; spectral and pseudospectral methods based on Fourier series and eigenfunctions of singular Sturm-Liouville problems; Chebyshev, Legendre, and Laguerre representations; convergence of eigenfunction expansions; discontinuities and Gibbs phenomenon; aliasing errors and control; efficient implementation of spectral methods; spectral methods for complicated domains; time differencing and numerical stability.
3 units, given next year

ME 412. Engineering Functional Analysis and Finite Elements—Concepts in functional analysis to understand models and methods used in simulation and design. Topology, measure, and integration theory to introduce Sobolev spaces. Convergence analysis of finite elements for the generalized Poisson problem. Extensions to convection-diffusion-reaction equations and elasticity. Upwinding. Mixed methods and LBB conditions. Analysis of nonlinear and evolution problems. Prerequisites: 335A,B, CME 200, CME 204, or consent of instructor. Recommended: 333, MATH 171.
3 units, alternate years, not given this year

ME 417. Total Product Integration Engineering—For students aspiring to be product development executives and leaders in research and education. Advanced methods and tools beyond the material covered in 217: quality design across global supply chain, robust product architecture for market variety and technology advances, product development risk management. Small teams or individuals conduct a practical project that produces a case study or enhancement to produce development methods and tools. Enrollment limited to 16. Prerequisites: 317A,B.
4 units, Aut (Ishii, K; Beiter, K)

ME 420. Applied Electrochemistry: Micro- and Nanoscale—Concepts of physical chemistry such as thermodynamic equilibrium, reaction kinetics, and mass transport mechanisms from which the fundamentals of electrochemistry are derived. Theory of electrochemical methods for material analyses and modifications with emphasis on scaling behaviors. Electrochemical devices such as sensors, actuators, and probes for scanning microscopes, and their miniaturization concepts. Examples of these devices built, characterized, and applied in labs using technologies such as scanning probe techniques. Projects focus on current problems in biology, material science, microfabrication, and energy conversion.
3 units, Sum (Fasching, R)

ME 436. Advanced Techniques for Molecular Simulations—Advanced methods for computer simulation of proteins. Long-range force calculation, particle mesh Ewald, fast multipole method, multigrid. Free energy methods, umbrella sampling, acceptance ratio, thermodynamic integration, non equilibrium methods, adaptive biasing force, parallel computing. Parallel algorithms, MPI, implementation issues. Prerequisites: 346, statistical mechanics, advanced programming in C.
3 units, alternate years, not given this year

ME 438. Computational Molecular Modeling Project—Project-based class. Topics for projects include parallel methods for molecular dynamics, multiple time stepping algorithms, free energy computation, molecular pathways analysis, long-time scale behavior of numerical integrators, and multigrid based fast electrostatic algorithms. Students can propose their own projects. Final report and oral presentation. May be repeated for credit.
3 units, Sum (Darve, E)

ME 450. Advances in Biotechnology—Guest academic and industrial speakers. Latest developments in fields such as bioenergy, green process technology, production of industrial chemicals from renewable resources, protein pharmaceutical production, industrial enzyme production, stem cell applications, medical diagnostics, and medical imaging. Biotechnology ethics, business and patenting issues, and entrepreneurship in biotechnology.

3 units, Spr (Staff)

ME 451A. Advanced Fluid Mechanics—Topics: kinematics (analysis of deformation, critical points and flow topology, Helmholtz decomposition); constitutive relations (viscous and visco-elastic flows, non-inertial frames); vortex dynamics; circulation theorems, vortex line stretching and rotation, vorticity generation mechanisms, vortex filaments and Biot-Savart formula, local induction approximation, impulse and kinetic energy of vortex systems, vorticity in rotating frame. Prerequisite: graduate courses in compressible and viscous flow.

3 units, not given this year

ME 451B. Advanced Fluid Mechanics—Waves in fluids: surface waves, internal waves, inertial and acoustic waves, dispersion and group velocity, wave trains, transport due to waves, propagation in slowly varying medium, wave steepening, solitons and solitary waves, shock waves. Instability of fluid motion: dynamical systems, bifurcations, Kelvin-Helmholtz instability, Rayleigh-Benard convection, energy method, global stability, linear stability of parallel flows, necessary and sufficient conditions for stability, viscosity as a destabilizing factor, convective and absolute instability. Focus is on flow instabilities. Prerequisites: graduate courses in compressible and viscous flow.

3 units, Spr (Shaqfeh, E)

ME 451C. Advanced Fluid Mechanics—Compressible flow: governing equations, Crocco-Vazsonyi's equations, creation and destruction of vorticity by compressibility effects, shock waves. Modal decomposition of compressible flow, linear and nonlinear modal interactions, interaction of turbulence with shock waves. Energetics of compressible turbulence, effects of compressibility on free-shear flows, turbulent boundary layers, Van Direst transformation, recovery temperature, and shock/boundary layer interaction. Strong Reynolds analogy, modeling compressible turbulent flows. Prerequisites: 355, 361A, or equivalents.

3 units, not given this year

ME 453A. Finite Element-Based Modeling and Simulation of Linear Fluid/Structure Interaction Problems—Basic physics behind many fluid/structure interaction phenomena. Finite element-based computational approaches for linear modeling and simulation in the frequency domain. Vibrations of elastic structures. Linearized equations of small movements of inviscid fluids. Sloshing modes. Hydroelastic vibrations. Acoustic cavity modes. Structural-acoustic vibrations. Applications to liquid containers and underwater signatures. Prerequisite: graduate course in the finite element method or consent of instructor.

3 units, not given this year

ME 453B. Computational Fluid Dynamics Based Modeling of Nonlinear Fluid/Structure Interaction Problems—Basic physics behind many high-speed flow/structure interaction phenomena. Modern computational approaches for nonlinear modeling and simulation in the time domain. Dynamic equilibrium of restrained and unrestrained elastic structures. Corotational formulation for large structural displacements and rotations. Arbitrary Lagrangian-Eulerian description of inviscid and viscous flows. Time-accurate CFD on moving and deforming grids. Discrete geometric conservation laws. Discretization of transmission conditions on non-matching discrete fluid/structure interfaces. Coupled fluid/mesh-motion/structure time integration schemes. Application to divergence, flutter, and buffeting. Prerequisites: graduate course in the finite element method, and in computational fluid dynamics.

3 units, not given this year

ME 455. Complex Fluids and Non-Newtonian Flows—Definition of a complex liquid and microrheology. Division of complex fluids into suspensions, solutions, and melts. Suspensions as colloidal and non-colloidal. Extra stress and relation to the stresslet. Suspension rheology including Brownian and non-Brownian fibers. Microhydrodynamics and the Fokker-Planck equation. Linear viscoelasticity and the weak flow limit. Polymer solutions including single mode (dumbbell) and multimode models. Nonlinear viscoelasticity. Intermolecular effects in nondilute solutions and melts and the concept of reptation. Prerequisites: low Reynolds number hydrodynamics or consent of instructor.

3 units, not given this year

ME 457. Fluid Flow in Microdevices—Physico-chemical hydrodynamics. Creeping flow, electric double layers, and electrochemical transport such as Nernst-Planck equation; hydrodynamics of solutions of charged and uncharged particles. Device applications include microsystems that perform capillary electrophoresis, drug dispension, and hybridization assays. Emphasis is on bioanalytical applications where electrophoresis, electro-osmosis, and diffusion are important. Prerequisite: consent of instructor.

3 units, Win (Santiago, J)

ME 461. Advanced Topics in Turbulence—Turbulence phenomenology; statistical description and the equations governing the mean flow; fluctuations and their energetics; turbulence closure problem, two-equation turbulence models, and second moment closures; non-local effect of pressure; rapid distortion analysis and effect of shear and compression on turbulence; effect of body forces on turbulent flows; buoyancy-generated turbulence; suppression of turbulence by stratification; turbulent flows of variable density; effect of rotation on homogeneous turbulence; turbulent flows with strong vortices. Prerequisites: 351B and 361A, or consent of instructor.

3 units, Aut (Lele, S)

ME 463. Advanced Topics in Plasma Science and Engineering—Research areas such as plasma diagnostics, plasma transport, waves and instabilities, and engineering applications.

3 units, not given this year

ME 469A. Computational Methods in Fluid Mechanics—Finite volume methods on stuctured and unstructured grids. Advanced methods for the solution of systems of equations. ADI schemes, preconditioned conjugate gradient and generalized minimum residual algorithms, multigrid methods, and deferred-correction approaches. Projection, fractional step, and artificial compressibility methods. Turbulent flows: direct numerical simulation, large eddy simulation, and Reynolds-averaged Navier-Stokes methods. Prerequisite: ME 300C/CME 206 or equivalent.

3 units, Win (Iaccarino, G)

ME 469B. Computational Methods in Fluid Mechanics—Advanced CFD codes. Geometry modeling, CAD-CFD conversion. Structured and unstructured mesh generation. Solution methods for steady and unsteady incompressible Navier-Stokes equations. Turbulence modeling. Conjugate (solid/fluid) heat transfer problems. Development of customized physical models. Batch execution for parametric studies. Final project involving solution of a problem of student's choosing. Prerequisite: ME 300C/CME 206.

3 units, not given this year

ME 471. Turbulent Combustion—Basis of turbulent combustion models. Assumption of scale separation between turbulence and combustion, resulting in Reynolds number independence of combustion models. Level-set approach for premixed combustion. Different regimes of premixed turbulent combustion with either kinematic or diffusive flow/chemistry interaction leading to different scaling laws and unified expression for turbulent velocity in both regimes. Models for non-premixed turbulent combustion based on mixture fraction concept. Analytical predictions for flame length of turbulent jets and NOx formation. Partially premixed combustion. Analytical scaling for lift-off heights of lifted diffusion.

3 units, alternate years, not given this year

ME 484. Computational Methods in Cardiovascular Bioengineering—(Same as BIOE 484.) Lumped parameter, one-dimensional nonlinear and linear wave propagation, and three-dimensional modeling techniques applied to simulate blood flow in the cardiovascular system and evaluate the performance of cardiovascular devices. Construction of anatomic models and extraction of physiologic quantities from medical imaging data. Problems in blood flow within the context of disease research, device design, and surgical planning.
3 units, alternate years, not given this year (Taylor, C)

ME 485. Modeling and Simulation of Human Movement—(Same as BIOE 485.) Direct experience with the computational tools used to create simulations of human movement. Lecture/labs on animation of movement; kinematic models of joints; forward dynamic simulation; computational models of muscles, tendons, and ligaments; creation of models from medical images; control of dynamic simulations; collision detection and contact models. Prerequisite: 281, 331A,B, or equivalent.
3 units, Win (Delp, S; Levenston, M)

ME 491. Ph.D. Teaching Experience—Required of Ph.D. students. May be repeated for credit.
3 units, Aut, Win, Spr, Sum (Staff)

ME 500. Thesis (Ph.D.)
2-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES (GRADUATE)

See respective department listings for course descriptions. See degree requirements above or the department's student services office for applicability of these courses to a major or minor program.

CHEMENG 444. Quantum Simulations of Molecules and Materials
3 units, Aut (Musgrave, C)

CS 223A. Introduction to Robotics
3 units, Win (Khatib, O)

CS 327A. Advanced Robotics
3 units, Spr (Khatib, O)

ENGR 206. Control System Design
4 units, Spr (Niemeyer, G)

ENGR 207A. Linear Control Systems I
3 units, Aut (Lall, S)

ENGR 207B. Linear Control Systems II
3 units, Win (Lall, S)

ENGR 209A. Analysis and Control of Nonlinear Systems
3 units, Win (Staff)

ENGR 231. Transformative Design
3-5 units, Win (Roth, B; Ju, W; Jain, S)

ENGR 240. Introduction to Micro and Nano Electromechanical Systems (M/NEMS)
3 units, Aut (Pruitt, B)

ENGR 341. Micro/Nano Systems Design and Fabrication Laboratory
3-5 units, Spr (Solgaard, O; Pruitt, B)

ME 231. Transformative Design
3-5 units, Win (Roth, B; Ju, W; Jain, S)

MS&E 250A. Engineering Risk Analysis
2-3 units, Win (Paté-Cornell, E)

MS&E 264. Manufacturing Systems Design
3-4 units, Aut (Erhun Oguz, F)

SCHOOL OF HUMANITIES AND SCIENCES

Dean: Richard P. Saller
Vice Dean for Academic Planning: Iain Johnstone
Senior Associate Deans: Martin Fejer, Ian Gotlib, Stephen Hinton, Susan Stephens
Executive Dean: Kären N. Nagy
Associate Dean for Faculty Affairs: Tina Kass
Associate Dean for Graduate and Undergraduate Studies: Lorraine Sterritt
Senior Assistant Dean: Roni Holeton
Assistant Deans: Joseph Brown, Ayodele Thomas
Department Chairs: Ted Andersson (German), Russell Berman (Comparative Literature), Tim Bresnahan (Economics), Patricia Burchat (Physics), Steven Carter (Asian Languages), Karen Cook (Sociology), James Fearon (Political Science), James Ferguson (Anthropology), James Fishkin (Communication), Gregory Freidin (Slavic Languages and Literatures), Hester Gelber (Religious Studies), Roland Greene (Division of Languages, Cultures, and Literatures), Robert Harrison (French and Italian), Trevor Hastie (Statistics), Aharon Kapitulnik (Applied Physics), Richard Martin (Classics), Rafe Mazzeo (Mathematics), Peggy Phelan (Drama), Joan Ramon Resina (Spanish and Portuguese), Aron Rodrigue (History), Ramón Saldívar (English), Kristine Samuelson (Art and Art History), Stephen Sano (Music), Robert Simoni (Biological Sciences), George Somero (Hopkins Marine Station), Ken Taylor (Philosophy), Brian Wandell (Psychology), Tom Wasow (Linguistics), Richard Zare (Chemistry)
Lecturer: Ayodele Thomas

The School of Humanities and Sciences, with over 40 departments and interdepartmental degree programs, is the primary locus for the liberal arts education offered by Stanford University. Through exposure to the humanities, undergraduates study the ethical, aesthetic, and intellectual dimensions of the human experience, past and present, and so are prepared to make thoughtful and imaginative contributions to the culture of the future. Through the study of social, political, and economic events, they acquire theories and techniques for the analysis of specific societal issues, as well as general crosscultural perspectives on the human condition. And through exposure to the methods and discoveries of mathematics and the sciences, they become better-informed participants and leaders in today's increasingly technological societies.

The research environment within the school offers undergraduates and graduate students the intellectual adventure of working on their own research projects side by side with the school's distinguished faculty. While a few of the school's graduate programs offer professional degrees such as the Master of Fine Arts, most are academic and research programs leading to the Ph.D. Doctoral programs emphasize original scholarly work by the graduate students, often at the frontiers of knowledge, and normally require the students to participate in the supervised teaching of undergraduates. Indeed, in the school, as in the University more broadly, graduate students are of central importance in developing a community of scholars.

The fact that so many different disciplines lie within the same organization is one reason why the school has had great success in promoting interdisciplinary teaching and research programs. Whether engaged in studies as wide ranging as ethics, policy, and technological issues, or by applying contemporary social and philosophical theories to classical literature, the school's undergraduates, graduate students, and faculty are challenging the barriers among scholarly disciplines. The school continues to strive for a balance between teaching and research, the academy and society.

ORGANIZATION

The School of Humanities and Sciences includes the departments of Anthropology, Applied Physics, Art and Art History, Asian Languages, Biological Sciences (and the Hopkins Marine Station), Chemistry, Classics, Communication, Comparative Literature, Drama, Economics, English, French and Italian, German Studies, History, Linguistics, Mathematics, Music, Philosophy, Physics, Political Science, Psychology, Religious Studies, Slavic Languages and Literatures, Sociology, Spanish and Portuguese, and Statistics.

The school also includes 19 interdepartmental degree programs: African and African American Studies; African Studies; American Studies; Archaeology; Biophysics; Comparative Studies in Race and Ethnicity; East Asian Studies; Human Biology; Feminist Studies; Financial Mathematics; Interdisciplinary Studies in Humanities; International Policy Studies; International Relations; Latin American Studies; Mathematical and Computational Science; Modern Thought and Literature; Public Policy; Russian, East European and Eurasian Studies; Science, Technology, and Society; Symbolic Systems; and Urban Studies.

In addition, the school sponsors programs that do not currently grant degrees: Astronomy; Black Performing Arts; Buddhist Studies; Creative Writing, Ethics in Society; History and Philosophy of Science; the Institute for Gender Research; the Institute for Social Science Research; Islamic Studies; Jewish Studies; Medieval Studies; and the Social Science History Institute.

Faculty and academic staff of the School of Humanities and Sciences are listed under the respective departments or programs.

DEGREES OFFERED

Candidates for the degree of Bachelor of Arts, Bachelor of Science, Bachelor of Arts and Sciences, Master of Arts, Master of Fine Arts, Master of Science, Doctor of Musical Arts, or Doctor of Philosophy should consult the department or program in which they intend to specialize.

COURSES

HUMSCI 190. Individually Designed Major Honor's Thesis—May be repeated for credit.
1-10 units, Aut, Win, Spr (Staff)

HUMSCI 201. Graduate Environment of Support— Psychosocial, financial, and career issues in adapting graduate students to Stanford; how these issues relate to diversity, resources, policies, and procedures. Discussions among faculty, advanced graduate students, campus resource people, and the dean's office.
1 unit, Aut (Thomas, A)

PROGRAM IN AFRICAN AND AFRICAN AMERICAN STUDIES

Acting Director: Michele Elam
Associate Director: Vera I. Grant
Advisory Committee: Clayborne Carson (History), Harry Elam (Drama), Joel Samoff (African Studies), Morris Graves (Associate Dean of Students), Marcyliena Morgan (Communication), Elaine C. Ray (Director, Stanford University News Service), Arnold Rampersad (English), John R. Rickford (Linguistics)
Affiliated Faculty: David Abernethy (Political Science, emeritus), Arnetha Ball (Education), Richard Banks (Law), Lucius Barker (Political Science, emeritus), Lawrence D. Bobo (Sociology, on leave), Albert Camarillo (History), Clayborne Carson (History), Prudence Carter (Education), Susan Cashion (Drama), Wanda Corn (Art History), Linda Darling-Hammond (Education), David Degusta (Anthropology), Sally Dickson (Law), Sandra Drake (English, emeritus), Jennifer Eberhardt (Psychology), Paulla Ebron (Anthropology), Harry Elam (Drama), James Ferguson (Anthropology), Shelley Fisher Fishkin (English), George Fredrickson (History, emeritus), James Gibbs Jr. (Political Science, emeritus), William B. Gould (Law, emeritus), Sean Hanretta (History), Aleta Hayes (Drama), Allison Hobbs (History), Anthony Kramer (Drama), Teresa LaFromboise (Education), Brian Lowery (Graduate School of Business), Liisa Malkki (Anthropology), Hazel Markus (Psychology), Barbaro Martinez-Ruiz (Art and Art History), Monica McDermott (Sociology), Marcyliena Morgan (Communication), Robert Moses (Drama), Paula Moya (English), Elisabeth Mudimbe-Boyi (French and Comparative Literature), Na'ilah S. Nasir (Education), Susan Olzak (Sociology), David Palumbo-Liu (Comparative Literature), Patricia Powell (African and African American Studies), Jack Rakove (History), Arnold Rampersad (English), John R. Rickford (Linguistics), Richard Roberts (History), Ramón Saldívar (English), Joel Samoff (African Studies), Ewart Thomas (Psychology), Jeremy Weinstein (Political Science), Joy Williamson (Education)

Program Offices: 450 Serra Mall, Building 360
Mail Code: 94305-2084
Phone: (650) 723-3782
Email: aaas@stanford.edu
Web Site: http://www.stanford.edu/dept/AAAS/

Courses given in the Program in African and African American Studies have the subject code AFRICAAM. For a complete list of subject codes, see Appendix.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The African and African American Studies (AAAS) program emphasizes creative scholarship and research in fields including: the history, literature, culture, and social science of African Americans as a central component of American culture; and the history, literature, culture, and social science of the peoples of Africa and the African diaspora. AAAS is an indispensable subject for those interested in the cultural, economic, historical, political, or social study of the United States.

To investigate the field which AAAS covers, students are encouraged to use interdisciplinary methods drawn from fields including anthropology, art, art history, economics, education, history, languages, linguistics, literature, music, philosophy, political science, psychology, religion, and sociology. A degree in AAAS prepares students for many jobs requiring a broad liberal arts perspective, as well as those requiring the specialized knowledge that AAAS offers. Students in AAAS receive training that is especially valuable for graduate study and careers in fields such as business, comparative literature, creative writing, education, history, journalism, law, linguistics, medicine, performing arts, politics, social sciences, social work, teaching, and urban studies.

MAJOR

Majors must complete a total of 60 units, of which 25 units must be selected from the AAAS core courses, including AFRICAAM 105 and ENGLISH 152D (not given this year) which are mandatory. Since AAAS is affiliated with the program in Comparative Studies in Race and Ethnicity (CSRE), AAAS students must enroll in two CSRE core introductory courses and complete a CSRE senior seminar (CSRE 200X) before graduating. Students may count one single-group core course toward their 15-unit core introductory course requirement as long as that course takes as its focus the experience of a racial or ethnic group different from the one in which they are majoring.

Additionally, 20 units are to be selected from areas I (African American Studies) or II (Africa and the African Diaspora), or an individually designed area. All majors must include at least one course from areas I and II. Students who choose to create an individually designed area may devise a program with a special theme. This choice allows the student to use up to 20 units to explore issues encountered in other courses in greater depth or to strike out in new directions. Students who choose to create an individually designed area must work closely with an adviser and must have written approval from the director of the program. Regardless of whether students choose to focus on area I or II or an individually designed area, no more than two courses of a general nature (such as SOC 145, Race and Ethnic Relations, which deals with race and ethnicity, but without a primary African or African American focus) may be counted towards the major.

All AAAS majors must take the CSRE 200X, CSRE Senior Seminar; this course satisfies the Writing in the Major requirement (WIM).

THEMATIC CONCENTRATION IN IDENTITIES, DIVERSITY AND AESTHETICS (IDA)

Students interested in focusing their study on how questions of race and diversity can be critically examined through the arts can choose a thematic concentration in Identities, Diversity, and Aesthetics (IDA) within any of the CSRE majors. This concentration is not declared on Axess; it does not appear on the transcript or diploma. A thematic concentration in IDA offers students a curriculum that integrates academic theory and artistic practice focused on issues of diversity including race and ethnicity and gender and sexuality. This area of study encourages new thinking in cultural theory and the arts because it cuts across traditional disciplines within the humanities, and moves beyond the boundaries between the humanities and other disciplines.

The IDA thematic concentration develops social, cultural, and practical knowledge and leadership through hands-on work with artists and the Institute for Diversity in the Arts and courses with Stanford faculty that use the arts as a lens for understanding the dynamic interrelationship of race, gender, and sexuality. The Institute for Diversity in the Arts offers performing arts workshops with professional artists working in culturally rooted, community-based art forms. Students learn techniques, historical significance, and social application of artistic processes from their origins to contemporary practice.

For details about the requirements for the thematic concentration in Identities, Diversity and Aesthetics, contact the CSRE undergraduate program office.

MINOR

Students who minor in AAAS must complete either (1) a total of six courses of 3 or more letter-graded units, or (2) a minimum of 25 graded units from the list of AAAS courses listed below. The courses must include AFRICAAM 105 and at least one course from the social sciences and one from the humanities. Students should develop a coherent theme in their course selections, in consultation with the program director or associate director.

AAAS stresses academic advising. The director or associate director advises all AAAS students, including majors, minors, and double majors. Additionally, majors and double majors have the opportunity to participate in individual and group mentoring activities offered by CSRE. The program prides itself on its responsiveness to student concerns, and its advisory committee includes both faculty and student representation.

HONORS

Majors who have maintained a grade point average (GPA) of at least 3.5 or higher in the major may apply for the honors program. Students should apply in the Spring Quarter of junior year. The honors thesis is intended to enable students to synthesize skills to produce a document or project demonstrating a measure of competence in their specialty. The honors thesis must be discussed with and approved by the major adviser and the program director. A student may receive 5-15 units for the honors thesis. All students completing an honors thesis must participate in at least two quarters of the CSRE Senior Seminar; take CSRE 200X in Autumn Quarter and AFRICAAM 199 in Winter and Spring quarters for the full 15 units.

CORE COURSES

The core consists of 25 units, including the two required courses.

Subject and Catalog Number	*Units*
AFRICAAM 101. African and African American Lecture Series	1-3
AFRICAAM 105. Intro to African and African American Studies (required)	5
AFRICAAM 123. Great Works of the African American Tradition	5
or ENGLISH 172G. Great Works of the African American Tradition	5
COMM 148. Hip-Hop and Don't Stop: Introduction to Modern Speech Communities	4-5
ENGLISH 152D. W.E.B. Du Bois and American Culture (required) (not given this year)	5
FRENLIT 133. Literature and Society: Introduction to Francophone Literature from Africa and the Caribbean	4
HISTORY 145B. Africa in the 20th Century	5
HISTORY 166. Introduction to African American History: The Modern African American Freedom Struggle	4-5
LINGUIST 65. African American Vernacular English	3-5
POLISCI 225R. Black Politics in the Post-Civil Rights Era (not given this year)	5
SOC 144. Race and Crime in America	5

CSRE INTRODUCTORY CORE COURSES

15 units from the following courses are required for AAAS majors:

CASA 88. Theories in Race and Ethnicity (not given this year)	5
COMPLIT 241. Comparative Fictions of Ethnicity	5
CSRE 196C. Introduction to Comparative Studies in Race and Ethnicity (not given this year)	5
CSRE 200X. CSRE Senior Seminar (WIM)	5
EDUC 156A. Understanding Racial and Ethnic Identity (not given this year)	3-5
EDUC 177. Education of Immigrant Students	4
ENGLISH 45/145. Writings by Women of Color	3-5
ENGLISH 172E. The Literature of the Americas	5
HISTORY 64. Introduction to Race and Ethnicity in the American Experience (not given this year)	5
PHIL 77. Philosophical Issues in Race and Racism (not given this year)	4
PSYCH 75. Cultural Psychology	5
SOC 143. Prejudice, Racism, and Social Change (not given this year)	5
SOC 145. Race and Ethnic Relations (not given this year)	5
SOC 147/247. Comparative Ethnic Conflict	5

SINGLE-GROUP CORE COURSES

COMPLIT 148. Introduction to Asian American Cultures	5
HISTORY 59. Introduction to Asian American History	5
CHICANST 180E. Introduction to Chicana/o Life and Culture	5
SOC 138. American Indians in Comparative Historical Perspective (not given this year)	5
SOC 139. American Indians in Contemporary Society (not given this year)	5

AREA I: AFRICAN AMERICAN HISTORY, LITERATURE, CULTURE, AND SOCIETY

Area I majors choose at least 20 units in addition to the core from the following list, plus at least one course from the Area II list below:

AFRICAN AND AFRICAN AMERICAN STUDIES (AFRICAAM)

101. African and African American Lecture Series (Aut, Win, Spr)
105. Introduction to African and African American Studies (required)
123. Great Works of the African American Tradition
or ENGLISH 172G. Great Works of the African American Tradition

SOCIAL SCIENCES

Area I minors must choose at least one course below:

Communication (COMM):
148. Hip-Hop and Don't Stop: Introduction to Modern Speech Communities
246. Language and Discourse: Race, Class, and Gender

Anthropology (CASA):
36. Life on the Streets: Anthropology of United States Urban Life
88. Theories in Race and Ethnicity: A Comparative Perspective

Economics (ECON):
116. American Economic History
148. Urban Economics

Education (EDUC):
156A. Understanding Racial and Ethnic Identity
193C. Peer Counseling: The African American Community
201A. History of African American Education
201B. Education for Liberation

English (ENGLISH):
43. Introduction to African American Literature
172P. African American Poetry
172G. Great Works of the African American Literary Tradition

Political Science (POLISCI):
136. Philosophical Issues concerning Race and Racism
221. Race and American Politics
221T. Politics of Race and Ethnicity in the United States
325S. Race and Place in American Politics

Psychology (PSYCH):
180. Social Psychological Perspectives on Stereotyping and Prejudice
215. Mind, Culture, and Society

Sociology (SOC):
141A. Social Class, Race, Ethnicity, Health
144. Race and Crime in America
149. The Urban Underclass

HUMANITIES

Area I minors must choose at least one course below.

Dance (DANCE):
44. Jazz Dance I
144. Jazz Dance II
145. Jazz Dance III

Drama (DRAMA):
155D. Performances of Race, Race-ing Performance
163. Performance and America
168. African American Drama: Traditions and Revisions
169. Contemporary Dramatic Voices of Color

History (HISTORY):
166. Introduction to African American History: The Modern African American Freedom Struggle
299M. Martin Luther King, Jr. Papers Project

Linguistics (LINGUIST):
65. African American Vernacular English

Music (MUSIC):
18A. Jazz History: Ragtime to Bebop (1900-1940)
18B. Jazz History: Bebop to Present (1940-Present)
20A. Jazz Theory
20B. Advanced Jazz Theory
161B. Jazz Orchestra

Philosophy (PHIL):
177. Philosophical Issues Concerning Race and Racism

AREA II: AFRICAN HISTORY, CULTURE, AND SOCIETY; HISTORY, CULTURE, AND SOCIETY OF THE BLACK DIASPORA

Area II majors choose at least 20 units from the following lists in addition to the core courses, plus at least one course from the Area I list:

AFRICAN AND AFRICAN AMERICAN STUDIES (AFRICAAM)

101. African and African American Lecture Series (Aut, Win, Spr)

SOCIAL SCIENCES

Area II minors must choose at least one course below:

Anthropology (CASA):
72. Dance and Culture in Latin America
88. Theories of Race and Ethnicity
119. The State in Africa

HUMANITIES

Area II minors must choose at least one course below:

Dance (DANCE):
43. Afro-Brazilian and Afro-Peruvian Dance

French and Italian (FRENLIT):
133. Literature and Society: Introduction to Francophone Literature from Africa and the Caribbean
248. Literature, History, and Representation

History (HISTORY):
48Q. South Africa: Contested Transitions
61. The Constitution and Race
147G. African History in Novels and Film
145B. Africa in the 20th Century
245E. Health and Society in Africa
245G. Law and Colonialism in Africa
246. Successful Futures for Africa: An Inventory of the 1970s-2000s
246S. Popular Culture in Africa
248S. African Societies and Colonial States

Language Center (AMELANG):
100A,B,C. Beginning Amharic
102A,B,C. Advanced Amharic
106A,B,C. Beginning Swahili
107A,B,C. Intermediate Swahili
108A,B,C. Advanced Swahili
133A,B,C. The African Forum

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

AFRICAAM 101. African American Lecture Series—Weekly lectures on African or African American artistic expression, culture, history, language, literature, music, politics, religion and society. One unit for attendance at lecture reading and submission of brief response papers. Additional units require participation in discussion sections, readings, and the opportunity to conduct and record interviews with speakers in the lecture series for the AAAS archives. Topics this year: hip hop; Black film; and residential segregation. May be repeated for credit.
1-3 units, Aut, Win, Spr (Grant, V)

AFRICAAM 105. Introduction to African and African American Studies—(Same as SOC 147B/247B.) Interdisciplinary. Central themes in African American culture and history related to race as a definitive American phenomenon. Possible topics: African survivals and interpretations of slavery in the New World, contrasting interpretations of the Black family, African American literature, and art. Possible readings: Frederick Douglass, Harriet Jacobs, Booker T. Washington, W.E.B. DuBois, Richard Wright, Maya Angelou, James Baldwin, Malcom X, Alice Walker, and bell hooks. Focus may vary each year. GER:DB-Hum, EC-AmerCul
5 units, Spr (Staff)

AFRICAAM 123. Great Works of the African American Tradition—Foundational African and African American scholarly figures and their work from the 19th century to the present. Historical, political, and scholarly context. Dialogues distinctive to African American culture. May be repeated for credit.
5 units, Spr (Rampersad, A)

AFRICAAM 190. Directed Reading—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Staff)

AFRICAAM 199. Honors Project—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Win, Spr (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ARTHIST 192/392. Introduction to African Art
4 units, Win (Martinez-Ruiz, B)

CASA 88. Theories in Race and Ethnicity
5 units, Aut (Yanagisako, S)

COMM 148/248. Hip Hop and Don't Stop: Introduction to Modern Speech Communities
4-5 units, Win (Morgan, M)

COMPLIT 41Q. Ethnicity and Literature
3-5 units, not given this year

COMPLIT 147. Comparative Approaches to African American and Asian American Literature—(Same as ASNAMST 147A, CSRE 147A.)
5 units, Spr (Tang, A)

COMPLIT 241. Comparative Fictions of Ethnicity
5 units, not given this year

CSRE 196C. Introduction to Comparative Studies in Race and Ethnicity—(Same as ENGLISH 172D, PSYCH 155.)
5 units, Win (Moya, P; Markus, H)

CSRE 198. Internship for Public Service
1-5 units, Aut, Win, Spr (Staff)

CSRE 200X. CSRE Senior Seminar
5 units, Aut (Snipp, C; Hamedani, M), Spr (Thompson, V)

CSRE 203A. The Changing Face of America: Civil Rights and Education Strategies for the 21st Century
5 units, Spr (Montoya, J; Steyer, J)

DANCE 42. Dances of Latin America
2 units, Aut, Spr (Cashion, S)

DANCE 43. Afro-Peruvian and Afro-Brazilian Dance
1 unit, Win (Cashion, S)

DANCE 44. Jazz Dance I
2 units, Win, Spr (Kramer, A)

DANCE 51. Congolese Dance
2 units, Aut (Malonga, M)

DANCE 58. Beginning Hip-Hop
1 unit, Aut (Reddick, R)

DANCE 59. Intermediate-Advanced Hip-Hop
1 unit, Aut (Reddick, R)

DANCE 105. Contemporary Afro Styles and Dancemaking: Technique, Rhythm, Architecture
2 units, Win (Hayes, A)

DANCE 106. Essence of Contemporary Dance Performance: African Styles on Stage
2 units, Spr (Hayes, A)

DRAMA 110. Identity, Diversity, and Aesthetics: The Institute for Diversity in the Arts
5 units, Win (Elam, H)

DRAMA 163/263. Performance and America
5 units, not given this year

ECON 116. American Economic History
5 units, Spr (Wright, G)

EDUC 103B/337. Race, Ethnicity, and Linguistic Diversity in Classrooms: Sociocultural Theory and Practices
3-5 units, not given this year

EDUC 193C. Peer Counseling in the African American Community
1 unit, Aut (Edwards, S)

EDUC 201. History of Education in the United States—(Same as HISTORY 158B.)
3-4 units, Spr (Staff)

EDUC 201A. History of African American Education
3-4 units, not given this year

EDUC 201B. Education for Liberation
3-4 units, not given this year

EDUC 245. Understanding Racial and Ethnic Identity Development
3-5 units, Aut (LaFromboise, T)

ENGLISH 69Q. Sources of Global Challenges Today, Possibilities for Global Solutions: A Literary Exploration
3-5 units, Spr (Drake, S)

ENGLISH 43/143. Introduction to African American Literature
3-5 units, Aut (Elam, M)

ENGLISH 55N. American Sports, American Lives
5 units, Win (Rampersad, A)

ENGLISH 146C. Hemingway, Hurston, Faulkner, and Fitzgerald
5 units, Aut (Jones, G)

ENGLISH 172G. Great Works of the African American Literary Tradition
5 units, Spr (Rampersad, A)

ENGLISH 172P. African American Poetry
5 units, Spr (Rampersad, A)

ENGLISH 374. Writing Race and Nation: Mark Twain and Paul Laurence Dunbar
5 units, Spr (Fishkin, S)

FRENLIT 133. Literature and Society in Africa and the Caribbean—(Same as COMPLIT 141.)
4 units, Spr (Boyi, E)

FRENLIT 248. Literature, History, and Representation—(Same as COMPLIT 250.)
3-5 units, Spr (Boyi, E)

HISTORY 48Q. South Africa: Contested Transitions
3 units, Win (Samoff, J)

HISTORY 145B. Africa in the 20th Century
5 units, Win (Hanretta, S)

HISTORY 150A. Colonial and Revolutionary America
5 units, Aut (Rakove, J)

HISTORY 150B. 19th-Century America
5 units, Win (White, R)

HISTORY 150C. The United States in the Twentieth Century
5 units, Spr (Camarillo, A; Chang, G)

HISTORY 158. The United States Since 1945
4-5 units, Win (Bernstein, B)

HISTORY 166. Introduction to African American History: The Modern African American Freedom Struggle
4-5 units, Aut (Carson, C)

HISTORY 243S/443A. Human Origins: History, Evidence, and Controversy
4-5 units, not given this year

HISTORY 245E/347E. Health and Society in Africa
4-5 units, not given this year

HISTORY 245G/348D. Law and Colonialism in Africa
4-5 units, not given this year

HISTORY 248/348. Islam in Africa
4-5 units, Spr (Hanretta, S)

HISTORY 260. California's Minority-Majority Cities
5 units, Spr (McKibben, C)

HISTORY 299M. Undergraduate Directed Research: Martin Luther King, Jr., Research and Education Institute
1-4 units, Aut (Staff), Win (Carson, C), Spr (Staff)

HUMBIO 122S. Social Class, Race, Ethnicity, Health
4 units, offered next year

LINGUIST 65/265. African American Vernacular English
3-5 units, Spr (Rickford, J)

LINGUIST 152/252. Sociolinguistics and Pidgin Creole Studies
2-4 units, Spr (Rickford, J)

MUSIC 18A. Jazz History: Ragtime to Bebop, 1900-1940
3 units, Win (Berry, F)

MUSIC 18B. Jazz History: Bebop to Present, 1940-Present
3 units, Spr (Berry, F)

MUSIC 20A. Jazz Theory
3 units, Aut (Nadel, J)

MUSIC 20B. Advanced Jazz Theory
3 units, alternate years, not given this year

MUSIC 20C. Jazz Arranging and Composition
3 units, Win (Nadel, J)

MUSIC 161B. Jazz Orchestra
1 unit, Aut, Win, Spr (Berry, F)

POLISCI 141. The Global Politics of Human Rights
5 units, not given this year

PSYCH 75. Introduction to Cultural Psychology
5 units, alternate years, not given this year

PSYCH 215. Mind, Culture, and Society
3 units, Win (Markus, H; Steele, C)

SOC 143/243. Prejudice, Racism, and Social Change
5 units, not given this year

SOC 144/244. Race and Crime in America
5 units, not given this year

SOC 145/245. Race and Ethnic Relations
5 units, not given this year

OVERSEAS STUDIES

Courses approved for the major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

CAPE TOWN

OSPGEN 21. Public Health and Primary Health Care in a Changing Community Context
4 units, Spr (Stanton, T)

OSPGEN 22. Community Reconstruction and Development in Post-Apartheid South Africa
4 units, Spr (Stanton, T)

OSPGEN 23. History and Politics of South Africa in Transition
4 units, Spr (Simons, M)

OXFORD

OSPOXFRD 84. African Art and Writing Traditions
5 units, Spr (Martinez-Ruiz, B)

OSPOXFRD 85. African Art and Museum Display
5 units, Spr (Martinez-Ruiz, B)

PARIS

OSPPARIS 186F. Contemporary African Literature in French
4 units, Aut (Rullier, F)

AFRICAN STUDIES

Emeriti: David B. Abernethy, John Baugh, Sandra E. Drake, George M. Frederickson, James. L. Gibbs, Jr., William B. Gould, Bruce F. Johnston, William R. Leben, Hans N. Weiler, Sylvia Wynter

Chair: Jeremy Weinstein

Professors: Jean-Marie Apostolidès (French, Drama), Ellen Jo Baron (Pathology), Joel Beinin (History), Russell Berman (Comparative Literature, German Studies), John Boothroyd (Microbiology and Immunology), Elisabeth Mudimbe-Boyi (French and Italian, Comparative Literature), Joan Bresnan (Linguistics), Martin Carnoy (Education), Peter Egbert (Ophthalmology), Harry Elam (Drama), James Fearon (Political Science), James Ferguson (Anthropology), Terry Lynn Karl (Political Science), Richard Klein (Anthropology), David Laitin (Political Science), Michael McFaul (Political Science), Lynn Meskell (Anthropology), Mary L. Polan (Obstetrics and Gynecology), John Rickford (Linguistics, African and African American Studies), Richard Roberts (History)

Associate Professors: Paulla A. Ebron (Anthropology), Bruce Lusignan (Electrical Engineering, emeritus), Yvonne Maldonado (Pediatrics, Infectious Diseases), Liisa Malkki (Anthropology), Joseph Manning (Classics), Robert Siegel (Microbiology and Immunology)

Assistant Professors: David DeGusta (Anthropology), Oliver Fringer (Civil and Environmental Engineering), Sean A. Hanretta (History), Barbaro Martinez-Ruiz (Art History), Kathryn Miller (History), Jeremy Weinstein (Political Science)

Professor (Research): David Katzenstein (School of Medicine)

Assistant Professor (Clinical): Brian Blackburn (Infectious Diseases)

Senior Lecturers: Khalil Barhoum (African and Middle Eastern Languages), Susan Cashion (Dance)

Lecturers: Olubunmi Ashaolu (French, African and Middle Eastern Languages), Byron Bland (Stanford Center on Conflict and Negotiation), Jonathan Greenberg (Law), Sanghai Mohochi (African and Middle Eastern Languages), Timothy Stanton (Public Policy)

Consulting Professor: Joel Samoff (Center for African Studies)

Curators: Peter Duignan (Senior Fellow, emeritus, Hoover Institution), Karen Fung (African Collection Curator, Green Library), Thomas Seligman (Director, Cantor Arts Center, and Lecturer, Art and Art History)

Senior Research Fellows: Coit Blacker (Freeman Spogli Institute), Larry Diamond (Hoover Institution), Stephen Stedman (Freeman Spogli Institute, Center for International Security and Cooperation)

Senior Research Scholar: Helen Stacy (Freeman Spogli Institute)

Center Office: Encina Hall West, Room 209
Mail Code: 94305-6045
Phone: (650) 723-0295
Email: africanstudies@stanford.edu
Web Site: http://africanstudies.stanford.edu/

Courses given in African Studies have the subject code AFRICAST. For a complete list of subject codes, see Appendix.

The Center for African Studies coordinates an interdisciplinary program in African Studies for undergraduates and graduate students which seeks to enrich understanding of the interactions among the social, economic, cultural, historical, linguistic, genetic, geopolitical, ecological, and biomedical factors that shape and have shaped African societies. By arrangement with the Stanford/Berkeley Joint Center for African Studies, graduate students may incorporate courses from both institutions into their programs. Contact the center for information regarding courses offered at the University of California, Berkeley.

Courses in African Studies are offered by departments and programs throughout the University. Each year the committee sponsors a seminar to demonstrate to advanced undergraduates and graduate students how topics of current interest in African Studies are approached from different disciplinary perspectives.

Course offerings in African languages are also coordinated by the Center for African Studies. Along with regular courses in several levels of Swahili and Arabic, the committee arranges with the African and Middle Eastern Languages and Literatures Program in the Stanford Language Center to offer instruction in other African languages; in recent years, it has offered courses in Amharic, Bambara, Chichewa, Ewe, Fulani, Hausa, Igbo, Shona, Twi, Wolof, Xhosa, Yoruba, and Zulu.

The Center for African Studies offers a Master of Arts degree for graduate students. Undergraduates, and graduate students not pursuing the master's degree, can specialize in African Studies under the arrangements listed below.

UNDERGRADUATE PROGRAMS

Undergraduates may choose an African Studies focus from:

1. A major in a traditionally defined academic department (for example, Anthropology, History, Political Science). These departments afford ample opportunity to enroll in courses outside the major, leaving the student free to pursue the interdisciplinary study of Africa.
2. Interdepartmental majors, such as African and African American Studies or International Relations, which offer coordinated and comprehensive interdisciplinary course sequences, permitting a concentration in African Studies.
3. An individually designed major. Under the supervision of a faculty adviser and two other faculty members, the student can plan a program of study focused on Africa that draws courses from any department or school in the University. If approved by the Dean's Advisory Committee on Individually Designed Majors, the program becomes the curriculum for the B.A. degree.

MINOR

The Center for African Studies awards a minor in African Studies. Students majoring in any field qualify for this minor by meeting the following requirements:

1. A minimum of 25 units of Africa-related courses. Students may not double-count courses for completing major and minor requirements.
2. At least one quarter's exposure to a sub-Saharan African language. Africa is a linguistically heterogeneous region, and most Africans are multilingual. Learning an African language is an excellent way to learn about African cultures. The Center for African Studies and the Special Languages Program may arrange instruction in any of several languages spoken in West, East, Central, and Southern Africa.
3. One introductory course that deals with more than one region of Africa.
4. A minimum 25-page research paper, with a focus on Africa. This paper may be an extension of a previous paper written for an African Studies course.
5. Designate a focus of study, either disciplinary or regional, through a three-course concentration.

Upon completion of requirements, final certification of the minor is made by the Center for African Studies and appears on the student's transcript.

CERTIFICATE

Students may apply for a certificate in African Studies. Requirements for the certificate are the same as for the minor; however, students may double-count courses applied toward their major or graduate studies. The principal difference between the minor and the certificate is that the certificate does not appear on the transcript. For more information and an application, contact the center.

GRADUATE STUDY

For those who wish to specialize in Africa at the graduate level, African Studies can be designated a field of concentration within the master's and doctoral programs of some academic departments. Students in such departments as Anthropology, History, Political Science, and Sociology, and in the School of Education, may declare African Studies as the area of specialization for their master's and Ph.D. thesis work. Some other departments, programs, and institutes such as the International Comparative Education Program also permit students to specialize in African Studies. Stanford graduate students who are U.S. citizens or permanent residents may request an academic year application for a Foreign Language and Area Studies (FLAS) Fellowship. Students need not be enrolled at Stanford to apply for the summer fellowship. The deadline for both is mid-January. For more information or an application, contact the center.

MASTER OF ARTS

The one-year master's program in African Studies is designed for students who have experience working, living, or studying in Africa and little prior course work on the region.

The application deadline is January 8, 2008. Applicants submit an online application, including a 500-word statement of purpose, resume, 10-15 page double-spaced academic writing sample, three letters of recommendation, official transcripts, and Graduate Record Examination scores. TOEFL scores are required of applicants for whom English is not their first language or who did not attend an undergraduate institution where English is the language of instruction. To apply online and for information on graduate admissions, see http://gradadmissions.stanford.edu/.

DEGREE REQUIREMENTS

University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin. A description of the M.A. program is also available at http://ica.stanford.edu/afr/ma/.

The program requires completion of a minimum of 45 graduate units. Upon entering, each student is assigned a faculty adviser who works with the student to develop a customized program of study.

To receive the M.A. degree in African Studies, students must complete:

1. *Core courses* (15 units): students must complete the core African Studies M.A. course, AFRICAST 301, Dynamics of Change in Africa, in Winter Quarter. Students elect two additional graduate courses taught by African Studies academic council members and drawn from a list of approved courses. Students must also complete AFRICAST 302, Research Workshop, in Spring Quarter, in which they present and discuss their research and research interests.
2. *Cognate courses* (10 units): a minimum of 10 units of graduate-level credit in two cognate courses from the following thematic clusters not chosen as the student's concentration field: culture and society; health, well-being, and the environment; and political economy and security.
3. *Concentration field* (12-15 units): students choose one area of specialization (culture and society; health, well-being, and the environment; or political economy and security), and a group of three related elective courses for graduate credit from the cognate course listings or elsewhere in the Stanford curriculum in consultation with the student's adviser and with the approval of the CAS director. With approval, introductory courses may be substituted in fields such as advanced undergraduate biology for those interested in epidemic diseases or public health. The academic adviser, in agreement with faculty in the chosen field, guarantees that each set of courses forms part of a coherent program.
4. *Language Requirement:* students take one year of training in an African language, usually at least 3 units per quarter, resulting in intermediate-level proficiency as measured by American Council on the Teaching of Foreign Languages (ACTFL) or comparable language acquisition standards. Students who have advanced proficiency in an African language must fulfill this requirement by taking another European language spoken in Africa such as French or Portuguese, by taking another African language to the intermediate-level, or by taking a year-long sequence in Arabic. Students with competency in one or more African languages and one or more other languages widely spoken in Africa, may substitute a program of methodological training including, for example, a sequence of courses in statistics or GIS survey techniques.
5. *Seminar Requirement:* students enroll each quarter in AFRICAST 300, Contemporary Issues in African Studies, 1 unit, in which guest scholars present lectures on African themes and topics.
6. *Thesis Option:* students may elect to write a master's thesis; they may register for up to 10 units of thesis research under the guidance of an Academic Council member. Thesis units may be counted toward the electives within the concentration field unit requirements.
7. *Grade Requirements:* courses to be counted toward the degree, except for AFRICAST 300, must be taken for a letter grade and receive a grade of 'B' or higher.

FINANCIAL AID

The Center for African Studies offers a limited number of Foreign Language and Area Studies (FLAS) fellowships to U.S. citizens and permanent residents who undertake full-time study of an African language.

COURSES

AFRICAST 111/211. Education for All? The Global and Local in Public Policy Making in Africa—(Graduate students register for 211.) Policy making in Africa and the intersection of policy processes and their political and economic dimensions. The failure to implement agreements by international institutions, national governments, and nongovernmental organizations to promote education. Case studies of crowded and poorly equipped schools, overburdened and underprepared teachers, and underfunded education systems.

5 units, Spr (Samoff, J)

AFRICAST 199. Independent Study or Directed Reading—May be repeated for credit.

1-5 units, Aut, Win, Spr (Staff)

AFRICAST 200. The HIV/AIDS Epidemic in Tanzania: A Pre-Field Seminar—Goal is to prepare students for an HIV/AIDS prevention, service-learning experience in Tanzania. Topics include: history of HIV/AIDS epidemic globally and in Tanzania; social and economic impact of AIDS; national and societal responses; ethical issues in crosscultural service learning; teaching for prevention; biology of HIV transmission, disease progression, and prevention; introduction to Tanzanian history and politics; HIV/AIDS and development; social, cultural, and economic context of HIV risk; and strategies for HIV prevention in Tanzania.

1 unit, Spr (Hoagland, S)

AFRICAST 212. AIDS, Literacy, and Land: International Aid and the Problems of Development in Africa—Public policy issues, their roots, and the conflicts they engender. The policy making process: who participates, how, why, and with what results? Innovative approaches to contested policy issues. Foreign roles and their consequences. Case studies such as: a clinic in Uganda that addresses AIDS as a family and community problem; and strategies in Tanzania to increase girls' schooling.

5 units, Win (Samoff, J), not given this year

AFRICAST 299. Independent Study or Directed Reading

1 unit, Aut, Win, Spr (Staff)

AFRICAST 300. Contemporary Issues in African Studies—Guest scholars present analyses of major African themes and topics. Brief response papers required. May be repeated for credit.

1 unit, Aut, Win, Spr (Rapp, K)

AFRICAST 301. Dynamics of Change in Africa—For graduate students and advanced undergraduates. The transformed African policy landscape, including the African Union, truth and reconciliation commissions, poverty reduction strategy papers, HIV and AIDS, debt burdens, open and private universities, war crimes tribunals, multinational peacekeeping forces, democratization, and decentralization. Methods, alternative voices, and case studies.

5 units, Win (Samoff, J)

AFRICAST 302. Research Workshop—Required for African Studies master's students. Student presentations.

1 unit, Spr (Weinstein, J)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

For courses in African and Middle Eastern language instruction with the subject code AMELANG, see the "Language Center" section of this bulletin.

AFRICAAM 101. African American Lecture Series
1-3 units, Aut, Win, Spr (Grant, V)

AFRICAAM 105. Introduction to African and African American Studies—(Same as SOC 147B/247B.)
5 units, Spr (Staff)

ARTHIST 192/392. Introduction to African Art
4 units, Win (Martinez-Ruiz, B)

ARTHIST 290. Mapping Africa: Cartography and Architecture
5 units, Win (Martinez-Ruiz, B)

CASA 158/258. Sex, Death, and the Body in Ancient Egypt
5 units, Win (Meskell, L)

CASA 180/280. Ethnography of Africa
5 units, Aut (Hubbard, L)

CLASSHIS 105. History and Culture of Ancient Egypt
4-5 units, Spr (Manning, J)

COMPLIT 127. Postcolonial *Bildungsroman*
3-5 units, Aut (Tanoukhi, N)

CSRE 131A. Race and Reconciliation in Post-Apartheid Literature
5 units, Win (Staff)

DANCE 43. Afro-Peruvian and Afro-Brazilian Dance
1 unit, Win (Cashion, S)

DANCE 106. Essence of Contemporary Dance Performance: African Styles on Stage
2 units, Spr (Hayes, A)

ECON 118. Development Economics
5 units, Aut (Jayachandran, S)

EDUC 202. Introduction to Comparative and International Education
4-5 units, Aut (Staff)

EDUC 306A. Education and Economic Development
5 units, Aut (Carnoy, M)

FRENLIT 133. Literature and Society in Africa and the Caribbean—(Same as COMPLIT 141.)
4 units, Spr (Boyi, E)

FRENLIT 248. Literature, History, and Representation—(Same as COMPLIT 250.)
3-5 units, Spr (Boyi, E)

HISTORY 47S. Health and Healing in Sub-Saharan Africa
5 units, Spr (Powers, J)

HISTORY 48Q. South Africa: Contested Transitions
3 units, Win (Samoff, J)

HISTORY 106A. Global Human Geography: Asia and Africa—(Same as INTNLREL 161A.)
5 units, Aut (Lewis, M)

HISTORY 145B. Africa in the 20th Century
5 units, Win (Hanretta, S)

HISTORY 149C. Slavery and the Slave Trade
5 units, Spr (Klein, M)

HISTORY 246S/446A. Research Seminar: African Nationalism and Beyond
4-5 units, Win (Hanretta, S)

HISTORY 248/348. Islam in Africa
4-5 units, Spr (Hanretta, S)

HISTORY 299X/399A. Design and Methodology for International Field Research
1 unit, Spr (Kollmann, N; Roberts, R)

HISTORY 305. Graduate Workshop in Teaching
1 unit, Spr (Kollmann, N; Roberts, R)

HISTORY 345C. Graduate Core Colloquiun: Sub-Saharan Africa
4-5 units, Spr (Klein, M)

HUMBIO 129. Critical Issues in International Women's Health
4 units, Win (Murray, A)

HUMBIO 153. Parasites and Pestilence: Infectious Public Health Challenges
4 units, Spr (Smith, D)

HUMBIO 156. Global HIV/AIDS
3 units, Aut (Katzenstein, D)

MED 243. Biomedical and Social Science Responses to the HIV/AIDS Epidemic
3 units, Spr (Katzenstein, D)

POLISCI 43N. Oil, Regime Change, and Conflict
5 units, Aut (Karl, T)

POLISCI 143. Nongovernmental Organizations and Development in Poor Countries—(Same as INTNLREL 143.)
5 units, Win (Abernethy, D)

POLISCI 146S. Civil War and Violence in Africa
5 units, Win (Johnston, P)

POLISCI 147. Comparative Democratic Development
5 units, Win (Diamond, L)

POLISCI 215. Explaining Ethnic Violence
5 units, Aut (Fearon, J)

POLISCI 243R. Research Seminar in Democratization and Human Rights
5 units, Aut (Karl, T)

OVERSEAS STUDIES

Course descriptions are in the "Overseas Studies" section of this bulletin, at the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu.

OXFORD

OSPOXFRD 84. African Art and Writing Traditions
5 units, Spr (Martinez-Ruiz, B)

OSPOXFRD 85. African Art and Museum Display
5 units, Spr (Martinez-Ruiz, B)

PARIS

OSPPARIS 22. Immigration in France
4-5 units, Aut (Strudel, S)

OSPPARIS 186F. Contemporary African Literature in French
4 units, Aut (Rullier, F)

CAPE TOWN

OSPGEN 21. Public Health and Primary Health Care in a Changing Community Context
4 units, Spr (Stanton, T)

OSPGEN 22. Community Reconstruction and Development in Post-Apartheid South Africa
4 units, Spr (Stanton, T)

OSPGEN 23. History and Politics of South Africa in Transition
4 units, Spr (Simons, M)

AMERICAN STUDIES

Director: Shelley Fisher Fishkin
Program Coordinator: Richard Gillam
Administrative Committee: Barton J. Bernstein (History), David Brady (Political Science), Scott Bukatman (Art and Art History, on leave Winter, Spring), Gordon H. Chang (History), Michele B. Elam (English), Estelle Freedman (History), Nicholas Jenkins (English), Gavin Jones (English), Doug McAdam (Sociology), Hilton Obenzinger (English), David Palumbo-Liu (Comparative Literature, on leave), Jack Rakove (History), Arnold Rampersad (English), Rob Reich (Political Science), Judith Richardson (English), Ramón Saldívar (English, Comparative Literature), Stephen Sohn (English), Fred Turner (Communication, on leave), Barry Weingast (Political Science), Caroline Winterer (History), Bryan Wolf (Art and Art History), Gavin Wright (Economics)

Program Offices: Building 240
Mail Code: 94305-2152
Phone: (650) 723-3413
Email: idstudies.moore@stanford.edu
Web Site: http://www.stanford.edu/group/HSP/AmStud/

Courses given in American Studies have the subject code AMSTUD. For a complete list of subject codes, see Appendix.

The American Studies program is administered through the office of Interdisciplinary Studies in Humanities.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

American Studies is an interdisciplinary undergraduate major that seeks to convey a broad understanding of American culture and society. Building on a foundation of courses in history and institutions, literature and the arts, and race and ethnicity, students bring a range of disciplines to bear on their efforts to analyze and interpret America's past and present, forging fresh and creative syntheses along the way.

The core requirements illustrate how different disciplines approach the study and interpretation of American life and include three courses in each of two main areas: history and institutions; and literature, art, and culture. The required gateway seminar, AMSTUD 160, Perspectives on American Identity, explores the tensions between commonality and difference from a variety of disciplinary perspectives.

Beyond the core requirements of the major, American Studies expects students to define and pursue their own interests in interpreting important dimensions of American life. Accordingly, each student designs a thematic concentration of at least five courses drawn from fields such as history, literature, art, communication, theater, political science, African American studies, feminist studies, economics, anthropology, religious studies, Chicana/o studies, law, sociology, education, Native American studies, music, and film. At least one of the five courses in a student's thematic concentration should be a small group seminar or a colloquium. With program approval, students may conclude the major with a capstone honors research project during their senior year.

Whether defined broadly or narrowly, the thematic focus or concentration should examine its subject from the vantage of multiple disciplines. Examples of concentrations include: race and the law in America; gender in American culture and society; technology in American life and thought; health policy in America; art and culture in 19th-century America; education in America: nature and the environment in American culture; politics and the media; religion in American life; borders and boundaries in American culture; the artist in American society, and civil rights in America.

Completion of the major thus normally requires 13 courses (totaling at least 60 units), all of which must be taken for a letter grade.

The course requirements for the American Studies major are:

1. *History and Institutions*—American Studies majors are required to complete three foundation courses in American History and Institutions. Specific requirements are:

    HISTORY 150A, Colonial and Revolutionary America
    HISTORY 150B, 19th-Century America

    The third course may be chosen from one of the following:

    AMSTUD 179, Introduction to American Law
    ECON 116, American Economic History
    HISTORY 150C, The United States in the 20th Century
    HISTORY 154, 19th-Century U.S. Cultural and Intellectual History 1790-1860
    HISTORY 158, The United States since 1945
    HISTORY 161, U.S. Women's History, 1890s-1990s
    POLISCI 2, American National Government and Politics

2. *Literature, Art, and Culture*—Majors must take three gateway courses that, together, cover the broad range of the American experience. Specific requirements are:

    a) at least one course focusing on the period before the Civil War, normally AMSTUD 150, American Literature and Culture to 1855
    b) two additional courses, including at least one from Art or Drama. Choices include but are not limited to:

        AMSTUD 138C, *Huckleberry Finn* and American Culture
        ARTHIST 132, American Art and Culture, 1528-1860 (not given 2007-08)
        ARTHIST 153A, American Art, 1900-1945
        ARTHIST 159A, Photography in America
        ARTHIST 178, Ethnicity and Dissent in United States Art and Literature (not given 2007-08)
        ARTHIST 235A, Art and the Machine Age
        DRAMA 163, Performance and America (not given 2007-08)
        ENGLISH 121, Masterpieces of American Literature
        ENGLISH 143, Introduction to African American Literature
        ENGLISH 143C, Engaging the Enemy Within: An Introduction to Asian American Literature
        ENGLISH 146C, Hemingway, Hurston, Faulkner, and Fitzgerald
        ENGLISH 152G, Harlem Renaissance (not given 2007-08)
        ENGLISH 172E, Literature of the Americas
        ENGLISH 186A, American Hauntings.

3. *Comparative Race and Ethnicity*—Majors are required to take one course in Comparative Studies of Race and Ethnicity (CSRE) that focuses on comparative studies rather than a single racial or ethnic group (5 units). Courses that satisfy this requirement include:

    AMSTUD 114N, Visions of the 1960s
    AMSTUD 214, The American 1960s: Thought, Protest, and Culture
    CASA 88, Theories of Race and Ethnicity
    COMPLIT 148, Introduction to Asian American Cultures (not given 2007-08)
    COMPLIT 241, Comparative Fictions of Ethnicity (not given 2007-08)
    CSRE 196C, Introduction to Comparative Studies in Race and Ethnicity
    HISTORY 64, Introduction to Race and Ethnicity in the American Experience (not given 2007-08)
    SOC 138/238, American Indians in Comparative Historical Perspective
    SOC 144, Race and Crime (not given 2007-08)
    SOC 148, Racial Identity (not given 2007-08)
    SOC 149, The Urban Underclass

    If a CSRE course is appropriate for a student's thematic focus, the course may be used to satisfy both this requirement and, in part, the unit requirement for the focus.

4. *Gateway Seminar*—Majors are required to take AMSTUD 160, Perspectives on American Identity (5 units), which is the Writing in the Major (WIM) course for American Studies.

5. *Thematic Concentration and Capstone Seminar*—Students must design a thematic concentration of at least 5 courses. The courses, taken together, must give the student in-depth knowledge and understanding of a coherent topic in American cultures, history, and institutions. With the help of faculty advisers, students are required to design their own thematic concentrations, preferably by the end of registration period, Autumn quarter of the junior year. Sample thematic concentrations and courses that allow a student to explore them are available in the American Studies Office in Building 240.

   At least one of these courses must be a capstone seminar or other group discussion course in the thematic concentration that requires a research paper. The American Studies Program office has a list of courses that satisfy the seminar requirement, but students are encouraged to propose others that fit better with their concentration area. An independent study course with a faculty member culminating in a research paper or an honors project may also fulfill this requirement, with the Director's approval.

MINORS

To earn a minor in American Studies, students must complete at least 28 units of course work in the program. Because students may not count courses for both a major and a minor, the specific courses that are used for an American Studies minor depend on the courses that are used to satisfy the major requirement.

A student must take the following:

1. at least 2 courses from category 1 (History and Institutions)
2. at least 2 courses from category 2 (Literature, Art, and Culture)
3. at least 1 course from category 3 (CSRE)
4. AMSTUD 160.

Courses used to satisfy these requirements must be taken for a letter grade.

HONORS PROGRAM

To graduate with honors, American Studies majors must complete a senior thesis and have an overall grade point average of 3.5 in the major, or demonstrated academic competence. Students must apply to enter the honors program no later than the end of registration period in the Autumn Quarter of their senior year, and must enroll in 10-15 units of AMSTUD 250, Senior Research, during the senior year. These units are in addition to the units required for the major. The application to enter the program must contain a one-page statement of the topic of the senior thesis, and must be signed by at least one faculty member who agrees to be the student's honors adviser. (Students may have two honors advisers.) The thesis must be submitted for evaluation and possible revision to the adviser no later than four weeks before graduation.

Students are encouraged to choose an honors topic and adviser during the junior year. To assist students in this task, American Studies offers a pre-honors seminar in which students learn research skills, develop honors topics, and complete honors proposals. Students also may enroll in the American Studies Honors College during September before the senior year. American Studies also provides students the opportunity to work as paid research assistants for faculty members during the summer between their junior and senior year, which includes participation in a research seminar. More information about American Studies honors is available from the program office.

COURSES

See departmental listings for complete descriptions and University General Education Requirements (GER) notations. Some courses may require prerequisites that do not apply toward the major. See the *Time Schedule* and Axess each quarter for changes in listings. An up-to-date list is also available in the program office.

AMERICAN STUDIES

AMSTUD 68N. Mark Twain and American Culture—(Same as ENGLISH 68N.) Stanford Introductory Seminar. Preference to freshmen. Mark Twain defined the rhythms of American prose, the contours of its moral map, and its promise, failures, foibles, and flaws. Focus is on how his work provides a window on his time and speaks to the present. Sources include his travel books, journalism, short stories, and novels. GER:DB-Hum
4 units, not given this year

AMSTUD 101. American Fiction into Film: How Hollywood Scripts and Projects Black and White Relations—Movies and the fiction that inspires them; power dynamics behind production including historical events, artistic vision, politics, and racial stereotypes. What images of black and white does Hollywood produce to forge a national identity? How do films promote equality between the races? What is lost or gained in film adaptations of books? GER:EC-AmerCul
3-5 units, Win (Mesa, C)

AMSTUD 114N. Visions of the 1960s—Stanford Introductory Seminar. Preference to sophomores. Introduction to the ideas, sensibility, and, to a lesser degree, the politics of the American 60s. Topics: the early 60s vision of a beloved community; varieties of racial, generational, and feminist dissent; the meaning of the counterculture; and current interpretive perspectives on the 60s. Film, music, and articles and books. GER:DB-Hum, EC-AmerCul
5 units, Aut (Gillam, R)

AMSTUD 138C. *Huckleberry Finn* and American Culture—(Same as ENGLISH 138C.) From publication to the present, Mark Twain's *Adventures of Huckleberry Finn* has generated widespread disagreement over what it is, what it does, and why it should be valued. The literature, history, and popular culture that shaped the novel, and that it helped shape. Topics include vernacular traditions in American literature, the history of racism in American society, and the role of African American voices in shaping the text. GER:DB-Hum, EC-AmerCul
5 units, Win (Fishkin, S)

AMSTUD 150. American Literature and Culture to 1855—(Same as ENGLISH 123.) Sources include histories, poetry, autobiography, captivity and slave narratives, drama, and fiction. Authors include Mather, Bradstreet, Rowlandson, Franklin, Brockden Brown, Emerson, Douglass, Hawthorne, and Melville. GER:DB-Hum, EC-AmerCul
5 units, Spr (Richardson, J)

AMSTUD 160. Perspectives on American Identity—Required for American Studies majors. Changing interpretations of American identity and Americanness. WIM. GER:DB-Hum, EC-AmerCul
5 units, Win, Spr (Gillam, R)

AMSTUD 179. Introduction to American Law—(Same as LAW 106, POLISCI 122.) For undergraduates. The structure of the American legal system including the courts; American legal culture; the legal profession and its social role; the scope and reach of the legal system; the background and impact of legal regulation; criminal justice; civil rights and civil liberties; and the relationship between the American legal system and American society in general. GER:DB-SocSci
3-5 units, Aut (Friedman, L)

AMSTUD 183. Border Crossings and American Identities—(Same as CASA 183.) How novelists, filmmakers, and poets perceive racial, ethnic, gender, sexual preference, and class borders in the context of a national discussion about the place of Americans in the world. How Anna Deavere Smith, Sherman Alexie, or Michael Moore consider redrawing such lines so that center and margin, or self and other, do not remain fixed and divided.

How linguistic borderlines within multilingual literature by Caribbean, Arab, and Asian Americans function. Can Anzaldúa's conception of borderlands be constructed through the matrix of language, dreams, music, and cultural memories in these American narratives? Course includes examining one's own identity. GER:DB-Hum, EC-AmerCul
5 units, Aut (Duffey, C)

AMSTUD 185. American Studies Internship—Restricted to declared majors. Practical experience working in a field related to American Studies for six to ten weeks. Students make internship arrangements with a company or agency, under the guidance of a sponsoring faculty member, and with the consent of the director or a program coordinator of American Studies. Required paper focused on a topic related to the internship and the student's studies. May be repeated for credit.
1-3 units, Aut (Staff), Win (Fishkin, S), Spr, Sum (Staff)

AMSTUD 195. Individual Work
1-5 units, Aut, Win, Spr, Sum (Staff)

AMSTUD 203A. Children in American History—Children as a subject of historical inquiry. The experience of children, ideas about childhood, and policies and institutions for children from the late 18th century to the present. How were children perceived and cared for within families, and what was growing up like for children? Variations in childhood experience based on class, race, ethnicity, gender, and geographic location. Discourses on the nature of childhood developed by experts and society. How society defined its responsibility to children, and how it treated those dependent on public care or defined as social problems. GER:DB-SocSci
5 units, Spr (Horn, M)

AMSTUD 214. The American 1960s: Thought, Protest, and Culture—The meaning of the American 60s emphasizing ideas, culture, protest, and the new sensibility that emerged. Topics: black protest, the new left, the counterculture, feminism, the new literature and journalism of the 60s, the role of the media in shaping dissent, and the legacy of 60s protest. Interpretive materials from film, music, articles, and books. GER:DB-Hum, EC-AmerCul
5 units, Aut (Gillam, R)

AMSTUD 240. Pre-Honors Seminar—Methods, interpretations, and issues pertinent to honors work in American Studies. Open to juniors interested in honors.
2-5 units, Win (Gillam, R)

AMSTUD 250. Senior Research—Research and writing of senior honors thesis under the supervision of a faculty member. The final grade for the thesis is assigned by the chair based on the evaluations of the primary thesis adviser and a second reader appointed by the program. Prerequisite: consent of chair.
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ARTHIST 142/342. Varieties of Modern Architecture
4 units, Win (Beischer, T)

ARTHIST 153A/353A. American Art, 1900-1945
4 units, Spr (Marshall, J)

ARTHIST 159A/359A. Photography in America
4 units, Win (Marshall, J)

ARTHIST 235A. Art and the Machine Age
5 units, Aut (Marshall, J)

CASA 82/282. Medical Anthropology
4-5 units, Win (Kohrman, M)

CASA 88. Theories in Race and Ethnicity
5 units, Aut (Yanagisako, S)

CASA 174. Cultures of Disease: Cancer
5 units, Win (Jain, S)

COMM 1A/211. Media Technologies, People, and Society
4-5 units, Aut (Nass, C)

COMM 116/216. Journalism Law
4-5 units, Aut (Wheaton, J)

COMM 117/217. Digital Journalism
4-5 units, Win (Rheingold, H)

COMM 125/225. Perspectives on American Journalism
4-5 units, Aut (Glasser, T)

COMM 131/231. Media Ethics and Responsibilities
4-5 units, Win (Glasser, T)

COMM 136/236. Democracy and the Communication of Consent—(Same as POLISCI 134.)
4-5 units, Aut (Fishkin, J)

COMM 148/248. Hip Hop and Don't Stop: Introduction to Modern Speech Communities
4-5 units, Win (Morgan, M)

COMM 160/260. The Press and the Political Process
4-5 units, Win (Iyengar, S)

COMM 162/262. Analysis of Presidential Campaigns
4-5 units, Spr (Iyengar, S)

COMPLIT 142. The Literature of the Americas—(Same as ENGLISH 172E.)
5 units, Aut (Greene, R; Saldívar, R)

DRAMA 110. Identity, Diversity, and Aesthetics: The Institute for Diversity in the Arts
5 units, Win (Elam, H)

DRAMA 180Q. Noam Chomsky: The Drama of Resistance
3 units, Spr (Rehm, R)

ECON 116. American Economic History
5 units, Spr (Wright, G)

ECON 158. Antitrust and Regulation
5 units, Spr (Steiner, F)

EDUC 102. Culture, Class, and Educational Opportunity
2 units, Spr (Staff)

EDUC 112X/212X. Urban Education
3-4 units, Win (Staff)

EDUC 115Q. Identities, Race, and Culture in Urban Schools
3 units, Spr (Nasir, N)

EDUC 177/277. Education of Immigrant Students: Psychological Perspectives
4 units, Win (Padilla, A)

EDUC 201. History of Education in the United States—(Same as HISTORY 158B.)
3-4 units, Spr (Staff)

ENGLISH 21/121. Masterpieces of American Literature: American Nomads from the Frontier to Cyberspace
3-5 units, Aut (Heise, U)

ENGLISH 43/143. Introduction to African American Literature
3-5 units, Aut (Elam, M)

ENGLISH 43A/143A. American Indian Mythology, Legend and Lore
3-5 units, Win (Fields, K)

ENGLISH 43B/143B. Introduction to Chicana/o Literature and Culture
3-5 units, Aut (Moya, P)

ENGLISH 43C/143C. Introduction to Asian American Literature
3-5 units, Aut (Sohn, S)

ENGLISH 45F/145F. American Detective Fiction: From Low Art to High Culture
5 units, Aut (Moser, J)

ENGLISH 55N. American Sports, American Lives
3 units, Win (Rampersad, A)

ENGLISH 146C. Hemingway, Hurston, Faulkner, and Fitzgerald
5 units, Aut (Jones, G)

ENGLISH 152E. The African American Novel, 1940-present
5 units, Spr (Ngai, S)

ENGLISH 172B. Introduction to Feminist Studies—(Same as FEMST 101.)
5 units, Aut (Elam, M)

ENGLISH 172G. Great Works of the African American Literary Tradition
5 units, Spr (Rampersad, A)

ENGLISH 186A. American Hauntings
5 units, Win (Richardson, J)

ENGLISH 259. Experimental Writing by Contemporary Women Poets
5 units, Spr (Bruns, G)

ENGLISH 262A. Studies in American Biography
5 units, Spr (Rampersad, A)

HISTORY 51N. The American Enlightenment
5 units, Win (Winterer, C)

HISTORY 62N. The Atomic Bomb in Policy and History
5 units, Spr (Bernstein, B)

HISTORY 59. Introduction to Asian American History
5 units, Aut (Chang, G)

HISTORY 150A. Colonial and Revolutionary America
5 units, Aut (Rakove, J)

HISTORY 150B. 19th-Century America
5 units, Win (White, R)

HISTORY 150C. The United States in the Twentieth Century
5 units, Spr (Camarillo, A; Chang, G)

HISTORY 154. 19th-Century U.S. Cultural and Intellectual History, 1790-1860
5 units, Spr (Winterer, C)

HISTORY 158. The United States Since 1945
4-5 units, Win (Bernstein, B)

HISTORY 161. U.S. Women's History, 1890s-1990s
5 units, Spr (Freedman, E)

HISTORY 163. North American Wests
5 units, Aut (White, R)

HISTORY 166. Introduction to African American History: The Modern African American Freedom Struggle
4-5 units, Aut (Carson, C)

HISTORY 251/352. Creating the American Republic
5 units, Win (Rakove, J)

HISTORY 252/355. Decision Making in International Crises: The A-Bomb, the Korean War, and the Cuban Missile Crisis
4-5 units, Aut (Bernstein, B)

HISTORY 254. Popular Culture and American Nature
5 units, Spr (White, R)

HISTORY 255. Martin Luther King, Jr.: The Social Gospel and the Struggle for Justice
5 units, Spr (Staff)

HISTORY 255A/355A. America in Western Civilization
4-5 units, Aut (Kennedy, D; Sheehan, J)

HISTORY 256/356. U.S.-China Relations: From the Opium War to Tiananmen
4-5 units, Win (Chang, G)

HISTORY 260. California's Minority-Majority Cities
5 units, Spr (McKibben, C)

HUMBIO 120A. American Health Policy
3 units, Spr (Heller, G)

HUMBIO 171. The Death Penalty: Human Biology, Law, and Policy
3 units, Spr (Abrams, W)

HUMBIO 172B. Children, Youth, and the Law
5 units, Win (Abrams, W), alternate years, not given next year

LINGUIST 65/265. African American Vernacular English
3-5 units, Spr (Rickford, J)

LINGUIST 150. Language in Society
4 units, Win (Rickford, J)

MUSIC 17Q. Perspectives in North American Taiko
4 units, Spr (Sano, S)

MUSIC 18A. Jazz History: Ragtime to Bebop, 1900-1940
3 units, Win (Berry, F)

MUSIC 18B. Jazz History: Bebop to Present, 1940-Present
3 units, Spr (Berry, F)

PHIL 78. Medical Ethics—(Same as ETHICSOC 78.)
4 units, Win (Jaworska, A)

PHIL 177. Philosophical Issues Concerning Race and Racism—(Same as POLISCI 136.)
4 units, Win (Satz, D)

POLISCI 2. Introduction to American National Government and Politics
5 units, Win (Fiorina, M; Frisby, T)

POLISCI 120B. Parties, Interest Groups, the Media, and Elections
5 units, Win (Staff)

POLISCI 120C. American Political Institutions: Congress, the Executive Branch, and the Courts
5 units, Spr (Rutten, A)

POLISCI 121. Urban Politics—(Same as SOC 149X/249X, URBANST 111.)
5 units, Aut (Bischoff, K)

POLISCI 123. Politics and Public Policy
5 units, Aut (Sprague, M)

POLISCI 124R. Judicial Politics and Constitutional Law: The Federal System
5 units, Aut (Rutten, A)

POLISCI 124S. Judicial Politics and Constitutional Law: Civil Liberties
5 units, Win (Rutten, A)

POLISCI 133. Ethics and Politics of Public Service—(Same as ETHICSOC 133.)
5 units, Aut (Reich, R)

POLISCI 148S. The U.S. and Asia During the Cold War
5 units, Win (Miller, L)

POLISCI 151A. Doing Political Science
5 units, Win (Staff)

POLISCI 221. Tolerance and Democracy
5 units, Spr (Sniderman, P)

POLISCI 221E. Seminar on Race in Institutional Contexts
5 units, Spr (Barker, L)

POLISCI 221F. Race and American Politics
5 units, Aut (Sniderman, P)

POLISCI 222R. Tolerance and Prejudice
5 units, Win (Sniderman, P; Callan, E)

POLISCI 223S. The Imperial Temptation: U.S. Foreign Policy in a Unipolar World
5 units, Aut (Joffe, J)

POLISCI 236. Theories of Civil Society, Philanthropy, and the Nonprofit Sector
5 units, Spr (Reich, R; Sievers, B)

PUBLPOL 194. Technology Policy
5 units, Win (Windham, P)

SLAVGEN 150/250. Countercultures in Conversation: Russian and American Rock Music and Protest Poetry
3-4 Units, Spr (Fleishman, K)

SOC 46N. Race, Ethnic, and National Identities: Imagined Communities
3 units, Spr (Rosenfeld, M)

SOC 138/238. American Indians in Comparative Historical Perspective
5 units, Win (Snipp, C)

SOC 139/239. American Indians in Contemporary Society
5 units, Spr (Snipp, C)

SOC 142/242. Sociology of Gender
3-5 units, Win (Ridgeway, C)

SOC 149/249. The Urban Underclass—(Same as URBANST 112.)
5 units, Aut (Rosenfeld, M)

SOC 155/255. The Changing American Family
5 units, Spr (Rosenfeld, M)

STS 101/201. Science, Technology, and Contemporary Society—(Same as ENGR 130.)
4-5 units, Aut (McGinn, R)

STS 110. Ethics and Public Policy—(Same as MS&E 197, PUBLPOL 103B.)
5 units, Win (McGinn, R)

URBANST 164. Utopia and Reality in Modern Urban Planning—(Same as ARTHIST 254.)
5 units, Spr (Stout, F; Turner, P)

ANTHROPOLOGY

Emeriti: (Professors) Clifford R. Barnett,* Harumi Befu,* George A. Collier, Jane F. Collier, Carol Delaney, Charles O. Frake, James L. Gibbs, Jr., Renato I. Rosaldo, G. William Skinner, George D. Spindler, Robert B. Textor
Chair: James Ferguson
Professors: William H. Durham, James Ferguson, Ian Hodder, Richard G. Klein, Tanya Luhrmann (on leave), Lynn Meskell, Sylvia J. Yanagisako
Associate Professors: Paulla Ebron, James A. Fox, Miyako Inoue, Liisa Malkki (on leave), John W. Rick (on leave)
Assistant Professors: Rebecca Bliege Bird, Melissa J. Brown, David DeGusta, James Holland Jones, Sarah S. Jain, Matthew Kohrman, Ian G. Robertson, Barbara Voss, Michael V. Wilcox
Assistant Professor (Research): Douglas W. Bird
Courtesy Professors: Penelope Eckert, Raymond McDermott
Visiting Assistant Professor: Ewa Domanska, Mark Maguire
Lecturers: Amy Burce, Daniel A. Contreras, Keila Diehl, Carolyn Duffey, Claudia Engel, Matthew J. Jobin, Cari Kapur, Eliane Karp de Toledo, Alma Kunanbaeva, Karen Levy, Merritt Ruhlen, Sadie Jane Ryan, James Truncer
Consulting Associate Professor: Dominique Irvine
Consulting Assistant Professor: Joanna Mountain
Affiliated Faculty: Carol Boggs, J. Gordon Brotherston, Susan Cashion, John Dolph, Jean-Pierre Dupuy, Marcus W. Feldman, John A. Gosling, Ellen McLarney, Robert Sapolsky, Jeffrey T. Schnapp, Bernardo Subercaseaux
Teaching Affiliates: Aisha Beliso De-Jesus, Chiara De Cesari, Tiffany Romain, Angel Roque, Sima Shakhsari, Mukta Sharangpani

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Web Site: http://anthropology.stanford.edu

Courses given in Anthropology have the subject code ANTHSCI or CASA. For a complete list of subject codes, see Appendix.

The departments of Anthropological Sciences and Cultural and Social Anthropology have merged to form one department, the Department of Anthropology.

Anthropology is devoted to the study of human beings and human societies as they exist across time and space. It is distinct from other social sciences in that it gives central attention to the full time span of human history, and to the full range of human societies and cultures, including those located in historically marginalized parts of the world. It is therefore especially attuned to questions of social, cultural, and biological diversity, to issues of power, identity, and inequality, and to the understanding of dynamic processes of social, historical, ecological, and biological change over time. Education in anthropology provides excellent preparation for living in a multicultural and globally-interconnected world, and helps to equip students for careers in fields including law, medicine, business, public service, research, and ecological sustainability and resource management. Students may pursue degrees in anthropology at the bachelor's, master's, and doctoral levels.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Students who declared a major in Anthropological Sciences or in Cultural and Social Anthropology prior to the academic year 2007-08 should consult the *Stanford Bulletin 2006-07* for degree requirements. Such students may continue in their degree program under these requirements, or they may elect to transfer to the new rules outlined below for the Bachelor of Arts in Anthropology.

In 2007-08, students may elect to declare a major in either Anthropology or Anthropological Sciences. Those who declare the major in Anthro-

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* Recalled to active duty.

pology may follow either the Anthropology track (formerly Cultural and Social Anthropology) or the Anthropological Sciences track listed below. Those who declare the major in Anthropological Sciences must follow the Anthropological Sciences track listed below.

ANTHROPOLOGY

Students may declare a major in Anthropology and earn the degree by following these requirements. The department also offers an honors program in Anthropology.

This program provides students with expertise for understanding social and cultural transformations from an international and crosscultural perspective. In addition to gaining an excellent foundation for graduate research and study, students majoring in Anthropology can pursue careers in government, international business, international development agencies, international education, law, mass media, non-profit organizations, and public policy.

Students may include course offerings in other departments such as Classics, Economics, English, History, Political Science, Psychology, and Sociology, as well as course offerings in programs such as African Studies, American Studies, Archaeology, Comparative Studies in Race and Ethnicity, East Asian Studies, Feminist Studies, Latin American Studies, Public Policy, and Urban Studies.

To declare a major in Anthropology, students should contact the department's student peer adviser or student program coordinator. The department checklist for the major can be downloaded in pdf format from http://anthropology.stanford.edu/. Submit the checklist to the student program coordinator and apply for the major in Axess. The checklist must be approved by the faculty chair of the committee on undergraduate degrees. Requirements for the major include:

1. A faculty adviser in Anthropology.
2. A program of 65 units, with at least 40 units of courses with the subject code CASA. The remaining 25 units may be taken from courses in related departments or transferred from other anthropological study programs, such as overseas programs. The 65 units must form a coherent program of study and be approved by the student's faculty adviser.
3. A grade of 'B-' or better in CASA 90, Theory in Cultural and Social Anthropology. This course is required of majors and should be taken within a year of declaring the major or before the end of the junior year. It introduces students to anthropological theory and prepares them for upper-division courses in the department.
4. The 40 units of courses with the subject code CASA required for the major must include at least one course from four of the six topical categories listed below:
    a) Archaeology
    b) Gender and Feminism
    c) Globalization and Transnationalism
    d) Linguistic and Symbolic Anthropology
    e) Race and Ethnicity
    f) Science, Technology, or Medicine
5. Students must choose a concentration, taking at least 15 units in three or more courses on one theme or topic. Concentrations may be defined by subject matter or cultural area. Some examples of themes for a concentration are: cultural studies, economic development, kinship, mass media, material culture, migration and immigration, political economy, popular culture, race and ethnicity, religion, urban cultures, or a particular culture area such as Japan, Europe, or South Asia. A student's area of concentration must be approved by the major adviser.
6. A minimum of 15 units must be in CASA seminars numbered 100 or above.
7. Competence in a foreign language beyond the first-year level. Such competence is usually demonstrated by completing a 5 unit course at the second-year level with a grade of 'B-' or better. The requirement may be met by special examination administered through the Language Center.
8. 10 units from IHUM 27A,B, Encounters and Identities, may be counted towards the major. Students whose programs require non-English language study as part of a geographical or linguistics focus may ask their faculty adviser to approve up to 5 units from language courses toward the degree if such courses are at the second-year level and above, or are in a second non-English language. No more than 10 units of CASA 96, Directed Individual Study, may be counted towards the major, and may only be included among the 25 related units permitted for the major. All required units for the undergraduate degree program must be passed with a grade of 'C' or better, and not more than 10 (maximum of 5 units in CASA courses and 5 units in related subjects) of the required 65 units may be taken for a credit/no credit grade.

Deadline for Declaring the Major—Students must complete the declaration process, including planning form submission and Axess declaration, upon completion of 90 units or upon achieving junior class status.

Majors are encouraged to develop field research projects under the supervision of a department faculty member. The department offers research grants to support individually-designed summer field research in cultural and social anthropology. The department research grant should be used to support field research as a supplement to other field research grants such as the UAR research grants. Eligibility for application to the research grants program requires that a student has completed a minimum of two department courses with a grade point average of 3.3 (B+) or better. One of the two courses may be completed in the quarter in which the grant application is submitted to the department. Michelle Z. Rosaldo Grant applications for individually-designed summer field research projects are due by the end of the fifth week in Winter Quarter.

Prospective majors may meet with the chair of the undergraduate committee or the undergraduate peer adviser for initial advice on choosing an appropriate faculty adviser in the department. In consultation with their faculty advisers, students must develop a coherent program of study for the major. Students are required to submit the application form for the major, including their completed proposed plan of study, to the student program coordinator, no later than the beginning of the Winter Quarter of the junior year. Required course work for the research grants program includes CASA 93, Prefield Research Seminar, and CASA 94, Postfield Research Seminar. Suggested course work for the research grants program includes CASA 92, Research Writers Workshop, CASA 95A, Research in Anthropology, and CASA 96, Directed Individual Study. Contact the student program coordinator for more information.

Majors are required to meet with their faculty advisers at least once each quarter. Each student's progress towards fulfilling the major requirements is recorded in a file kept in the student program coordinator's office. It is the student's responsibility to see that this file is accurate and up to date.

SENIOR PAPER AND DEPARTMENTAL HONORS

The senior paper program in Anthropology provides majors in Anthropology the opportunity to conduct original research under the guidance of a faculty adviser. The senior paper program is open to all majors in the department. Students must initiate their participation in the senior paper program by filing an application of intent with the student program coordinator. The application must include a description of the proposed project, a program of study, and a letter of approval from a faculty sponsor. All majors are encouraged to apply to the senior paper program in their sophomore or junior year prior to initiating fieldwork or other research. The senior paper application of intent must be submitted no later than the second week of Autumn Quarter in the senior year. Enrollment in CASA 95A, Research in Anthropology, is recommended during Autumn and Winter quarters. The Senior Paper Checklist must be completed, signed by the program adviser, and handed in to the student program coordinator by the end of the second week in Autumn Quarter in the senior year. Students must enroll in CASA 95B, Senior Paper, in the final quarter in the undergraduate degree program before graduating. The senior paper is submitted in the final quarter before graduation. For more information, see the student program coordinator.

All majors are encouraged to write an honors paper. Majors should begin research for an honors paper prior to the last quarter of the junior year with guidance from their faculty adviser. At the latest, department majors must submit an application of intent to write an honors paper to the student program coordinator no later than the end of Spring Quarter (or the third quarter) in the junior year. Department majors are eligible to apply for honors candidacy with a 3.5 GPA in the department major and a 3.0 GPA in overall course work. Enrollment in CASA 95A, Research in Anthropology, is recommended during Autumn and Winter quarters. The Honors Checklist and Timeline must be completed, signed by the program adviser, and handed in to the student program coordinator by the end of the second week in Autumn Quarter in the senior year. Students must enroll in CASA 95B, Senior Paper, in the final quarter in the undergraduate degree program before graduating. A senior paper to be considered for departmental honors is submitted in the final quarter before graduation. Senior papers with a letter grade of 'A-' or better may be awarded departmental honors. For more information, see the student program coordinator.

MINOR

To declare a minor in Anthropology, students should contact the department's student peer adviser or student program coordinator. The checklist for the minor can be downloaded in pdf format from http://anthropology.stanford.edu. Submit the checklist to the student program coordinator and apply for the minor in Axess. The checklist must be approved by the faculty chair of the committee on undergraduate degrees. Requirements for the minor include the following:

1. A faculty adviser in Anthropology.
2. 30 units of department course work. IHUM 27A,B may be applied to the 30 units. Only 5 units of directed individual study may apply towards the 30 units in the minor. Units for the minor must be passed with a grade of 'C' or better.
3. Up to 10 of the 30 units may be taken for instructor-elected, satisfactory/no credit grade.
4. At least 15 of the 30 units must be from CASA courses numbered 70 or above.
5. A minimum of 5 of the 30 units must be taken in a cultural area course approved by the program adviser on the undergraduate minor checklist.

Deadline for Declaring the Minor—Students must complete the declaration process, both planning form submission and Axess registration, by the last day of the quarter, two quarters prior to degree conferral, for example by the last day of Autumn Quarter if Spring graduation is intended.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

The deadline for applications to the coterminal M.A. degree program in Anthropology is March 4, 2008. Prospective applicants should see http://anthropology.stanford.edu/ for information about application for graduate admission. Applicants must submit a writing sample in English that demonstrates the ability to produce original analytical work at the graduate level, three letters of reference, recent original transcripts, and a statement of purpose.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

ANTHROPOLOGICAL SCIENCES

Students may declare a major in Anthropology or a major in Anthropological Sciences and earn the degree by following these requirements. The department also offers an honors program in Anthropology and in Anthropological Sciences.

The program gives students an understanding of the breadth and depth of anthropological knowledge, as well as a series of intellectual and practical tools developed from one of the four breadth areas listed below. Graduates are prepared for careers in anthropology, business, economic development, education, environmental conservation, foreign service, health professions, international relations, law, and public policy. With the addition of courses from the natural, physical, and mathematical sciences, the degree also provides preparation for further study in scientific areas, including earth sciences, ecology and evolutionary biology, environmental sciences, human genetics, medicine, and psychology.

REQUIREMENTS

The department offers considerable flexibility in structuring the major. In consultation with a faculty adviser, students develop a program that reflects their individual interests and needs. Majors are expected to meet with their advisers at least once every quarter. Each student's progress toward fulfilling the requirements of the major is recorded in a departmental file. It is the student's responsibility to see that this file is kept up to date.

All majors must fulfill the following requirements:

1. *Course work:* 65 units, with at least 45 units in courses with the subject code ANTHSCI. The remaining 20 units may be taken in any related science, social science, and humanities department or program. Outside courses must form a coherent program of study and must be approved by the student's adviser. Up to 10 of the 65 units may be in directed individual study.
2. *Breadth:* students complete one course from each of the these four breadth categories: archaeology; paleoanthropology and genetics; sociocultural and linguistic anthropology; environment and health. Two of these courses must be introductory. HUMBIO 2A and 2B fulfill the student's choice of two breadth categories as well as two introductory courses. A single course may only be counted toward a single breadth category.
3. *Theory courses:* ANTHSCI 190, Social Theory, and ANTHSCI 190B, Evolutionary Theory.
4. *Breadth area:* Majors may elect to specialize in one of the four breadth areas listed below, or they may submit a short paragraph that explains and justifies a self-designed breadth area. The breadth area must include at least 20 units, and one course must include significant methodological content. One course from outside the department may be included. Introductory courses may be used in the area of concentration only if they are not being used to satisfy the introductory course requirement. Courses from items 3, 5, and 6 may not be counted toward the area of concentration requirement. Statistics and theory courses beyond the single courses required by items 3 and 5 may be counted toward the concentration requirement, with the approval of the student's adviser.
    a) *Sociocultural and Linguistic Anthropology*—Contemporary social, cultural, and linguistic systems. Students choose from courses in culture and social theory, family, gender, kinship, linguistic anthropology, and political economy. Students who choose this breadth area are encouraged to take courses in ethnographic or linguistic area studies.
    b) *Archaeology*—Primate evolution, human origins and prehistory, and the development of human societies from early hunter-gatherers through complex civilizations. Students choose from courses in anthropological genetics, archaeology, evolutionary theory, historical linguistics, paleoanthropology, and primatology.
    c) *Environment and Health*—The dynamic relationship between the human organism and its natural and social environment; how processes of adaptation and evolutionary change create variability and how that variability interacts dynamically with local environments at the population and individual levels. How and why do humans cause global environmental change? Students choose from courses in behavioral ecology, conservation science, coevolutionary theory, evolutionary theory, historical ecology, life history theory, population biology, social network analysis, spatial analysis, and political ecology.
    d) *Paleoanthropology and Genetics*—Human and primate evolution through study of fossils, genetics, and stone tools. Focuses on the direct study of the deep past. Students choose from courses in human origins, human osteology, genetics, evolutionary theory, and paleoanthropology.
5. *One course in statistics:* ANTHSCI 192, STATS 60, STATS 141, or equivalent.
6. *Capstone course:* ANTHSCI 191C, Anthropological Sciences Capstone Core Seminar, or ANTHSCI 196B, Senior Honors Seminar, for honors students.

Declaring a Major—To declare a major in Anthropology or a major in Anthropological Sciences, students should first discuss their ideas and plans with one or more department faculty, the peer adviser, or student services coordinator who provides a form to declare a working plan for the proposed course of study. The major is declared on Axess, and students must obtain the signature of their peer and faculty advisers. The student services coordinator reviews the degree requirements and gives general guidance. Students must complete the declaration process, including the signature of their Anthropological Sciences adviser, by the time they achieve junior status (85 units completed).

Undergraduates are encouraged to take advantage of funding opportunities to carry out independent research. Funding for undergraduate research is available from Undergraduate Advising and Research (UAR) grants, affiliated area studies programs such as Latin American Studies, the Beagle II Awards, and the department's Pritzker Summer Scholars and Franz Boas Summer Scholars programs. Information and applications for the latter are available from the student services coordinator.

Advising Program—Each student works with the peer adviser and a faculty adviser to design and carry out an Anthropological Sciences major or minor. The advising program is built on a faculty mentoring approach so that students develop a good working relationship with at least one faculty member. Students are expected to meet regularly with their faculty adviser to discuss their progress and to review course selection, research opportunities, graduate or professional schools, and career planning. The peer adviser is often the first step in seeking advice; the peer adviser keeps regular hours in the peer advising office in the department.

HONORS

The honors program in Anthropology or in Anthropological Sciences provides students with an opportunity to conduct original research under the guidance of a faculty adviser. Declared majors of sophomore or junior standing may apply for admission to the honors program by submitting an application form available from the student services coordinator, a transcript, a copy of their planned course of study in the major, a proposal for an honors research project and paper, and a formal letter of recommendation from the professor who will supervise the student's honors project. A minimum average letter grade of 'B+' in department course work is required. For students planning fieldwork as part of their thesis project, all application materials must be completed and turned in no later than March 1 of the candidate's junior year. For students planning lab- or library-based research projects, applications must be submitted by the third week of Spring Quarter in the candidate's junior year. Applications are reviewed by the department's undergraduate student affairs committee which selects the students who become candidates for honors. Honors projects typically involve field research, but applications for lab or library-based research will be considered.

Students work closely with their advisers to plan the honors proposal, conduct the research, and write the honors paper. Honors students are encouraged to take ANTHSCI 190 and 192 no later than the junior year. Students whose projects require human subjects approval are required to take ANTHSCI 193, Prefield Research Seminar. Honors students are required to have methodological preparation for their research, and they are required to take ANTHSCI 196B, Senior Honors Seminar. An honors candidate may enroll in ANTHSCI 199, Directed Individual Study, for up to 15 units but may not count more than five of these units toward fulfilling the 65-unit requirement for the major. The honors paper must be completed and two copies submitted to the student services coordinator no later than the second Friday in May of the student's senior year. The paper is read and evaluated by the adviser and by one other faculty member. Candidates submitting a paper that is judged to be of honors quality, earning a letter grade of 'A-' or better from both readers, are awarded honors.

MINOR

The department offers flexibility in structuring a minor in Anthropology or a minor in Anthropological Sciences. In consultation with peer and faculty advisers, students develop a program that reflects their interests and needs. Prospective minors should request an Anthropological Sciences Minor Planning Form from the department's student services coordinator. All minors in the Department of Anthropology must fulfill the following requirements:

1. Select a department faculty adviser and obtain approval of the minor courses by peer and faculty advisers.
2. Complete 30 units of course work in ANTHSCI courses with an average letter grade of 'B-' or better. No more than 10 of the 30 units may be taken for an instructor-elected satisfactory/no credit grade. Student-elected credit/no credit units are not allowed. No more than 5 of the 30 units may be in directed individual study.
3. Complete HUMBIO 2A,B, or 10 units of introductory ANTHSCI courses, numbered 1-99, from at least two breadth areas.
4. Complete at least two courses at the 100 level or higher. Human Biology majors who minor in Anthropology or Anthropological Sciences may use HUMBIO 2A,B to fulfill requirement 3, but may not use it towards requirement 2; that is, students are not required to take an additional 10 units of introductory courses, but they must take 30 units of ANTHSCI course work other than 2A and 2B.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

The department offers a coterminal M.A. in Anthropology; the department plans to offer a coterminal M.S. in Anthropology. Students admitted to the coterminal M.S. in Anthropological Sciences before 2007-08 should consult the *Stanford Bulletin, 2006-07*, for program requirements.

The deadline to apply for the coterminal master's program is the third Friday of Winter Quarter. Students planning field work are encouraged to take ANTHSCI 193 in Spring Quarter of the senior year. Students apply by submitting application forms, a proposal for master's research project and paper, a plan for the master's course of study, at least one writing sample (preferably a research paper), a University transcript, and a letter of recommendation from the department faculty member who agrees to supervise the master's work. The GRE is not required.

1. Coterminal master's studies are normally carried out in the student's fifth year, subsequent to the undergraduate degree program.
2. As a graduation requirement, master's students defend their project before a committee comprised of a primary and secondary reader in a forum of the primary reader's choosing. This same committee ensures that the student has met all requirements before signing approval for the degree.
3. The deadline for completion of requirements for the coterminal master's degree is the second Friday in May in the fifth year of study. Any exceptions to this rule must be approved by the departmental graduate affairs committee.
4. The primary reader/adviser for the coterminal master's degree must be an Academic Council member in the Department of Anthropology.
5. Students must meet the requirements for the Master of Arts listed in the graduate section below.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

University requirements for the degrees of Master of Arts and Doctor of Philosophy are described in the "Graduate Degrees" section of this bulletin.

MASTER OF ARTS

The Department of Anthropology offers the master's degree to four groups of students:

1. Stanford undergraduates admitted to the coterminal master's program in Anthropology. The department offers a coterminal M.A. in Anthropology, and plans to offer a coterminal M.S. in Anthropology. Students admitted to the coterminal M.S. in Anthropological Sciences before 2007-08 should consult the *Stanford Bulletin, 2006-07*, for program requirements.
2. Stanford graduate students taking advanced degrees in other departments or schools at Stanford who are admitted to the terminal M.A. program in Anthropology.
3. Ph.D. students in Anthropology who fulfill the M.A. requirements on the way to the Ph.D. degree.
4. Applicants who apply from outside Stanford for entry into the terminal M.A. program in Anthropology.

Applicants whose ultimate goal is the Ph.D. degree should apply directly to the Ph.D. program. Students accepted for the terminal M.A. degree program cannot transfer to the Ph.D. program; they must reapply on the same basis as other Ph.D. applicants and in competition with other Ph.D. applicants. Ph.D. students who decide to take the M.A. on the way to the Ph.D. are governed by separate requirements described in the department's *Guide to the Ph.D. Program*.

Graduate enrollment at Stanford University for three consecutive quarters of full tuition for at least 45 units is required of all candidates for the terminal masters degree. M.A. students in Anthropology must take a minimum of 45 units in anthropology coursework beyond the undergraduate degree with a grade point average (GPA) of 3.0 ('B') or better. 45 units constitutes the University minimum for the M.A. degree. However, the Department requires 60 units of course work for the coterminal M.A. degree. Courses must be at or above the 100 level.

The M.A. program usually requires more than one year of study. However, full-time students entering the program with appropriate background should complete the M.A. degree program within three consecutive calendar years after the student's first quarter of master's-level enrollment. The University allows no transfer units to the master's program. To provide a meaningful master's program within one year, advance planning of course work with an adviser is required. Requirements for the master's program must be completed within three years.

For further information about the department's master's degree program requirements, see http://anthropology.stanford.edu/.

COTERMINAL MASTER'S DEGREE PROGRAM

See respective sections above concerning applying for the coterminal M.A. or M.S. in Anthropology. For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

TERMINAL MASTER'S DEGREE PROGRAM

The deadline for graduate applications to the terminal M.A. degree program in Anthropology is March 4, 2008. Prospective applicants should see http://anthropology.stanford.edu/ for information about application for graduate admission. Successful applicants to the M.A. program may enter only in the following Autumn Quarter. Applicants must file a report of their Graduate Record Examination score electronically, and submit a writing sample in English that demonstrates the ability to produce original analytical work at the graduate level. Applicants should also submit three letters of reference, recent original transcripts, and a statement of purpose.

DOCTOR OF PHILOSOPHY

The deadline for graduate applications to the Ph.D. degree program is January 8, 2008. Prospective applicants should see http://anthropology.stanford.edu for information about application for graduate admission. Successful applicants for the Ph.D. program may enter only in Autumn Quarter. It is department policy not to defer graduate admission. Applicants must file a report of their Graduate Record Examination (GRE) score electronically and submit a writing sample in English that demonstrates the ability to produce original analytical work at the graduate level. Applicants should also submit three letters of reference, recent original transcripts, and a statement of purpose.

Effective academic year 2008-09, the department plans to offer the following three concentrations, inclusive of required courses for area, ethics, methods and theory, and plans to require students to meet the requirements for at least one concentration:

1. Culture and Society
2. Archaeology
3. Ecology and Environment

The department plans to provide further information as it becomes available at http://anthropology.stanford.edu.

REQUIREMENTS

Students are encouraged to plan for completion of all work for the Ph.D. in five years. Requirements for students who matriculate beginning in academic year 2008-09 include:

1. Attend the department's colloquia and core seminars, including CASA 444 and 445
2. Pass with a minimum grade of 'B+' all department evaluation and concentration course work
3. Pass with a minimum grade of 'B+' ANTHSCI 211G or CASA 311G, Introduction to Graduate Studies in Anthropology
4. Pass with a minimum grade of 'B+' required area, ethics, methods, and theory courses
5. Attend the department's required introductory seminars
6. Complete the department's ethics requirement(s)
7. Participate in the department's teaching assistant training program
8. Serve as teaching assistants
9. Attend an approved proposal writing seminar
10. Pass the department's language examination
11. File for candidacy at end of second year
12. Complete the department's qualifying projects in third year
13. Submit required extramural funding applications
14. Pass the oral examination by the end of the third year
15. File the dissertation reading committee form at end of third year
16. Attend an approved dissertation writers seminar

FINANCIAL

The department endeavors to provide needed financial support through fellowships, teaching and research assistantships, and tuition grants to all students admitted to the Ph.D. program who maintain satisfactory degree progress. Applicants for the Ph.D. program must file a request for financial aid when applying to the program if they wish to be considered for support. For further information, see http://anthropology.stanford.edu.

No financial support is available to students enrolled for the M.A. degree.

COURSES

WIM indicates that the course satisfies the University undergraduate writing in the major requirement.

INTRODUCTION TO THE HUMANITIES (IHUM)

The following Introduction to the Humanities courses are taught by Anthropology department faculty members. IHUM courses are typically available only to freshmen seeking to fulfill GER:IHUM requirements; see the "Introduction to the Humanities" section of this bulletin for further information. Prospective Anthropology majors are advised to consider satisfying their GER: IHUM2,3 requirements by registering for the following IHUM courses.

IHUM 40A. World Archaeology and Global Heritage—The impact of the past on the present, and of the present on the past: the role of the past in contemporary society, and of present-day archaeological research, management, and conservation in approaching the past. Topics include debates about the peopling of the New World, religious conflicts over heritage sites, and archaeology's roles in heritage and conflicts. Sources include archaeological sites, landscapes, architecture, objects, literary works, religious texts, films, political essays, and scientific articles. GER:IHUM-2,3

IHUM 40A: *4 units, Win (Hodder, I)*
IHUM 40B: *4 units, Spr (Voss, B)*

ANTHROPOLOGY

The following courses have the subject code CASA.

Open to all students, these courses are introductory in the sense that prior knowledge is not assumed. Students who want a general introduction to human behavior and culture are advised to take CASA 1; those who are interested in introductory courses focused on specific areas of anthropological inquiry should choose from among the courses numbered 2 through 18.

UNDERGRADUATE

INTRODUCTORY

CASA 1/201. Introduction to Cultural and Social Anthropology—Crosscultural anthropological perspectives on human behavior, including cultural transmission, social organization, sex and gender, culture change, technology, war, ritual, and related topics. Case studies illustrating the principles of the cultural process. Films. GER:DB-SocSci, EC-GlobalCom

5 units, Win (Burce, A),

CASA 4. Language and Culture—Language in relation to inequality and power. Focus is on the roles of linguistic practices in constituting and reproducing social relationships, institutional arrangements, and political interests and identities. How language is implicated in differing contexts of domination and struggle including class, race, gender, and sexuality, using existing empirical studies of the language-power linkage. Student projects involve data collection, transcription, analysis, theoretical implications, and connections to existing literature. GER:DB-SocSci

5 units, alternate years, not given this year

CASA 7N. Science, Technology, Medicine: Disease as Culture—Stanford Introductory Seminar. Preference to freshmen. Health, death, and illness as cultural events; how identity and culture produce illness, and vice versa. Sources include literature and debates from disciplines such as law, literature, science, bioethics, cultural history, economics, and medical anthropology. Social science methods for understanding issues of ethics and illness. GER:DB-SocSci

3-5 units, Spr (Jain, S)

CASA 14. Anthropology and Art—Modernity. How the concept of art appears timeless and commonsensical in the West, and with what social consequences. Historicizing the emergence of art. Modernist uses of primitive, child art, asylum, and outsider art. GER:DB-Hum

5 units, alternate years, not given this year

CASA 16. Native Americans in the 21st Century: Encounters, Identity, and Sovereignty in Contemporary America—What does it mean to be a Native American in the 21st century? Beyond traditional portrayals of military conquests, cultural collapse, and assimilation, the relationships between Native Americans and American society. Focus is on three themes leading to in-class moot court trials: colonial encounters and colonizing discourses; frontiers and boundaries; and sovereignty of self and nation. Topics include gender in native communities, American Indian law, readings by native authors, and Indians in film and popular culture. GER:DB-SocSci, EC-AmerCul

5 units, alternate years, not given this year

CASA 62. Transnational Circuits: Latin America and the Caribbean—Focus is on Mexico, Cuba, Puerto Rico, and Central America. Relationships between U.S. foreign policy and laws, and transnational practices including migration, diaspora, and tourism.

3-5 units, Spr (Beliso-DeJesus, A)

CASA 75. *Pyar Vyar:* Love and Intimacy in Hindi Cinema—From the 40s to the present. How cinema reflects and shapes culture. Deconstructing notions of masculinity and femininity that underlie and are embedded in Hindi cinema, a site which reflects, articulates, and shapes perceptions of social institutions such as the family and state through tropes of gender, caste, class, religion, and nationhood. Cinematic discourses of love, duty, violence, tradition and modernization: how cinema mediates Indian men and women's understanding of their place in a changing world.

3-5 units, Aut (Sharangpani, M)

CASA 77/277. Japanese Society and Culture—Focus is on power, identity, and the politics of knowledge production. How transnational interactions influence Japanese identity. How anthropological knowledge has contributed to understanding Japanese culture and society. Gender, race and class; contemporary ethnographies. Modernity and globalization. Cultural politics, domestic work, labor management, city planning, ad images, anime, martial art, fashion, theater, leisure, and tourism. GER:DB-SocSci, EC-GlobalCom

5 units, alternate years, not given this year

CASA 79. Anthropology of Conflict: The Case of Israel and Palestine—Ethnographic works that have opened up the study of the cultural politics of the conflict. Focus is on topics related to memory, Palestine experience in Israel, refugee camps, and gendered dimensions of political resistance. Popular culture, diasporas, militarization, and state formation. The relationship between culture and power and militarism; terrains of conflict central to its perpetuation. GER:DB-SocSci

3-5 units, Spr (De Cesari, C)

CASA 82/282. Medical Anthropology—Emphasis is on how health, illness, and healing are understood, experienced, and constructed in social, cultural, and historical contexts. Topics: biopower and body politics, gender and reproductive technologies, illness experiences, medical diversity and social suffering, and the interface between medicine and science. GER:DB-SocSci, EC-GlobalCom

4-5 units, Win (Kohrman, M)

CASA 84. Gender and Nationalism in South Asia—Traditional cultural conceptions of Indian womanhood; debates around gender, caste, and class in colonial and postcolonial contexts; the effects of Partition and communal violence on national identity; and the cultural politics of masculine and feminine national identities in an era of globalization and transnational labor. Sources include autobiography, ethnography, history, social theory, literature, and films. GER:DB-SocSci

3-5 units, Spr (Kapur, C)

CASA 88. Theories in Race and Ethnicity—Concepts and theories of race and ethnicity in the social sciences and cultural studies. U.S. based definitions, ideas, and problems of race and ethnicity are compared to those that have emerged in other areas of the world. GER:DB-SocSci

5 units, Aut (Yanagisako, S)

CASA 90. Theory of Cultural and Social Anthropology—Preference to CASA majors. Anthropological interpretations of other societies contain assumptions about Western societies. How underlying assumptions and implicit categories have influenced the presentation of data in major anthropological monographs. Emphasis is on Karl Marx, Emile Durkheim, Max Weber, and anthropological analyses of non-Western societies. GER:DB-SocSci, WIM

5 units, Win (Ebron, P)

CASA 100N. Ethnographies of North America: An Introduction to Cultural and Social Anthropology—Stanford Introductory Seminar. Preference to sophomores. Ethnographic look at human behavior, including cultural transmission, social organization, sex and gender, culture change, and related topics in N. America. Films. GER:DB-SocSci

3-4 units, Aut (Wilcox, M)

ADVANCED UNDERGRADUATE

CASA 92. Undergraduate Research Proposal Writing Workshop—Practicum. Students develop independent research projects and write research proposals. How to formulate a research question; how to integrate theory and field site; and step-by-step proposal writing.

1-3 units, Aut, Win (Roque, A)

CASA 93. Prefield Research Seminar—For CASA majors only; non-majors register for 93B. Preparation for anthropological field research in other societies and the U.S. Data collection techniques include participant observation, interviewing, surveys, sampling procedures, life histories, ethnohistory, and the use of documentary materials. Strategies of successful entry into the community, research ethics, interpersonal dynamics, and the reflexive aspects of fieldwork. Prerequisites: two CASA courses or consent of instructor.

5 units, Spr (Inoue, M)

CASA 93B. Prefield Research Seminar: Non-Majors—Preparation for anthropological field research in other societies and the U.S. Data collection techniques include participant observation, interviewing, surveys, sampling procedures, life histories, ethnohistory, and the use of documentary materials. Strategies for successful entry into the community, research ethics, interpersonal dynamics, and the reflexive aspects of fieldwork.

5 units, not given this year

CASA 94. Postfield Research Seminar—Goal is to produce an ethnographic report based on original field research gathered during summer fieldwork, emphasizing writing and revising as steps in analysis and composition. Students critique classmates' work and revise their own writing in light of others' comments. Ethical issues in fieldwork and ethnographic writing, setting research write-up concerns within broader contexts.

5 units, Aut (Burce, A)

CASA 95A. Research in Anthropology—Independent research conducted under faculty supervision, normally taken junior or senior year in pursuit of a senior paper or an honors project. May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

CASA 95B. Senior Paper—Taken in the final quarter before graduation. Independent study and work on senior paper for students admitted to the program. Prerequisite: consent of program adviser and instructor.

1-10 units, Aut, Win, Spr, Sum (Staff)

CASA 96. Directed Individual Study—Prerequisite: consent of instructor.

1-15 units, Aut, Win, Spr, Sum (Staff)

CASA 103/203. Laboratory Methods in Archaeology—What do archaeologists do with the things they dig up, and how can they use artifacts to learn about past cultures? Hands-on experience cataloging, analyzing, and interpreting an archaeological collection. Students are exposed to standard methods in cataloging and curation, and in analysis of different types of artifacts, animal bone, and botanical remains. Individual or group analysis projects with reports that communicate the research findings. GER:DB-SocSci

5 units, alternate years, not given this year

CASA 108. History of Archaeological Thought—(Same as ARCHLGY 103.) Introduction to the history of archaeology and the forms that the discipline takes today, emphasizing developments and debates over the past five decades. Historical overview of culture, historical, processual and post-processual archaeology, and topics that illustrate the differences and similarities in these theoretical approaches. GER:DB-Hum

5 units, Aut (Meskell, L)

CASA 111. Cities in Comparative Perspective—(Same as URBANST 114.) Core course for Urban Studies majors. The city as interdisciplinary object. Discourses about cities such as the projects, practices, plans, representations, and sensibilities that combine to create what people know about urban spaces. Local, national, and transnational spatial scales. Conversations across regional boundaries; geographies of difference. Case studies. GER: DB-SocSci

5 units, Aut (Ebron, P)

CASA 112/212. The Archaeology of Modern Urbanism—Seminar. Urbanism as a defining feature of modern life. The perspective of archaeology on the history and development of urban cultures. Case studies are from around the globe; emphasis is on the San Francisco Bay Area megalopolis. Cities as cultural sites where economic, ethnic, and sexual differences are produced and transformed; spatial, material, and consumption practices; and the archaeology of communities and neighborhoods. GER:DB-SocSci

5 units, Win (Voss, B)

CASA 114/214. Minaret and Mahallah: Women, Music, and Islam in Central Eurasia—Women as key figures in transmission of traditional culture, folk Islam, family rites, and folklore. Pilgrimages to saint tombs and holy shrines, healing practices, Sufi poetry, hadith storytelling. The continuity of Islamic education in central Asia during Communist dominance. Women's oral tradition. Sources include audio-visual materials. GER:DB-Hum

5 units, Spr (Kunanbaeva, A)

CASA 116. Women in Muslim and Arab Worlds—Interdisciplinary. How the interplay between power and knowledge has produced representations of women in different historical periods and locations; the dehistoricization of women's experiences in orientalist representations. Focus is on the relationship between culture and economy; attention to national and transnational discourses, social practices, and political structures that inform and are informed by women's lives.

5 units, Spr (Shakhsari, S)

CASA 117/217. Archaeology of the American Southwest: Contemporary Peoples, Contemporary Debates—Cultural diversity and archaeology from paleo-indians to the present. Focus is on cultural florescences in areas such as the Mimbres Valley, Chaco Canyon, Mesa Verde, the Rio Grande, and the Hohokam in the Phoenix Basin. The development of agriculture, theories of social complexity and political economy, and the relationships between contemporary Native Americans, archaeologists, and the production of the past. GER:DB-SocSci

5 units, alternate years, not given this year

CASA 125. Anthropology of the Performing Arts—Theoretical approaches to documenting and understanding theater, music, song, verbal play, puppetry, dance, and other life genres through texts, videos, and recordings. GER:DB-Hum

5 units, Win (Diehl, K)

CASA 127. Tibetan Ritual Life—(Same as RELIGST 217A.) The human life cycle, the calendar year, and pilgrimage as organizing principles to examine Tibetan Buddhist and lay rituals that mark important occasions, bless people and places, ward off danger, heal wounds, alleviate suffering, predict the future, affirm Tibetan identity, and inspire political activism-Material culture and performative aspects of Tibetan rituals, the meanings of these rituals to those who participate in them, and the role of ritual in human culture. GER:DB-Hum, EC-GlobalCom

5 units, not given this year

CASA 128B. Globalization and Japan—(Same as ANTHSCI 128B/228B.) Globalization theories in anthropology and sociology, and Japan in the context of these theories. Ethnographic cases of Japan's global presence from the 15th century to the present. Processes of globalization in business management, popular culture, and expatriate communities. Japan's multiculturalization through its domestic globalization. GER:DB-SocSci

3-5 units, Win (Befu, H)

CASA 130/230. The Anthropology of Violence—Anthropological literature on violence, relationships between human biology and culture, and role of social structures in governing human action. Sociobiological and evolutionary psychological basis of violent behaviors; how social and material relations create such behaviors. Case studies: ethnographies of S. America; crack dealers in New York City; holocaust in Cambodia. Nonviolent structures within the history of anthropological thinking. GER:DB-SocSci

5 units, Win (Maguire, M)

CASA 132. Science, Technology, and Gender—Why is engineering often seen as a masculine profession? What have women's experiences been in entering fields of science and technology? How has gender been defined by scientists? Issues: the struggles of women in science to negotiate misogyny and cultural expectation (marriage, children), reproductive issues (surrogate motherhood, visual representations of the fetus, fetal surgery, breast feeding, childbirth practices), how the household became a site of consumerism and technology, and the cultural issues at stake as women join the ranks of scientists. GER:DB-SocSci, EC-Gender

3-5 units, alternate years, not given this year

CASA 133. City and Sounds—How do people experience modern cities and urban public cultures through auditory channels? How does sound mediate and constitute urban space? How to listen to and write about culture through sound. Students carry out narrative interviews and sound fieldwork in the Bay Area. Readings include urban anthropology, semiotics, art history, social studies of science and technology, media studies, and musicology. GER:DB-SocSci

5 units, Win (Inoue, M)

CASA 135X. Pilgrimage and Sacred Landscapes—(Same as RELIGST 235.) Cultural, spiritual, psychological, medical, economic, and political perspectives. Christianity, Buddhism, Hinduism, Islam, Native American and secular; sources include Europe, Tibet, India, Native America, and the Middle East. Why do pilgrims often make journeys as difficult and painful as possible? How do landscapes become sacred? What happens when places like Jerusalem are intersections for different belief systems? Contemporary U.S. destinations such as Graceland and the Vietnam Memorial; journeys of personal or non-parochial cultural significance. GER:DB-Hum

4 units, not given this year

CASA 137E/ 237E. Excavation at Catalhoyuk, Turkey—Archaeological field experience by participating in Stanford's excavation at Catalhoyuk in Summer. Focus is on the urban character of this earliest of towns. Prepares students for Summer dig. Prerequisite: consent of instructor.

3-5 units, Spr (Hodder, I)

CASA 138/238. Archaeology of Sex, Sexuality, and Gender—How archaeologists study sex, sexuality, and gender through the material remains left behind by past cultures and communities. Theoretical and methodological issues; case studies from prehistoric and historic archaeology. GER:DB-SocSci

5 units, Spr (Voss, B)

CASA 145A. Politics and Poetics of Caribbean's Literature—(Same as CSRE 145A.) Mid 20th-century to the present. How historical, economic, and political conditions in Haiti, Cuba, Jamaica, Antigua, and Guadeloupe affected women. How Francophone, Anglophone, and Hispanophone women novelists, poets, and short story writers respond to similar issues and pose related questions. Caribbean literary identity within a multicultural and diasporic context; the place of the oral in the written feminine text; family and sexuality; translation of European master texts; history, memory, and myth; and responses to slave history, colonialism, neocolonialism, and globalization. GER: DB-SocSci, EC-Gender

5 units, Win (Duffey, C)

CASA 150. Archaeological Methods—(Same as ARCHLGY 102.) Methodological issues related to the investigation of archaeological sites and objects. Aims and techniques of archaeologists including: location and excavation of sites; dating of places and objects; analysis of artifacts and technology and the study of ancient people, plants, and animals. How these methods are employed to answer the discipline's larger research questions.

5 units, Spr (Hodder, I)

CASA 151/251. Cultural Studies—Identity, community, and culture; their interactions and formation. GER:DB-SocSci

5 units, alternate years, not given this year

CASA 152/252. Archaeology: World Cultural Heritage—Focus is on issues dealing with rights to land and the past on a global scale including conflicts and ethnic purges in the Middle East, the Balkans, Afghanistan, India, Australia, and the Americas. How should world cultural heritage be managed? Who defines what past and which sites and monuments should be saved and protected? Are existing international agreements adequate? How can tourism be balanced against indigenous rights and the protection of the past? GER:DB-SocSci

5 units, alternate years, not given this year

CASA 156. Interpreting Space and Place: An Introduction to Mapmaking—How mapmaking, geographical information systems (GIS), and spatial tools can be applied in social research. Qualitative and quantitative approaches in the use of geospatial information. Methodologies and case examples. GER:DB-SocSci

5 units, Aut (Engel, C)

CASA 158/258. Sex, Death, and the Body in Ancient Egypt—The Egyptian life course from conception to death and burial focusing on New Kingdom materials. Egyptian ideology pertaining to the self, in which the individual is multifaceted and whose embodiment transcended death. Their concerns with questions about being and non-being, the meaning of death, the constitution of the body, the nature of the cosmos and humanity, and the basis of human society. Recent theoretical developments in anthropology, feminist theory, and studies of the body which explore hierarchies of difference in age, sex, class, ethnicity, and sexuality. GER:DB-SocSci

5 units, Win (Meskell, L)

CASA 159. New Frontiers in Biomedical Technologies: Anthropology and the Remaking of the Body—The relationship between innovations in biomedical technology and new ways of defining the body, health, and personhood through ethnographically grounded readings. Technologies that see inside and act on the living body in ways that challenge dichotomies of interior/exterior, self/other, and natural/artificial. How patients, doctors, and research scientists negotiate these technologies and how they inform human self-awareness.

5 units, Spr (Romain, T)

CASA 160/260. Race, Genetics, and Interpreting Difference—Contemporary practices and struggles about race in the context of emerging genomic technologies. How knowledge around racial difference is produced; science and assumptions underpinning core claims in human genetics on issues including relatedness, significance, risk, admixture, and difference. Topics include national biobanks, ancestry testing, pharmacogenomics, and DNA mining in the forensics. GER:DB-SocSci

5 units, Aut (Lee, S)

CASA 164. Ritual Musics of the World—(Same as RELIGST 164.) The roles of music in human ritual life. Psychological and physical effects of music in healing and trance-inducing rituals; its power to create and affirm communities and other affective ties; and its effectiveness as a medium for spiritual knowledge. What can be learned about people, places, and cultures through sound; how does music express and shape social identity and culture; how are belief systems and patterns of social interaction encoded and made manifest in musical practices? GER:DB-Hum

4 units, Aut (Diehl, K)

CASA 171. Mythology, Folklore, and Oral Literature of Central Asia—Central Asian cults, myths, and beliefs from ancient time to modernity. Life crisis rites, magic ceremonies, songs, tales, narratives, taboos associated with childbirth, marriage, folk medicine, and calendrical transitions. The nature and place of the shaman. Sources include music from fieldwork of the instructor and the Kyrgyz epoch Manas. The cultural universe of Central Asian peoples as a symbol of their modern outlook. GER:DB-SocSci

3-5 units, not given this year (Kunanbaeva, A)

CASA 172/272. Object Lessons—Human-object relations in the processes of world making. Objectification and materiality through ethnography, archaeology, material culture studies, and cultural studies. Interpretive connotations around and beyond the object, the unstable terrain of interrelationships between sociality and materiality, and the cultural constitution of objects. Sources include: works by Marx, Hegel, and Mauss; classic Pacific ethnographies of exchange, circulation, alienability, and fetishism; and material culture studies. GER:DB-SocSci

3-5 units, Aut (Meskell, L)

CASA 173/273. Nomads of Eurasia: Culture in Transition—The nomads of the Eurasian steppes, their lifestyles, and cultural history, including Mongolia, Kazakhstan, Kyrgyzstan, and Turkmenistan. Languages, traditional economics, art, the relationships between sedentary and nomadic peoples, and the early background and gradual Turkification and Islamization of Central Asia and Lamaization of S. Siberia. Regional trade networks (the Silk Road) where nomads were the mediators in innovations, the Mongol empire and its fate, Imperial Russian expansion, and the incorporation of inner Asia into the USSR. GER:DB-SocSci

4-5 units, Win (Kunanbaeva, A)

CASA 174. Cultures of Disease: Cancer—History, politics, science, and anthropology of cancer; political and economic issues of disease and health care in the U.S., including the ethics and economics of health care provision, the pharmaceutical industry, carcinogen production, and research priorities. GER:DB-SocSci

5 units, Win (Jain, S)

CASA 180/280. Ethnography of Africa—The politics of producing knowledge in and about Africa through the genre of ethnography, from the colonial era to the present. The politics of writing and the ethics of social imagination. Sources include novels juxtaposed to ethnographies. GER:DB-SocSci

5 units, Aut (Hubbard, L)

CASA 183. Border Crossings and American Identities—(Same as AMSTUD 183.) How novelists, filmmakers, and poets perceive racial, ethnic, gender, sexual preference, and class borders in the context of a national discussion about the place of Americans in the world. How Anna Deavere Smith, Sherman Alexie, or Michael Moore consider redrawing such lines so that center and margin, or self and other, do not remain fixed and divided. How linguistic borderlines within multilingual literature by Caribbean, Arab, and Asian Americans function. Can Anzaldúa's conception of borderlands be constructed through the matrix of language, dreams, music, and cultural memories in these American narratives? Course includes examining one's own identity. GER:DB-Hum, EC-AmerCul

5 units, Aut (Duffey, C)

CASA 188. South Asian American Experiences in Cultural and Historical Perspective—Interdisciplinary. How narratives and histories about communities from the S. Asian subcontinent are constructed and situated within scholarly literature in Asian American studies. Transnational feminist perspectives on categories such as homeland and diaspora. Sources include literary texts, film, historical narrative, anthropological analyses, immigration histories, and state policy.

5 units, not given this year

CASA 199/299. Senior and Master's Thesis Writing Workshop—Techniques of interpreting data, organizing bibliographic materials, writing, editing and revising. Preparation of papers for conferences and publications in anthropology. Seniors register for 199; master's students register for 299.

1-2 units, Win, Spr (Staff)

CASA 201X. Readings in Science, Technology, and Society—Focus is on anthropological approaches and contributions to the field.

5 units, not given this year

GRADUATE: PRIMARILY FOR DOCTORAL STUDENTS

CASA 300. Reading Theory Through Ethnography—Required of and restricted to first-year CASA Ph.D. students. Focus is on contemporary ethnography and related cultural and social theories generated by texts. Topics include agency, resistance, and identity formation, and discourse analysis.

5 units, Win (Yanagisako, S)

CASA 301. History of Anthropological Theory—Required of CASA Ph.D. students. The history of cultural and social anthropology in relation to historical and national contexts and key theoretical and methodological issues as these inform contemporary theory and practices of the discipline. Enrollment limited to 15. Prerequisite: consent of instructor.

5 units, Aut (Ferguson, J)

CASA 302. Anthropological Research Methods—Required of CASA Ph.D. students; open to all graduate students. Research methods and modes of evidence building in ethnographic research. Enrollment limited to 10.

5 units, Spr (Kohrman, M)

CASA 310. Intersections—Themes of materiality and visuality, aesthetic and other forms of cultural production, and the meanings of creativity and convention. Ethnographic and archaeological material and case studies from worldwide cultural contexts. Prerequisite: consent of instructor.

5 units, Win (Ebron, P; Meskell, L)

CASA 311G. Introduction to Graduate Studies in Anthropology—(Same as ANTHSCI 211G.) Required graduate seminar. The history of anthropological theory and key theoretical and methodological issues of the discipline.

5 units, not given this year

CASA 322. From Biopolitics to Necropolitics and Beyond—Scholarship produced and informed by Michel Foucault. Focus is on the final period of Foucault's life; how his discussions of biopolitics, subjectification, governmentality, and death have served as touchstones for recent empirical research. Key interventions initially made under these rubrics; how anthropologists and others have applied, challenged, and extended them.

5 units, not given this year

CASA 324. Continental Philosophy and Social Sciences: Human/Non-Human—Concepts and methodologies for studying human/non-human relations. Animals and things as non-human subjects in the contemporary human sciences. Topics include agency, face, ethics, rights, and the other of animals and things. Epistemological approaches including Latour and Don Ihde. Readings from continental philosophers.

5 units, Spr (Domanska, E)

CASA 327. Language and Political Economy—Theories of language: Saussure, Jakobson, Hymes, Marx, Foucault, Butler, and Derrida. The theorization of language in its linkages to power, social relations, and history. Prerequisites: Linguistics or Anthropology course work.

5 units, Aut (Inoue, M)

CASA 331. The Anthropology of Technology—Iconic discipline-building works of the last three decades; readings that lay out and intervene in contemporary debates.

5 units, Win (Jain, S)

CASA 336. Anthropology of Rights—Ideas of rights at the center of contemporary politics around the world. An anthropological perspective on how rights are invoked, claimed, and translated into institutional policies in ethnographic cases. The limitations of liberal notions of rights and innovative forms of politics emerging within and against rights talk.

5 units, alternate years, not given this year

CASA 341. Food and Globalization—Globalization through the history of food and cuisine. Commodities and cuisines, the movement of plants, technologies of production, and the mechanisms of distribution.
5 units, not given this year

CASA 343. Culture as Commodity—Focus is on theories of commodification, interests in tourism, national cultures as marketable objects, and how identities are constituted through production and consumption. The formation of global style and taste.
5 units, Aut (Ebron, P)

CASA 346A. Sexuality Studies in Anthropology—Current research on sexuality from perspectives including paleoanthropology, archaeology, ethnography, and linguistic anthropology. Readings paired with case studies that explore theoretical and methodological issues.
5 units, alternate years, not given this year

CASA 349. Anthropology of Capitalism—Issues in cultural theory and methodology through research on people who have greater material and cultural resources than those usually studied by anthropologists. How ideas about ideology, hegemony, identity, power, and practice are altered in studying those considered to be agents of power rather than the subaltern. Topics: global capitalism, masculinity, white racial subjectivity. Enrollment limited to 20.
4-5 units, Aut (Yanagisako, S)

CASA 352. Foucault: The Question of Method—Foucault as methodological exemplar for historical and social research. Emphasis is on his historical studies of clinical medicine, prisons, and sexuality, and on applying his methods to empirical studies of topics such as colonialism, race, and liberal governmental rationality.
5 units, not given this year

CASA 360. Archaeological Methods and Research Design—Methodological aspects of field and laboratory practice from traditional archaeological methods to the latest interdisciplinary analytical techniques. The nature of archaeological data and inference; interpretive potential of these techniques.
5 units, Spr (Hodder, I)

CASA 364. The Anthropology of Development—Multidisciplinary. Topics vary annually. Areas include Africa, S. Asia, and Latin America.
5 units, not given this year

CASA 373. Introduction to Archaeological Theory—The history of archaeological thought emphasizing recent debates. Evolutionary theories, behavioral archaeology, processual and cognitive archaeology, and approaches termed feminist and post-processual archaeology in the context of wider debate in adjacent disciplines. The application and integration of theory on archaeological problems and issues.
5 units, Win (Hodder, I)

CASA 375. Archaeology and Globalism—The emergence of archaeology as a discipline in the context of the rise of the nation state. Global economies and other issues have created a new context for archaeology. How are archaeology and heritage responding? The idea of world heritage. The impact of postcolonialism. The commodification of the past: the past as theme park, as travel tourism or nostalgia, as exotic and other. Conflict between uses of the past for identity and as theme park; between heritage and resource or play. The impact of the Goddess, New Age, and other movements. Archaeology and human rights issues including forensic archaeology.
4-5 units, alternate years, not given this year

CASA 380. Practice and Performance: Bourdieu, Butler, Giddens, de Certeau—Poststructuralist theories of iteration and mimesis used by social scientists to negotiate the tension between social structure and social practice: Gidden's structuration theory; Bourdieu's practice theory; Butler's theories of gender performativity; and de Certeau's analysis of tactics and strategies. Ethnographic and archaeological case studies that employ methodologies inspired by these approaches. Intersections and contradictions between these theorists' work; their use in anthropological practice. Issues of gender, sexuality, and ethnicity.
5 units, Win (Voss, B)

CASA 391A. Qualifying Paper: Topic—Qualifying Project-Required of second- and third-year Ph.D. students writing the qualifying paper or the qualifying written examination.
2-5 units, Aut, Win, Spr (Staff)

CASA 391B. Qualifying Paper: Area—Qualifying Project-Required of second- and third-year Ph.D. students writing the qualifying paper or the qualifying written examination.
2-5 units, Aut, Win, Spr (Staff)

CASA 392. Dissertation Writers Seminar—Required of fifth-year Ph.D. students returning from dissertation field research and in the process of writing dissertations and preparing for professional employment.
1-3 units, Aut, Win, Spr (Staff)

CASA 393. Internship—Prerequisite: consent of instructor.
1-15 units, Aut, Win, Spr, Sum (Staff)

CASA 394. Proposal Writing Seminar—The conceptualization of dissertation research problems, the theories behind them, and the methods for exploring them. Participants draft a research prospectus suitable for a dissertation proposal and research grant applications. Limited enrollment. Prerequisite: 212 or consent of instructor.
5 units, Spr (Inoue, M)

CASA 395. Introduction to Cultural and Social Anthropology: Faculty Research—Required of first-year CASA Ph.D. May be repeated for a total of 5 units of credit over three quarters.
1-2 units, Aut, Win, Spr (Ferguson, J)

CASA 396. Research Apprenticeship—Supervised work on a research project with an individual faculty member.
1-15 units, Aut, Win, Spr (Staff)

CASA 397. Directed Individual Study—Supervised work for a qualifying paper, examination, or project with an individual faculty member.
1-15 units, Aut, Win, Spr, Sum (Staff)

CASA 397A. Directed Individual Tutorial—Supervised study with an individual faculty member.
1-15 units, Aut, Win, Spr, Sum (Staff)

CASA 397B. Dissertation Fieldwork—Supervised work for Ph.D. students conducting pre-dissertation or dissertation field research with an individual faculty member.
1-15 units, Aut, Win, Spr, Sum (Staff)

CASA 398. Teaching Apprenticeship—Supervised work for a teaching mentor participating in an undergraduate course; not the same as teaching assistantship.
1-15 units, Aut, Win, Spr, Sum (Staff)

CASA 399. Master's Research Thesis—Supervised work for terminal and coterminal master's students writing the master's project in the final quarter of the degree program.
1-15 units, Aut, Win, Spr, Sum (Staff)

CASA 444. Cultural and Social Anthropology Colloquium—Required of Anthropology graduate students.
1 unit, Aut, Win, Spr (Staff)

CASA 445. Cultural and Social Anthropological Symposium—Current topics and trends in cultural and social anthropology, cultural archaeology, and archaeology.
1 unit, Aut, Win, Spr (Staff)

COGNATE COURSES FOR ANTHROPOLOGY

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

COMPLIT 257C/357C. Crowds—(Same as FRENGEN 317, ITALGEN 317.)
3-5 units, Aut (Schnapp, J)

COMPLIT 370. Anthropology of Speed—(Same as FRENGEN 370, ITALGEN 370.)
3-5 units, Spr (Schnapp, J)

DANCE 168. Dance and Culture in Latin America
4 units, Spr (Cashion, S)

FEMST 120. Introduction to Queer Studies
4-5 units, Win (Hunter, M)

FRENGEN 295. Science, Technology, and Society in Europe and the U.S.: Ethical Debates and Controversies
3-5 units, Win (Dupuy, J)

ANTHROPOLOGICAL SCIENCES

The following courses have the subject code ANTHSCI. HEF and DA refer to degree requirements in effect 2006-07 and earlier. See the *Stanford Bulletin 2006-07* for an explanation of these codes.

UNDERGRADUATE

INTRODUCTORY

ANTHSCI 3. Introduction to Prehistoric Archaeology—(Same as ARCHLGY 1.) Aims, methods, and data in the study of human society's development from early hunters through late prehistoric civilizations. Archaeological sites and remains characteristic of the stages of cultural development are examined for selected geographic areas, emphasizing methods of data collection and analysis appropriate to each. (HEF I, II) GER:DB-SocSci, EC-GlobalCom
3-5 units, Aut (Robertson, I)

ANTHSCI 4. Language and Culture—Language in relation to inequality and power. Focus is on the roles of linguistic practices in constituting and reproducing social relationships, institutional arrangements, and political interests and identities. How language is implicated in differing contexts of domination and struggle including class, race, gender, and sexuality, using existing empirical studies of the language-power linkage. Student projects involve data collection, transcription, analysis, theoretical implications, and connections to existing literature.
5 units, alternate years, not given this year (Fox, J)

ANTHSCI 6. Human Origins—(Graduate students register for 206; same as BIOSCI 106, HUMBIO 6.) The human fossil record from the first nonhuman primates in the late Cretaceous or early Paleocene, 80-65 million years ago, to the anatomically modern people in the late Pleistocene, between 100,000 to 50,000 B.C.E. Broad evolutionary trends and the natural selective forces behind them. (HEF I, III; DA-B) GER: DB-NatSci
5 units, Win (Klein, R)

ANTHSCI 7. Marriage and Kinship—Variation in human kinship systems; whether they can be understood as evolutionary products and the contribution to be made by a Marxist perspective. Eurasia and Africa contrasted with Europe and E. Asia. (HEF I) GER:DB-SocSci, EC-Gender
4-5 units, not given this year

ANTHSCI 12. Querying Human Nature—Historical and contemporary anthropological perspectives on human nature. Topics include human behaviors such as aggression, incest avoidance, sexual jealousy, childhood attachments, maternal care, color symbolism, facial expression, and language. (HEF I) GER:DB-SocSci
5 units, not given this year

ANTHSCI 13. Bioarchaeology—The study of skeletal remains from archaeological contexts. Methods of bioarchaeology including taphonomy, paleodemographics, paleopathology, and molecular approaches. Case studies illustrate issues such as health consequences of the adoption of agriculture, cannibalism, and relationships among health, violence, class, and sex in historic and prehistoric cultures. (HEF I, IV) GER: DB-NatSci
3-5 units, not given this year

ANTHSCI 14. Introduction to Anthropological Genetics—(Same as HUMBIO 14.) How genetic methods address anthropological questions. Examples include the evolutionary relationships between humans and the apes, the place of the Neanderthals in human evolution, the peopling of the New World, ancient DNA, the genetics of ethnicity, forensic genetics, genomics, behaviorial genetics, and hereditary diseases. (HEF I, II) GER: DB-NatSci
3-5 units, Win (Jobin, M)

ANTHSCI 15. Sex and Gender—Commonality and diversity of gender roles in crosscultural perspective. Cultural, ecological, and evolutionary explanations for such diversity. Theory of the evolution of sex and gender, changing views about men's and women's roles in human evolution, conditions under which gender roles vary in contemporary societies, and issues surrounding gender equality, power, and politics. (HEF I) GER:DB-SocSci, EC-Gender
3 units, alternate years, not given this year (Bird, R)

ANTHSCI 22. Archaeology of North America—Why and how people of N. America developed. Issues and processes that dominate or shape developments during particular periods considering the effects of history and interactions with physical and social environment. Topics include the peopling of the New World, explaining subsequent diversity in substance and settlement adaptations, the development of social complexity, and the impact of European contact. (HEF II, III) GER:DB-SocSci, EC-AmerCul
3-5 units, not given this year

ANTHSCI 25. Human Ecology of the Amazon—(Same as HUMBIO 25.) The diversity of peoples and cultures in the Amazon Basin and the ecosystems in which they live. Themes in ecological anthropology of Amazonia including limiting factors, the protein debate, indigenous knowledge and resource management, and anthropogenic modification. Ethnographic, historical, and archeological evidence. (HEF I, IV) GER:DB-SocSci, EC-GlobalCom
5 units, not given this year

ANTHSCI 28. Australia and New Guinea Ethnology—The prehistory and ethnology of New Guinea and Australia. Regional climate, environment, and pre-European history. Ethnography of the contact period focusing on theoretical problems central to the development of anthropological theory. Contemporary sociopolitical issues. Films. (HEF I,II) GER:DB-SocSci
4 units, not given this year

ANTHSCI 29A. First-Year Nahuatl, First Quarter—The language of the Aztecs, once used as a lingua franca throughout Mesoamerica. Focus is on vocabulary building and reading colonial literary and historical documents, including Central Mexican codices. Modern spoken dialects, the place of Nahuatl in the Uto-Aztecan language phylum, and the relationship between the language and Aztec culture. (HEF IV) (Fox)
4 units, not given this year

ADVANCED UNDERGRADUATE

ANTHSCI 102. Women, Fertility, and Work—(Graduate students register for 202.) Is gender culturally or biologically determined or both? The arguments for sociobiological and cultural determinist explanations of the differences between women and men are compared, emphasizing their intersection in work. Case studies: hunter/gatherer, horticultural (Melanesian), southern Chinese, and Anglo American societies. (HEF I, IV; DA-A) GER:DB-SocSci, EC-Gender
5 units, not given this year

ANTHSCI 103. Cultural Diversity, Ethnicity, and Governance in Indigenous Latin America—(Graduate students register for 262C.) Continuation of 162B. Posibilities for building representative institutions within a democratic regional and national context for the empowerment of indigenous peoples. Case studies of where this has happened. Long-term consequences, reaction from different sectors of society, business, media, and professionals. (DA-A) GER:DB-SocSci

3-5 units, Spr (Karp-Toledo, E)

ANTHSCI 106B. Maya Mythology and the *Popol Vuh*—The mythology and folklore of the ancient Maya, emphasizing the relationship between the 16th-century Quiché Maya mythological epic *Popol Vuh* (*Book of the Council*) and classic lowland Maya art, architecture, religion, and politics. General Mesoamerican mythology. Anthropological and other theories of mythology. Class participates in the creation of a web project on the Popol Vuh. GER:DB-SocSci

5 units, Win (Fox, J)

ANTHSCI 110. Introduction to Language Change—(Same as LINGUIST 160.) Variation and change as the natural state of language. Differentiation of dialects and languages over time. Determination and classification of historical relationships among languages, and reconstruction of ancestral stages. Types, rates, and explanations of change. Parallels with cultural and genetic evolutionary theory. Implications for the description and explanation of language in general. (HEF II; DA-A) GER:DB-SocSci

4-5 units, alternate years, not given this year (Fox, J)

ANTHSCI 111. Language and Prehistory—(Graduate students register for 211.) Language classification and its implications for human prehistory. The role of linguistic data in analyzing prehistoric populations, cultures, contact, and migrations. Comparison of linguistic and biological classifications. Reconstruction, proto-vocabularies, and culture. Archaeological decipherment and the origins and evolution of writing. Archaeological and genetic evidence for human migrations. (DA-A; HEF II,III) GER:DB-SocSci, EC-GlobalCom

3 units, alternate years, not given this year (Fox, J)

ANTHSCI 112. Human Diversity: A Linguistic Perspective—(Same as HUMBIO 187.) The diversity and distribution of human language and its implications for the origin and evolution of the human species. The origin of existing languages and the people who speak them. Where did current world languages come from and how can this diversity be used to study human prehistory? Evidence from related fields such as archaeology and human genetics. Topics: the origin of the Indo-European languages, the peopling of the Americas, and evidence that all human languages share a common origin. (HEF II; DA-A) GER:DB-SocSci, EC-GlobalCom

3 units, Spr (Ruhlen, M)

ANTHSCI 114. The Biology and Evolution of Language—(Graduate students register for 214.) Language as an evolutionary adaptation of humans. Comparison of communicative behavior in humans and animals, and the inference of evolutionary stages. Structure, linguistic functions, and the evolution of the vocal tract, ear, and brain, with associated disorders (stuttering, dyslexia, autism, schizophrenia) and therapies. Controversies over language centers in the brain and the innateness of language acquisition. Vision, color terminology, and biological explanation in linguistic theory. (HEF III; DA-A) GER: DB-NatSci

4-5 units, Spr (Fox, J)

ANTHSCI 115. Maya Hieroglyphic Writing—(Graduate students register for 215.) Deciphering the hieroglyphic writing of the classic Maya. Principles of archaeological decipherment. Maya calendrical, astronomical, political, and religious/mythological texts on stone, wood, bone, shell, ceramic vessels, and screenfold books. Ancient Maya scribal practice and literacy. The origins of Maya writing and related Mesoamerican writing systems. The impact of epigraphy on the archaeology and linguistics of the Maya. (DA-B; HEF II, IV) GER:DB-SocSci

5 units, alternate years, not given this year (Fox, J)

ANTHSCI 117. Introduction to the Language and Culture of the Aztecs—(Graduate students register for 217.) Spoken and written Nahuatl, the language spoken by the Aztecs and ca 1 million people in present-day Mexico. The history and culture of the Aztecs and related peoples through archaeology, ethnohistory, and ethnography. (HEF IV) GER:DB-SocSci

3-5 units, not given this year

ANTHSCI 118. Readings in Linguistic Anthropology—(Graduate students register for 218.) One or two major related works on language in its cultural context. Works for 2007-08 involve attempts to correlate linguistic and non-linguistic data for analysis of prehistoric human contact and migrations. May be repeated for credit.

2 units, Spr (Fox, J)

ANTHSCI 128B. Globalization and Japan—(Graduate students register for 228B; same as CASA 128B.) Globalization theories in anthropology and sociology, and Japan in the context of these theories. Ethnographic cases of Japan's global presence from the 15th century to the present. Processes of globalization in business management, popular culture, and expatriate communities. Japan's multiculturalization through its domestic globalization. (HEF IV; DA-A) GER:DB-SocSci

3-5 units, Win (Befu, H)

ANTHSCI 130. Paleoanthropology Seminar—(Graduate students register for 230B.) Aspects of human evolution through primary literature and fossils. Topics vary to fit the interests of participants. May be repeated for credit. (HEF II; DA-B) GER: DB-NatSci

3-4 units, Spr (DeGusta, D)

ANTHSCI 130C. Current Issues in Paleoanthropology—(Graduate students register for 230C, same as BIOSCI 130.) Current issues in fossil, archaeological, and genetic evidence for human evolution. Topics chosen by participants. May be repeated for credit.

1 unit, Aut, Win, Spr (DeGusta, D; Klein, R)

ANTHSCI 132B. Paleoanthropological Field Methods—(Graduate students register for 232B.) Analysis of geological maps, remote sensing data, and imagery to locate sites. Sources of funding and logistical considerations. Permission and heritage management issues. Survey methods. Techniques for recovering fossil, lithic, and geological materials. Data management and spatial documentation.

3-4 units, Aut (DeGusta, D)

ANTHSCI 133A. Human Osteology—(Graduate students register for 233A; same as HUMBIO 180.) The human skeleton. Focus is on identification of fragmentary human skeletal remains. Analytical methods include forensic techniques, archaeological analysis, paleopathology, and age/sex estimation. Students work independently in the laboratory with the skeletal collection. (HEF I,V; DA-B) GER: DB-NatSci

5 units, Win (DeGusta, D)

ANTHSCI 133B. Advanced Human Osteology—(Graduate students register for 233B.) Skeletal analytical methods such as paleopathology, taphonomy, osteometry, and functional and evolutionary morphology. Strategies for osteological research. Students conduct independent projects in their area of interest. (HEF II,V; DA-B) GER: DB-NatSci

5 units, Spr (DeGusta, D)

ANTHSCI 140A. Expanding the Toolkit for Quantitative Research in Archaeology—(Graduate students register for 230A.) Topics include statistics and graphics in R, database design, resampling methods, diversity measures, contingency table analysis, and introductory spatial methods. Recommended: basic statistical methods.

3 units, not given this year

ANTHSCI 141. Hunter-Gatherers in Archaeological Perspective—(Graduate students register for 241.) Hunter-gatherer diversity as documented by ethnography and archaeology; how these areas of study provide different but complementary forms of information. Ethnographic case studies of hunter-gatherer groups from Africa, Australia, and N. America; comparisons with examples from the archaeological record.

The use of ethnographic analogy in archaeology; current trends in hunter-gatherer archaeological research. (HEF I, II; DA-B) GER:DB-SocSci, EC-GlobalCom

4-5 units, not given this year

ANTHSCI 142. Incas and their Ancestors: Peruvian Archaeology—(Graduate students register for 242A; same as ARCHLGY 102B.) The development of high civilizations in Andean S. America from hunter-gatherer origins to the powerful, expansive Inca empire. The contrasting ecologies of coast, sierra, and jungle areas of early Peruvian societies from 12,000 to 2,000 B.C. The domestication of indigenous plants which provided the economic foundation for monumental cities, ceramics, and textiles. Cultural evolution, and why and how major transformations occurred. (HEF II, III; DA-B) GER:DB-SocSci, EC-GlobalCom

3-5 units, Spr (Contreras, D)

ANTHSCI 143. Ethnoarchaeology—(Graduate students register for 243.) The study of relationships between observable human behavior and material consequences. How ethnographic observation serves the primary goal of archaeology: to describe variability in past human behavior. The role of ethnoarchaeology in the history of anthropological inquiry, ethnoarchaeological studies of the use of space and subsistence, and future directions. (HEF II, IV; DA-B) GER:DB-SocSci

3-5 units, Spr (Bird, D)

ANTHSCI 144. Ancient Cities in the New World—(Graduate students register for 244.) Preindustrial urbanism as exemplified by prehispanic New World societies. Case studies: the central and southern highlands of Mesoamerica, and the Maya region. Comparative material from highland S. America. (HEF II; DA-B) GER:DB-SocSci

3-5 units, Spr (Robertson, I)

ANTHSCI 144B. India's Forgotten Empire: The Rise and Fall of Indus Civilization—S. Asian proto- and prehistory emphasizing the development of agriculture and social complexity. Rise and fall of the Indus or Harappan civilization; why cultural change occurred the way it did. (HEF II; DA-B) GER:DB-SocSci

3 units, Aut (Truncer, J)

ANTHSCI 144C. Archaeology of Central Mexico—(Graduate students register for 204.) Prehistory of highland Central Mexico from the appearance of agricultural settlements to the arrival of Europeans. The development of the ancient state of Teotihuacan. Regional focus is the basin of Mexico and adjoining regions. Relations between central Mexico and other parts of Mesoamerica including the Maya area, the Gulf lowlands, and Oaxaca. (HEF II; DA-B) GER:DB-SocSci

3-5 units, not given this year

ANTHSCI 145B. Evolution of Civilizations—(Graduate students register for 245B.) How archaeology contributes to understanding prehistoric civilizations. How and why complex social institutions arose, and the conditions and processes behind their collapse. The development of monumental architecture, craft specialization, trade and exchange, and social stratification using examples from the archaeological record. (HEF II, III; DA-B) GER:DB-SocSci

3-5 units, not given this year

ANTHSCI 146A. The Aztecs and Their Ancestors: Introduction to Mesoamerican Archaeology—The prehispanic cultures of Mesoamerica through archaeology and ethnohistory, from the archaic period to the Spanish conquest in the 16th century. (HEF II) GER:DB-SocSci, EC-GlobalCom

3-5 units, Win (Robertson, I)

ANTHSCI 147. Archaeology of Modern Times—(Same as ARCHLGY 104.) Archaeological theory, method, and data are used to approach an issue of contemporary public concern. Issues include resource and energy management strategies such as the electricity situation in California, biodegradation and solid waste management, the relationship between human beings and dogs, ethnic wars in the Balkans and elsewhere, and Bill Gates' strategies in the rise of Microsoft. (HEF IV) GER:DB-SocSci

5 units, not given this year

ANTHSCI 149B. Digital Methods in Archaeology—(Graduate students register for 208.) Hands-on. Topics include: data capture, digital survey, and mapping instruments; GPS; digital video and photography; 3-D scanning; data analysis; CAD; GIS; panoramic virtual reality; and photogrammetry. (HEF V; DA-B) GER:DB-EngrAppSci

3-5 units, Win (Contreras, D)

ANTHSCI 151. Anthropology and Demography—(Graduate students register for 251.) Topics include W. Europe and China as examples of extreme demographic regimes. (HEF V; DA-A) GER:DB-SocSci

5 units, not given this year

ANTHSCI 155. Demography and Life History Theory—(Graduate students register for 255.) Problems in demography and theoretical population biology applied to human systems. Emphasis is on establishing relationships between models in theoretical population biology and empirical demographic methodology. Topics include philosophy of models and model building, population dynamics, stable population theory, species interactions in human ecology, models of infectious diseases and their control, cultural evolution. Prerequisites: HUMBIO 137 or consent of instructor. (HEF I, III, V; DA-C) GER:DB-SocSci

5 units, not given this year

ANTHSCI 160B. Conservation Anthropology—Environmental conservation as a social and cultural process including strategies used around the world to achieve conservation goals such as market-based conservation, protected areas, and single-species conservation. Emphasis is on social and cultural issues and theory. (HEF III, IV; DA-A) GER:DB-SocSci

5 units, not given this year

ANTHSCI 162B. Ethnography and Ethnohistory in the Andean World—(Graduate students register for 262B.) Resistance, survival, and social organization of Andean indigenous cultures, including those of the tropical Amazon lowlands. Emphasis is on the indigenous perspective. Ethnographic and ethnohistoric documents and findings that reflect events and thoughts from the Conquest to the present. Indigenous community structures, special rights for social inclusion, rituals, and worldview under traditional and new leadership. GER:DB-SocSci

3-5 units, Win (Karp-Toledo, E)

ANTHSCI 163. Human Behavioral Ecology—(Graduate students register for 263; same as HUMBIO 117.) Theory, method, and application in anthropology. How theory in behavioral ecology developed to understand animal behavior is applied to questions about human economic decision making in ecological and evolutionary contexts. Topics include decisions about foraging and subsistence, competition and cooperation, mating, and reproduction and parenting. (HEF I, III; DA-A) GER:DB-SocSci

3-5 units, Aut (Bird, R)

ANTHSCI 164. Ecological Anthropology—(Graduate students register for 264; same as HUMBIO 118.) Dynamics of culturally inherited human behavior and its relationship to social and physical environments. Topics include a history of ecological approaches in anthropology, subsistence ecology, sharing, risk management, territoriality, warfare, and resource conservation and management. Case studies from Australia, Melanesia, Africa, and S. America. (HEF I, III; DA-A) GER:DB-SocSci

3-5 units, not given this year

ANTHSCI 165B. Central America: Environment, Sustainable Development, and Security—(Graduate students register for 265B; same as IPER 265.) Interrelationships among environmental stress, poverty, and security in Central America, with focus on Costa Rica. The legacy of the Cold War in Central America as manifested in the Contra war and U.S. policy. Current development schemes and their impact on environment and security in the region. Dilemmas between population growth in the developing world and consumption patterns in the industrial world. Possible optional field trip to Costa Rica over Spring Break at extra expense; limited capacity. (HEF III) GER:DB-SocSci

3-5 units, not given this year

ANTHSCI 167. Social Policy for Sustainable Resource Use—(Graduate students register for 267; same as EARTHSYS 167/267.) The development of social policies that foster a positive human role in the ecosystem. Goal is to develop group skills in a team setting while researching case studies of forest peoples impacted by integration into the global economy. The case of voluntary forest product certification under the Forest Stewardship Council system. Local participation in policy development, the effectiveness of certification, tenure and institutional aspects of sustainability, indigenous rights and forest conservation, and the role of local communities and workers in sustaining forests over the long term. Prerequisite: consent of instructor. (HEF II, IV, V; DA-A) GER:DB-SocSci

5 units, Spr (Irvine, D)

ANTHSCI 167C. Managing the Commons: Evolving Theories for Sustainable Resource Use—(Graduate students register for 267C; same as EARTHSYS 167C/267C.) Development of common property theory since Hardin's article on the tragedy of the commons. Interdisciplinary theorizing about sustainable management of common-pool resources such as grazing, forest, or marine resources; debates about sustainability of commons management within heterogeneous state and global systems; and new commons such as atmosphere or the information commons. Links among theory, methods, and policy. Prerequisite: 190 or consent of instructor. (HEF II, III, IV; DA-A) GER:DB-SocSci

5 units, Aut (Irvine, D)

ANTHSCI 168. Signaling Theory—(Graduate students register for 268.) Why does the peacock have such a large elaborate tail? Why does conspicuous consumption serve to create markers of distinction? How does the pursuit of social capital generate prestige? Answers to these questions from convergent scholarship in social theory, economic theory, and evolutionary theory. The use of signaling theory to explain disparate social and material phenomena. Authors include Veblen, Bourdieu, and Zahavi. Prerequisite for undergraduates: consent of instructor. GER:DB-SocSci

3 units, Aut (Bird, R)

ANTHSCI 169. Conservation and Evolutionary Ecology—(Graduate students register for 269.) Environmental degradation resulting from human behavior, and what can be done about it. Patterns of interaction between people and environments, and why they vary over time and space. Topics include adaptation and behavior, resource acquisition and utilization, conflicts of interest, collective action problems, conspicuous consumption, waste, land management, and public policy. (HEF I, III; DA-A) GER:DB-SocSci

3-5 units, Win (Bird, D)

ANTHSCI 170. Medical Anthropology—(Same as HUMBIO 178.) The crosscultural study of the health beliefs and healing systems around the world. How social processes shape human health. (HEF I,IV; DA-C) GER:DB-SocSci, EC-GlobalCom

3 units, not given this year

ANTHSCI 170A. Issues in Water, Health, and Development—(Graduate students register for 270A.) How water affects community health. Topics include transmission and control of waterborne diseases, pollution, dam building, distribution and management of fresh water resources, and water wars. The impact of development projects related to water distribution and management. International focus with domestic examples. Prerequisite: Human Biology core or equivalent. GER:DB-SocSci

5 units, Win (Levy, K)

ANTHSCI 171. Aging: From Biology to Social Policy—(Same as HUMBIO 149.) What people can expect when they join the ranks of the elderly. Issues include social security, medical care, lifespan, and the cultural, social, and economic consequences of a large elderly population in the U.S. and other countries. Films, service learning component. (HEF I; DA-C) GER:DB-SocSci

5 units, Win (Barnett, C)

ANTHSCI 178A. Past and Present Pestilence: An Interdisciplinary Examination of the Impact of Zoonotic Diseases—(Graduate students register for 278A.) Major zoonotic diseases in human beings, including HIV, tuberculosis, malarias, plagues, measles, and poxes, etc. Pathology, etiology, and transmission. Historical and current demographic, economic, and social impacts, and how these inform eradication and control strategies. Research paper. GER:DB-SocSci

3-4 units, Spr (Ryan, S)

ANTHSCI 179. Environmental Change and Emerging Infectious Diseases—(Graduate students register for 279; same as HUMBIO 114.) The changing epidemiological environment. How human-induced environmental changes, such as global warming, deforestation and land-use conversion, urbanization, international commerce, and human migration, are altering the ecology of infectious disease transmission, and promoting their re-emergence as a global public health threat. Case studies of malaria, cholera, hantavirus, plague, and HIV. (HEF III; DA-C) GER:DB-SocSci

3-5 units, Aut (Durham, W; Jones, J)

ANTHSCI 179A. Ethical Debates in Environment and Health Policy—(Graduate students register for 279A.) Topics include the use of DDT in malaria control, overseas drug trials, human rights and disease eradication, resettlement programs, quarantine, and animal culling. Writing-intensive; how to frame issues for a popular audience. Prerequisite: Human Biology core or equivalent. GER:DB-SocSci

5 units, Spr (Levy, K)

ANTHSCI 187. The Genetic Structure of Populations—(Graduate students register for 287.) Inference of evolutionary history from the current structure of genetic variation within a population genetic and phylogenetic framework. Methods include tree inference, analysis of molecular variance, gene genealogies and the coalescent, phylogeography, clustering algorithms, and Bayesian and frequentist approaches. Applications in evolutionary studies, medicine, conservation, and forensics. Principles and methods illustrated primarily with human and other primate examples; students investigate species of own choice. Prerequisites: 2A or Biology Core. (HEF II, III, V; DA-C) GER:DB-SocSci

5 units, Spr (Jobin, M)

ANTHSCI 188. Research in Anthropological Genetics—(Graduate students register for 288.) Seminar. Current research at Stanford and beyond. Presentations by instructor, guests, and class participants. May be repeated for credit. (HEF V; DA-C)

1-5 units, not given this year

ANTHSCI 190. Social Theory in the Anthropological Sciences—Required of majors. Foundational course in the history of social theory in anthropology from the late 19th century to the present. Major approaches to human culture and society: symbolic, social, material, and psychological. Questions about the role of theory in anthropology and how it can be applied to human issues. (HEF IV) GER:DB-SocSci, WIM

5 units, Win (Brown, M)

ANTHSCI 190B. Evolutionary Theory in Anthropological Sciences—History of evolutionary theory from the 19th century to present, emphasizing anthropological applications. Theory and concept in evolutionary biology; evolutionary theories of culture; and interactions and implications of genetic, social, and cultural evolution. Emphasis is on tools of analysis and the value of evolutionary thinking for formulating research questions in anthropology today. (HEF II, III) GER:DB-SocSci

5 units, Win (Jones, J)

ANTHSCI 191A. Communicating Science: Proposals, Talks, Articles—(Graduate students register for 291A.) The principles and practice of effective communication in science. Grant proposals, conference presentations, and scientific journal articles. Focus is on writing and speaking skills in professional contexts. (HEF V) GER:DB-SocSci

4-5 units, not given this year

ANTHSCI 191B. Conduct and Misconduct in Science—(Graduate students register for 291B.) The structure of modern science through a study of ethics and misconduct in research. Case studies of alleged scientific misconduct; what constitutes ethical research practices; the meaning of authorship; the limits of grantsmanship; the place of science in society; and roles of advisers, students, and postdocs. Theoretical and practical aspects of these issues. Emphasis is on anthropology and biology. GER:DB-SocSci

3-5 units, not given this year

ANTHSCI 191C. Anthropological Sciences Capstone Core Seminar—See 291 for description. Required of undergraduate majors who are not in the honors program. Must be taken in the senior year, or by petition in the junior year.

1-3 units, Aut (Jones, J)

ANTHSCI 192. Data Analysis in the Anthropological Sciences—(Graduate students register for 292.) Univariate, multivariate, and graphical methods used for analyzing quantitative data in anthropological research. Archaeological and paleobiological examples. Recommended: algebra. (HEF V) GER:DB-Math

5 units, Spr (Robertson, I)

ANTHSCI 192B. Statistical Computing for the Anthropological Science—(Graduate students register for 292B.) Tools of modern statistical computing. Emphasis is on problems in the Anthropological Sciences. Topics include the R statistical computing language, programming basics, probability distributions, likelihood, Monte Carlo simulation, graphics and exploratory data analysis, spatial data and maps, and Bayesian inference. (HEF V) GER:DB-Math

3-5 units, not given this year

ANTHSCI 193. Prefield Research Seminar—Required of Anthropological Sciences honors students. Preparation for field or laboratory research. Students develop a testable hypothesis and realistic data collection procedures, and review data collection techniques including participant observation, interviews, surveys, and sampling procedures. Emphasis is on theory-guided empirical work. (HEF V) GER:DB-SocSci

5 units, not given this year

ANTHSCI 195. Research Project—Independent research conducted under faculty supervision, normally taken junior or senior year in pursuit of an honors project. May be taken for more than one quarter for credit. Prerequisite: completed application to the honors program.

1-10 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 196B. Senior Honors Seminar—Techniques for interpreting data, organizing bibliographic material, writing, editing, and revising. Preparation of papers for conferences and publications in anthropology.

5 units, Aut (Staff)

ANTHSCI 197. Internship in Anthropological Sciences—Opportunity for students to pursue their specialization in an institutional setting such as a laboratory, clinic, research institute, or government agency. May be repeated for credit.

4-5 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 198. Museum Method—Individually directed work on anthropology collections. Introduction to the computerized storage and retrieval system, cataloging, exhibit techniques. May be taken for one or two quarters by arrangement with instructor. (HEF V)

1-4 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 199. Directed Individual Study—Prerequisite: consent of instructor.

1-10 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

ANTHSCI 202. Women, Fertility, and Work—(Graduate section; see 102. HEF I, IV; DA-A)

5 units, not given this year

ANTHSCI 203. Topics in the Anthropology of China and Taiwan—Graduate seminar. Topics vary. May be repeated for credit. (DA-A)

3-5 units, Win (Brown, M)

ANTHSCI 204. Archaeology of Central Mexico—(Graduate section; see 144C.)

3-5 units, not given this year

ANTHSCI 206. Human Origins—(Graduate section; see 6.)

5 units, Win (Klein, R)

ANTHSCI 208. Digital Methods in Archaeology—(Graduate section; see 149B.)

3-5 units, Win (Contreras, D)

ANTHSCI 210. Examining Ethnographies—Eight or nine important ethnographies, including their construction, their impact, and their faults and virtues. (HEF IV; DA-A)

5 units, not given this year

ANTHSCI 211. Language and Prehistory—(Graduate section; see 111.)

3 units, alternate years, not given this year (Fox, J)

ANTHSCI 211G. Introduction to Graduate Studies in Anthropology—(Same as CASA 311G.) Required graduate seminar. The history of anthropological theory and key theoretical and methodological issues of the discipline.

5 units, not given this year

ANTHSCI 212. Linguistic Anthropology—Seminar. The ethnography of communication; language repertoires including registers, dialects, styles, and their functions; language classification, phylogeny, ethnicity, and ideology; vocabulary, grammar, and codability in culture and cognition; discourse, conversation, narrative, and poetics; writing and literacy; multilingualism and extinction. Emphasis is on authorial argumentation and theoretical preoccupations, linguistic fieldwork, and the richness of language repertoires around the world. Sources include monographs and articles on relationships among language, culture, and society. Student presentations. (HEF IV; DA-A)

5 units, alternate years, not given this year (Fox, J)

ANTHSCI 214. The Biology and Evolution of Language—(Graduate section; see 114.)

4-5 units, Spr (Fox, J)

ANTHSCI 215. Maya Hieroglyphic Writing—(Graduate section; see 115.)

5 units, alternate years, not given this year (Fox, J)

ANTHSCI 217. Introduction to the Language and Culture of the Aztecs—(Graduate section; see 117.)

3-5 units, not given this year

ANTHSCI 218. Readings in Linguistic Anthropology—(Graduate section; see 118.)

2 units, Spr (Fox, J)

ANTHSCI 228B. Globalization and Japan—(Graduate section; see 128B.)

3-5 units, Win (Befu, H)

ANTHSCI 230A. Expanding the Toolkit for Quantitative Research in Archaeology—(Graduate section; see 140A.)

3 units, not given this year

ANTHSCI 230B. Paleoanthropology Seminar—(Graduate section; see 130.)

3-4 units, Spr (DeGusta, D)

ANTHSCI 230C. Current Issues in Paleoanthropology—(Graduate section; see 130C.)

1 unit, Aut, Win, Spr (DeGusta, D; Klein, R)

ANTHSCI 232B. Paleoanthropological Field Methods—(Graduate section; see 132B.)
3-4 units, Aut (DeGusta, D)

ANTHSCI 233A. Human Osteology—(Graduate section; see 133A.)
5 units, Win (DeGusta, D)

ANTHSCI 233B. Advanced Human Osteology—(Graduate section; see 133B.)
5 units, Spr (DeGusta, D)

ANTHSCI 241. Hunter-Gatherers in Archaeological Perspective—(Graduate section; see 141.)
4-5 units, not given this year

ANTHSCI 242. Beginnings of Social Complexity
5 units, not given this year

ANTHSCI 242A. Incas and their Ancestors: Peruvian Archaeology—(Graduate section; see 142.)
3-5 units, Spr (Contreras, D)

ANTHSCI 243. Ethnoarchaeology—(Graduate section; see 143.)
3-5 units, Spr (Bird, D)

ANTHSCI 244. Ancient Cities in the New World—(Graduate section; see 144.)
3-5 units, Spr (Robertson, I)

ANTHSCI 245B. Evolution of Civilizations—(Graduate section; see 145B.)
3-5 units, not given this year

ANTHSCI 251. Anthropology and Demography—(Graduate section; see 151.)
5 units, not given this year

ANTHSCI 254. Applied Bayesian Analysis—(Same as POLISCI 354F.) Bayesian modeling in the social sciences emphasizing applications in political science, anthropological science, sociology, and education testing. Topics include: Bayesian computation via Markov chain Monte Carlo; Bayesian hierarchical modeling; Bayesian models for latent variables and latent states (measurement modeling); dynamic models; and Bayesian analysis of spatial models. Implementation of Bayesian approaches (priors, efficient sampling from posterior densities), data analysis, and model comparisons. Final project. Prerequisites: exposure to statistical modeling such as 200-level STATS or POLISCI 150/350B,C, or ANTHSCI 292.
3-5 units, not given this year

ANTHSCI 255. Demography and Life History Theory—(Graduate section; see 155.)
5 units, not given this year

ANTHSCI 262B. Ethnography and Ethnohistory in the Andean World—(Graduate section; see 162B.)
3-5 units, Win (Karp-Toledo, E)

ANTHSCI 262C. Cultural Diversity, Ethnicity, and Governance in Indigenous Latin America—(Graduate section; see 103.)
3-5 units, Spr (Karp-Toledo, E)

ANTHSCI 263. Human Behavioral Ecology—(Graduate section; see 163.)
3-5 units, Aut (Bird, R)

ANTHSCI 264. Ecological Anthropology—(Graduate section; see 164.)
3-5 units, not given this year

ANTHSCI 265B. Central America: Environment, Sustainable Development, and Security—(Graduate section; see 165B; same as IPER 265.)
3-5 units, not given this year

ANTHSCI 267. Social Policy for Sustainable Resource Use—(Graduate section; see 167; same as EARTHSYS 267.)
5 units, Spr (Irvine, D)

ANTHSCI 267C. Managing the Commons: Evolving Theories for Sustainable Resource Use—(Graduate section; see 167C; same as EARTHSYS 267C.)
5 units, Aut (Irvine, D)

ANTHSCI 268. Signaling Theory—(Graduate section; see 168.)
3 units, Aut (Bird, R)

ANTHSCI 269. Conservation and Evolutionary Ecology—(Graduate section; see 169.)
3-5 units, Win (Bird, D)

ANTHSCI 270. Advanced Topics in Medical Anthropology—Graduate seminar. Specialized topics in human health, illness, and healing from anthropological perspectives. Topics based upon faculty and graduate student research interests and current issues. Students present topical research and analyses from published sources; required journal-quality paper. The history, theories, and methods of research. Recommended: courses in medical anthropology. (HEF I, IV; DA-C)
3-5 units, not given this year

ANTHSCI 270A. Issues in Water, Health, and Development—(Graduate section; see 170A.)
5 units, Win (Levy, K)

ANTHSCI 278A. Past and Present Pestilence: An Interdisciplinary Examination of the Impact of Zoonotic Diseases—(Graduate section; see 178A.)
3-4 units, Spr (Ryan, S)

ANTHSCI 279. Environmental Change and Emerging Infectious Diseases—(Graduate section; see 179)
3-5 units, Aut (Durham, W; Jones, J)

ANTHSCI 279A. Ethical Debates in Environment and Health Policy—(Graduate section; see 179A.)
5 units, Spr (Levy, K)

ANTHSCI 286. Advanced Andean Archaeology—Focus is on current research of guest lecturers. Topics this year include prehistoric impacts of El Niño, human sacrifice in prehispanic Peru, and mortuary archaeology on the north coast of Peru. Prerequisite: 142/242 or equivalent or consent of instructor.
1-3 units, not given this year

ANTHSCI 287. The Genetic Structure of Populations—(Graduate section; see 187.)
5 units, Spr (Jobin, M)

ANTHSCI 288. Research in Anthropological Genetics—(Graduate section; see 188.)
1-5 units, Aut (Jobin, M)

ANTHSCI 290A. Advanced Social Theory in the Anthropological Sciences—Social theories that have influenced anthropology including evolutionism, Marxism, interpretivism, and postmodernism. Implications of debates among theorists for anthropological research. Prerequisite: graduate standing or consent of instructor. With consent of instructors of 190 and 290A, undergraduate majors may substitute 290A for 190. (HEF IV)
5 units, Aut (Brown, M)

ANTHSCI 290B. Advanced Evolutionary Theory in Anthropological Sciences—History of evolutionary theory from the 19th century to present, emphasizing anthropological applications. Theory and concept in evolutionary biology; evolutionary theories of culture; and interactions of genetic, social, and cultural evolution and their implications. Emphasis is on tools of analysis and the value of evolutionary thinking for formulating research questions in anthropology today. Prerequisite: graduate standing or consent of instructor. (HEF II, III)
5 units, Win (Jones, J)

ANTHSCI 291. Graduate Core Seminar—The use of the scientific method in anthropological research. Published papers from subfields illustrate effective research design, the formulation and testing of hypotheses, and comparative methods. Field exercises in interviewing, observation, and taking and using field notes. The ethics of field research and procedures for maintaining physical and mental health in the field. May be repeated for credit.
1-5 units, Aut (Jones, J), Win (Staff), Spr (Truncer, J)

ANTHSCI 291A. Communicating Science: Proposals, Talks, Articles—(Graduate section; see 191A.)
4-5 units, not given this year

ANTHSCI 291B. Conduct and Misconduct in Science—(Graduate section; see 191B.)
3-5 units, not given this year

ANTHSCI 292. Data Analysis in the Anthropological Sciences—(Graduate section; see 192.)
5 units, Spr (Robertson, I)

ANTHSCI 292B. Statistical Computing for the Anthropological Science—(Graduate section; see 192B.)
3-5 units, not given this year

ANTHSCI 293B. Master's Thesis Writing Seminar—May be repeated for credit.
2-4 units, Win (Staff)

ANTHSCI 294. Proposal Writing Seminar—Required of ANTHSCI Ph.D. students. Hands-on practical training in grant writing methods. Students draft a research prospectus based on their own interests and proposed projects, and work closely with their advisers and other faculty. May be repeated for credit.
5 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 295. Research in Anthropological Sciences—Supervised work with an individual faculty member on the student research project. May be taken for more than one quarter.
3-5 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 296. Graduate Internship—Provides graduate students with the opportunity to pursue their area of specialization in an institutional setting such as a laboratory, clinic, research institute, or government agency.
4-5 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 297. Teaching Assistantship—Supervised experience as assistant in one undergraduate course.
3-5 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 298. Dissertation Writing Seminar—Required of ANTHSCI Ph.D. students. Students work with advisers and committee members to write a draft of their dissertation.
5 units, Aut, Win, Spr, Sum (Staff)

ANTHSCI 299. Directed Individual Study—Prerequisite: consent of instructor.
1-10 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES FOR ANTHROPOLOGICAL SCIENCES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ARCHLGY 101B/301B. Humanized Landscapes: Archaeological Approaches to Human/Environment Interactions
3-5 units, Aut (Contreras, D)

BIOSCI 146. Population Studies
1 unit, Win (Feldman, M)

BIOSCI 150/250. Human Behavioral Biology—(Same as HUMBIO 160.)
5 units, Spr (Sapolsky, R), alternate years, not given next year

CASA 93. Prefield Research Seminar
5 units, Spr (Inoue, M)

CASA 94. Postfield Research Seminar
5 units, Aut (Burce, A)

CASA 150. Archaeological Methods—(Same as ARCHLGY 102.)
5 units, Spr (Hodder, I)

EDUC 191X/291X. Introduction to Survey Research
3-4 units, Aut (Adams, J)

HUMBIO 2A. Genetics, Evolution, and Ecology
5 units, Aut (Boggs, C; Durham, W; Francke, U)

HUMBIO 2B. Culture, Evolution, and Society
5 units, Aut (Klein, R; Brown, M)

SURG 101. Regional Study of Human Structure
5 units, Win (Gosling, J; Whitmore, I)

OVERSEAS STUDIES

Courses approved for the Anthropology major and taught overseas can be found in the "Overseas Studies" section of this bulletin, in the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu.

BERLIN

OSPBER 11. The Vanishing City: Lost Architecture and the Art of Commemoration in Berlin
5 units, Spr (Ebeling, K)

SANTIAGO

OSPSANTG 104X. Modernization and Culture in Latin America
5 units, Aut (Subercaseaux, B)

APPLIED PHYSICS

Emeriti: (Professors) Alexander L. Fetter, Theodore H. Geballe, Walter A. Harrison, W. Conyers Herring, Peter A. Sturrock; (*Professors, Research*) Calvin F. Quate, Helmut Wiedemann, Herman Winick; (*Courtesy*) Gordon S. Kino

Chair: Aharon Kapitulnik

Professors: Malcolm R. Beasley, Arthur Bienenstock, Steven M. Block, Philip H. Bucksbaum, Robert L. Byer, Steven Chu, Sebastian Doniach, Martin M. Fejer, Daniel S. Fisher, Stephen E. Harris, Aharon Kapitulnik, Mark A. Kasevich, Hideo Mabuchi, Vahé Petrosian, Zhi-Xun Shen, Yoshihisa Yamamoto

Associate Professors: Ian R. Fisher, Kathryn A. Moler

Assistant Professors: Martin Greven, Mark J. Schnitzer

Courtesy Professors: Bruce M. Clemens, James S. Harris, Lambertus Hesselink, David A. B. Miller, W. E. Moerner, Douglas D. Osheroff, Stephen R. Quake, Robert H. Siemann, Shoucheng Zhang

Consulting Professors: Thomas M. Baer, Richard G. Brewer, John D. Fox, Bernardo A. Huberman, John R. Kirtley, Stuart S. P. Parkin, Daniel Rugar

Lecturers: Kyle S. Cole (Autumn), Zhirong Huang (Winter)

Visiting Professor: Yuval Oreg

Department Office: Applied Physics 101
Mail Code: 94305-4090
Phone: (650) 723-4027
Web Site: http://appliedphysics.stanford.edu

Courses given in Applied Physics have the subject code APPPHYS. For a complete list of subject codes, see Appendix.

The Department of Applied Physics offers qualified students with backgrounds in physics or engineering the opportunity to do graduate course work and research in the physics relevant to technical applications and natural phenomena. These areas include accelerator physics, biophysics, condensed matter physics, nanostructured materials, optoelectronics, photonics, quantum optics, space science and astrophysics, synchrotron radiation and applications. Student research is supervised by the faculty members listed above and also by various members of other departments such as Biological Sciences, Chemistry, Electrical Engineering, Materials Science and Engineering, Physics, SLAC, and faculty of the Medical School who are engaged in related research fields. Research activities are carried out in laboratories including the Geballe Laboratory for Advanced Materials, the Edward L. Ginzton Laboratory, the Hansen Experimental Physics Laboratory, the Stanford Linear Accelerator Center, and the Stanford Synchrotron Radiation Laboratory.

The number of graduate students admitted to Applied Physics is limited. Applications should be received by January 8, 2008. Graduate students normally enter the department only in Autumn Quarter.

GRADUATE PROGRAMS

Admission requirements for graduate work in Applied Physics include a bachelor's degree in Physics or an equivalent engineering degree. Students entering the program from an engineering curriculum should expect to spend at least an additional quarter of study acquiring the background to meet the requirements for advanced degrees in Applied Physics.

MASTER OF SCIENCE

The University's basic requirements for the master's degree are discussed in the "Graduate Degrees" section of this bulletin. The minimum requirements for the degree are 45 units, of which at least 39 units must be graduate-level courses in applied physics, engineering, mathematics, and physics. The required program consists of the following:

1. Courses in Physics and Mathematics to overcome deficiencies, if any, in undergraduate preparation.
2. Basic graduate courses (letter grade required):
   - a) Advanced Mechanics—one quarter, 3 units: PHYSICS 210, *or* approved substitute 211
   - b) Electrodynamics—two quarters, 6 units: PHYSICS 220, 221
   - c) Quantum Mechanics—two quarters, 6 units: PHYSICS 230, 231, *or* approved substitutes 232, 330, 331, 332, 370
3. 30 units of additional advanced courses in science and/or engineering. 15 of the 30 units may be any combination of advanced courses, Directed Study (APPPHYS 290), and 1-unit seminar courses, to complete the requirement of 45 units. At least 15 of these 30 units must be taken for a letter grade.
4. A final overall grade point average (GPA) of 3.0 (B) is required for courses used to fulfill degree requirements.

There are no department or University examinations, and a thesis is not required. If a student is admitted to the M.S. program only, but later wishes to change to the Ph.D. program, the student must apply to the department's Admissions Committee.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. including residency, dissertation, and examinations are discussed in the "Graduate Degrees" section of this bulletin. The program leading to a Ph.D. in Applied Physics consists of course work, research, qualifying for Ph.D. candidacy, a research progress report, a University oral examination, and a dissertation as follows:

1. *Course Work:*
   - a) Courses in Physics and Mathematics to overcome deficiencies, if any, in undergraduate preparation.
   - b) Basic graduate courses* (letter grades required):
     - 1) Advanced Mechanics—one quarter: PHYSICS 210, *or* approved substitute 211
     - 2) Statistical Physics—one quarter: PHYSICS 212
     - 3) Electrodynamics—two quarters: PHYSICS 220, 221
     - 4) Quantum Mechanics—two quarters: PHYSICS 230, 231, *or* approved substitutes 232, 330, 331, 332, 370
     - 5) Laboratory—one quarter: APPPHYS 207, 208, 304, 305; BIOSCI 232; EE 234, 410; MATSCI 171, 172, 173; PHYSICS 301.
   - c) 18 units of additional advanced courses in science and/or engineering, not including Directed Study (APPPHYS 290), Dissertation Research (APPPHYS 390), and 1-unit seminar courses. Only 3 units at the 300 or above level may be taken on a satisfactory/no credit basis.
   - d) 96 units of additional courses to meet the minimum residency requirement of 135. Directed study and research units as well as 1-unit seminar courses can be included.
   - e) A final average overall grade point average (GPA) of 3.0 (B) is required for courses used to fulfill degree requirements.
   - f) Students are normally expected to complete the specified course requirements by the end of their third year of graduate study.
2. *Research:* may be conducted in a science/engineering field under the supervision of a member of the Applied Physics faculty or appropriate faculty from other departments.
3. *Ph.D. Candidacy:* satisfactory progress in academic and research work, together with passing the Ph.D. candidacy qualifying examination, qualifies the student to apply for Ph.D. candidacy, and must be completed before the third year of graduate registration. The examination consists of a seminar on a suitable subject delivered by the student before the faculty academic adviser (or an approved substitute) and two other members of the faculty selected by the department.
4. *Research Progress Report:* normally before the end of the Winter Quarter of the fourth year of enrollment in graduate study at Stanford, the student arranges to give an oral research progress report of approximately 45 minutes, of which a minimum of 15 minutes should be devoted to questions from the Ph.D. reading committee.
5. *University Ph.D. Oral Examination*: consists of a public seminar in defense of the dissertation, followed by private questioning of the candidate by the University examining committee.
6. *Dissertation:* must be approved and signed by the Ph.D. reading committee.

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* Requirements for item '1b' may be totally or partly satisfied with equivalent courses taken elsewhere, pending the approval of the graduate study committee.

COURSES

(AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

APPPHYS 68N. Lasers and Photons—Stanford Introductory Seminar. Preference to freshmen. The physics of lasers and their light. Computer applets and hands-on investigations. Historical development of ideas about light: electromagnetic waves; particles; special relativity; quantum theory; and the laser. Properties of laser light: wavelength and frequency; coherence; polarization; interference; diffraction; and linear and nonlinear optics. Lasers and applications from Schawlow and Townes to Linac Coherent Light Source. Prerequisites: high school physics and calculus. GER:DB-EngrAppSci

3 units, Aut (Bucksbaum, P)

APPPHYS 69N. Advanced Electronic Materials: Principles and Applications—Stanford Introductory Seminar. Preference to freshmen. Topics include: introduction to quantum mechanics and the behavior of electrons in solids; semiconductor devices; superconductors; magnetic materials used for applications and data storage; and aspects of nanoscience and nanotechnology. Prerequisite: high school physics. GER:DB-EngrAppSci

3 units, Spr (Fisher, I)

APPPHYS 78Q. Tools of Nanotechnology—Stanford Introductory Seminar. Preference to sophomores. Advances in the visualization and manipulation of matter that enable a new era of nanotechnology. Nanoscale imaging and manipulation tools, highlighting Stanford research. Research lab tours. Prerequisite: high school physics. GER:DB-EngrAppSci

3 units, Aut (Cole, K)

APPPHYS 79Q. Energy Choices for the 21st Century—Stanford Introductory Seminar. Preference to sophomores. Choices for meeting the future energy needs of the U.S. and the world. Basic physics of energy sources, technologies that might be employed, and related public policy issues. Trade-offs and societal impacts of different energy sources. Policy options for making rational choices for a sustainable world energy economy. GER:DB-EngrAppSci

3 units, Aut (Fox, J; Geballe, T)

APPPHYS 192. Introductory Biophysics—(For undergraduates; see 292.)

3 units, Spr (Doniach, S), alternate years, not given next year

APPPHYS 207. Laboratory Electronics—Lecture/lab emphasizing analog and digital electronics for lab research. RC and diode circuits. Transistors. Feedback and operational amplifiers. Active filters and circuits. Pulsed circuits, voltage regulators, and power circuits. Precision circuits, low-noise measurement, and noise reduction techniques. Circuit simulation tools. Principles of synchronous demodulation and applications of lock-in amplifiers. Combinatorial and synchronous digital circuits. Design using programmable logic. Analog/digital conversion. Microprocessors and real time programming. Current lab interface protocols. Techniques commonly used for lab measurements. Development of student lab projects during the last three weeks of 208. Limited enrollment. Prerequisites: undergraduate device and circuit exposure.

3 units, Win (Fox, J)

APPPHYS 208. Laboratory Electronics—Lecture/lab emphasizing analog and digital electronics for lab research. RC and diode circuits. Transistors. Feedback and operational amplifiers. Active filters and circuits. Pulsed circuits, voltage regulators, and power circuits. Precision circuits, low-noise measurement, and noise reduction techniques. Circuit simulation tools. Principles of synchronous demodulation and applications of lock-in amplifiers. Combinatorial and synchronous digital circuits. Design using programmable logic. Analog/digital conversion. Microprocessors and real time programming. Current lab interface protocols. Techniques commonly used for lab measurements. Development of student lab projects during the last three weeks of 208. Limited enrollment. Prerequisites: undergraduate device and circuit exposure.

3 units, alternate years, not given this year

APPPHYS 215. Numerical Methods for Physicists and Engineers—Review of basic numerical techniques with additional advanced material: derivatives and integrals; linear algebra; linear least squares fitting, FFT and wavelets, singular value decomposition, linear prediction; optimization, nonlinear least squares, maximum entropy methods; deterministic and stochastic differential equations, Monte Carlo methods.

3 units, Aut (Doniach, S)

APPPHYS 216. X-Ray and VUV Physics—Research and classical concepts in photon science. Photon-electron interactions; x-ray absorption and Compton scattering. X-ray spectroscopy; EXAFS, SEXAFS, edge structure, magnetic circular dichroism, and linear dichroism. Photoemission spectroscopy and many-electron effects: angle-resolved and integrated photoemission, resonance photoemission, spin-polarized photoemission. Photoelectron diffraction and holography. X-ray interactions with condensed matter: diffraction and scattering. Photon sources: synchrotron, wigglers, and undulators. Photon and electron detectors and analyzers. Prerequisite: familiarity with quantum mechanics.

3 units, alternate years, not given this year

APPPHYS 217. Estimation and Control Methods for Applied Physics—Recursive filtering, parameter estimation, and feedback control methods based on linear and nonlinear state-space modeling. Topics in: dynamical systems theory; practical overview of stochastic differential equations; model reduction; and tradeoffs among performance, complexity, and robustness. Numerical implementations in MATLAB. Contemporary applications in systems biology and quantum precision measurement. Prerequisites: linear algebra and ordinary differential equations.

3 units, Spr (Mabuchi, H)

APPPHYS 218. X-Ray and Neutron Scattering in the 21st Century—Interaction of x-rays and neutrons with matter. Modern sources of radiation: synchrotrons, x-ray free electron lasers, and spallation neutron sources. Scattering formulae. Determination of molecular, crystal, and magnetic structures, and their associated charge, lattice, and magnetic excitations. Applications from condensed matter physics, materials science, biophysics, medicine, and the arts. Examples include thermal and quantum phase transitions, excitations and competing phases in high-temperature superconductors, materials under extreme pressure, structure of nanoparticles, proteins and water, computer-aided tomography, and nondestructive testing of art objects.

3 units, Win (Greven, M), alternate years, not given next year

APPPHYS 223. Stochastic and Nonlinear Dynamics—(Same as BIOSCI 223.) Theoretical analysis of dynamical processes: dynamical systems, stochastic processes, and spatiotemporal dynamics. Motivations and applications from biology and physics. Emphasis is on methods including qualitative approaches, asymptotics, and multiple scale analysis. Prerequisites: ordinary and partial differential equations, complex analysis, and probability or statistical physics.

3 units, Spr (Fisher, D)

APPPHYS 226. Physics of Quantum Information—Laws and concepts of quantum information science. Postulates of quantum mechanics: symmetrization postulate, quantum indistinguishability and multi-particle interference, commutation relation and quantum measurement, reduction postulate and impossibility of measuring, cloning and deleting a single wavefunction. Quantum information theory: von Neumann entropy, Holevo information and Schumacher data compression. Decoherence: Linbladian, quantum error correction, and purification of entanglement.

3 units, alternate years, not given this year

APPPHYS 227. Applications of Quantum Information—Concepts and constituent technologies of quantum information systems. Quantum cryptography: single photon and entangled photon-pair-based quantum key distributions, quantum teleportation, quantum repeater. Quantum computer: Deutsch-Josza algorithm, Grover algorithm, Shor algorithm, quantum simulation, quantum circuits. Quantum hardwares: atomic physics, nuclear magnetic resonance, spintronics and quantum optics.

3 units, alternate years, not given this year

APPPHYS 270. Magnetism and Long Range Order in Solids—Cooperative effects in solids. Topics include the origin of magnetism in solids, crystal electric field effects and anisotropy, exchange, phase transitions and long-range order, ferromagnetism, antiferromagnetism, metamagnetism, density waves and superconductivity. Emphasis is on archetypal materials. Prerequisite: PHYSICS 172 or MATSCI 209, or equivalent introductory condensed matter physics course.

3 units, Aut (Fisher, I)

APPPHYS 272. Solid State Physics I—The properties of solids. Theory of free electrons, classical and quantum. Crystal structure and methods of determination. Electron energy levels in a crystal: weak potential and tight-binding limits. Classification of solids: metals, semiconductors, and insulators. Types of bonding and cohesion in crystals. Lattice dynamics, phonon spectra, and thermal properties of harmonic crystals. Pre- or corequisites: PHYSICS 120 and 121; and PHYSICS 130 and 131, or equivalents.

3 units, Win (Kivelson, S)

APPPHYS 273. Solid State Physics II—Electronic structure of solids. Electron dynamics and transport. Semiconductors and impurity states. Surfaces. Dielectric properties of insulators. Electron-electron, electron-phonon, and phonon-phonon interactions. Anharmonic effects in crystals. Electronic states in magnetic fields and the quantum Hall effect. Magnetism, superconductivity, and related many-particle phenomena. Prerequisite: 272.

3 units, Spr (Kivelson, S)

APPPHYS 275. Probing the Nanoscale—Theory, operation, and applications of nanoprobes of interest in physics and materials science. Lectures by experts. Topics include scanning tunneling microscopy, spectroscopy, and potentiometry; atomic manipulation; scanning magnetic sensors and magnetic resonance; scanning field-effect gates; scanning force probes; and ultra-near-field optical scanning.

3 units, Win (Kirtley, J)

APPPHYS 280. Phenomenology of Superconductors—Applications based on superconductivity as a phase-coherent macroscopic quantum phenomena. Topics include the superconducting pair wave function, London and Ginzburg-Landau theories, their physical content, the Josephson effect and superconducting quantum interference devices, s- and d-wave superconductivity, the response of superconductors to currents, magnetic fields, and RF electromagnetic radiation.

3 units, Win (Beasley, M), alternate years, not given next year

APPPHYS 290. Directed Studies in Applied Physics—Special studies under the direction of a faculty member for which academic credit may properly be allowed. May include lab work or directed reading.

1-15 units, Aut, Win, Spr, Sum (Staff)

APPPHYS 291. Practical Training—Opportunity for practical training in industrial labs. Arranged by student with research adviser's approval. Summary of activities required.

3 units, Sum (Staff)

APPPHYS 292. Introductory Biophysics—(Same as 192.) For advanced undergraduates or beginning graduate students. Quantitative models used in molecular biophysics. The relation of structure to function. Chemical equilibria, cooperativity, and control: elementary statistical mechanics, affinity plots, allostery, models of hemoglobin-oxygen binding, bacterial chemotaxis. Macromolecular conformations: polymer chain models, protein folding, taxonomy of globular proteins, general principles of sequence selection. Chemical kinetics. Multiple barriers: CO-myoglobin kinetics, ion diffusion through channels and ion selectivity, spectroscopy of ion channels-acetylcholine receptor. Supramolecular kinetics: conversion of chemical energy to mechanical force, myosin and kinesin, actin polymers. Nerve impulse propagation: membrane potentials, voltage sensitive ion gates, Hodgkin-Huxley equations, propagation of the nerve impulse.

3 units, Spr (Doniach, S), alternate years, not given next year

APPPHYS 294. Cellular Biophysics—(Same as BIOSCI 294.) Physical biology of dynamical and mechanical processes in cells. Emphasis is on qualitative understanding of biological functions through quantitative analysis and simple mathematical models. Sensory transduction, signaling, adaptation, switches, molecular motors, actin and microtubules, motility, and circadian clocks. Prerequisites: differential equations and introductory statistical mechanics.

3 units, Aut (Fisher, D)

APPPHYS 302. Experimental Techniques in Condensed Matter Physics—Cryogenics; low signal measurements and noise analysis; data collection and analysis; examples of current experiments. Prerequisites: PHYSICS 170, 171, and 172, or equivalents.

3 units, Aut (Kapitulnik, A; Moler, K)

APPPHYS 304. Lasers Laboratory—Theory and practice. Theoretical and descriptive background for lab experiments, detectors and noise, and lasers (helium neon, beams and resonators, argon ion, cw dye, titanium sapphire, semiconductor diode, and the Nd:YAG). Measurements of laser threshold, gain, saturation, and output power levels. Laser transverse and axial modes, linewidth and tuning, Q-switching and modelocking. Limited enrollment. Prerequisites: EE 231 and 232, or consent of instructor.

3 units, Win (Byer, R)

APPPHYS 305. Nonlinear Optics Laboratory—Laser interaction with matter. Laser devices provide radiation to explore the linear and nonlinear properties of matter. Experiments on modulation, harmonic generation, parametric oscillators, modelocking, stimulated Raman and Brillouin scattering, coherent anti-Stokes scattering, other four-wave mixing interactions such as wavefront conjugation and optical bistability. Optical pumping and spectroscopy of atomic and molecular species. Limited enrollment. Prerequisites: 304, EE 231 and 232, or consent of instructor.

3 units, Spr (Byer, R)

APPPHYS 315. Methods in Computational Biology—Methods of bioinformatics and biomolecular modeling from the standpoint of biophysical chemistry. Methods of genome analysis; cluster analysis, phylogenetic trees, microarrays; protein, RNA and DNA structure and dynamics, structural and functional homology; protein-protein interactions and cellular networks; molecular dynamics methods using massively parallel algorithms.

3 units, alternate years, not given this year

APPPHYS 324. Introduction to Accelerator Physics—Linear and circular accelerators. Topics include acceleration, phase stability, transfer matrices, beam envelopes, emittance, and the effects of synchrotron radiation. Topics of current research including nonlinearities and instabiltiies. Prerequisites: undergraduate electromagnetism and mathematical physics.

3 units, Spr (Siemann, R), alternate years, not given next year

APPPHYS 377. Literature of Condensed Matter Physics—Discoveries and experiments in condensed matter physics in the past 15 years. Topics: sliding charge density waves in layer compounds, the first pressure-induced Mott transition and organic superconductor, discovery of superfluid 3He, quasicrystals, the Sharvin effect, the quantum Hall effect, and reentrant superconductivity. Journal club format; student presentations.

3 units, not given this year

APPPHYS 383. Introduction to Atomic Processes—Atomic spectroscopy, matrix elements using the Coulomb approximation, summary of Racah algebra, oscillator and line strengths, Einstein A coefficients. Radiative processes, Hamiltonian for two- and three-state systems, single- and multi-photon processes, linear and nonlinear susceptibilities, density matrix, brightness, detailed balance, and electromagnetically induced transparency. Inelastic collisions in the impact approximation, interaction potentials, Landau-Zener formulation. Continuum processes, Saha equilibrium, autoionization, and recombination.

3 units, alternate years, not given this year

APPPHYS 387. Quantum Optics and Measurements—Postulates in quantum mechanics and quantum optics: Heisenberg's uncertainty principle, von Newmann's projection hypothesis, quantum non-demolition measurements, quantum states of light, cavity quantum electrodynamics, nonlocality and quantum entanglement. Second quantization of bosonic and fermionic fields; Glauber, Fock, Dicke, and Bloch states, first- and second-order coherence, quantum interference. Reservoir theory of open systems: Markoff and Born approximations, density operator master, Fokker-Planck, quantum Langevin, stochastic differential equations, quantum Monte-Carlo wavefunction method.
3 units, Win (Yamamoto, Y), alternate years, not given next year

APPPHYS 388. Mesoscopic Physics and Nanostructures—Optical properties of semiconductor nanostructures: interband and intraband optical transitions, excitons and polaritons, semiconductor Bloch equations, bosonization, exciton BEC, exciton laser. Transport properties in mesoscopic and atomic systems: electron optics versus photon optics, Landauer-Büttiker formula, noise in diffusive and dissipative transport, nonequilibrium Green's function, electron entanglement, Coulomb blockade, single electronics, and spin dynamics in semiconductor quantum dots. Student presentations on assigned topics.
3 units, Spr (Yamamoto, Y), alternate years, not given next year

APPPHYS 390. Dissertation Research
1-15 units, Aut, Win, Spr, Sum (Staff)

APPPHYS 392. Topics in Molecular Biophysics—Concepts from statistical mechanics applied to contemporary molecular biology: allosteric transitions; protein folding; molecular recognition; actin polymers and gels; molecular motors; lipids and membrane proteins; ion channels. Some of the basic models used to quantitate fundamental biomolecular functions. Prerequisites: elementary statistical mechanics and chemical kinetics.
3 units, alternate years, not given this year

APPPHYS 453A. Topics in Accelerator Physics: Electromagnetic Radiation by Relativistic Electrons—Emission of electromagnetic radiation by relativistic electrons in accelerator environments such as storage rings, undulators, and free electron lasers. Concepts in particle and radiation beams. Properties of synchrotron radiation in bending magnets and the enhanced radiation from undulators or similar periodic structures. Interaction of electron and radiation beams in an undulator. Physics of free-electron lasers including self-amplified spontaneous emission. Source characteristics of x-ray free-electron lasers and other more advanced schemes. May be repeated for credit.
3 units, Win (Chao, A; Huang, Z)

APPPHYS 470. Condensed Matter Seminar—Current research and literature; offered by faculty, students, and outside specialists. May be repeated for credit.
1 unit, Aut, Win, Spr (Fisher, I)

APPPHYS 473B. Topics in Condensed Matter Physics: Many Body Physics in Quantum Dots—Coulomb blockade, rate equations, Landauer formula, co-tunneling, the Anderson model, Schrieffer-Wolff transformation, Kondo Hamiltonian. Fermi edge singularity, bosonization, the Coulomb gas representation and their relation to the Kondo effect. Fixed point Hamiltonian, Friedel sum rule, and transport properties. May be repeated for credit. Prerequisite: PHYSICS 231.
3 units, Aut (Oreg, Y)

APPPHYS 473C. Topics in Condensed Matter Physics: Novel Superconductivity—Superconductors whose properties cannot be described by the Bardeen-Cooper-Schrieffer or Ginzburg-Landau theories of superconductivity in their conventional forms. New physical properties: non-S-wave pairing symmetry, magnetic superconductors, time reversal symmetry breaking, odd-frequency superconductors, two-band superconductors, superconductivity in the Bose-Einstein condensation limit, coupled order parameters. Mechanisms of superconductivity beyond the conventional electron-phonon interaction: magnetic fluctuations, excitons, negative-U centers, charge Kondo effect, and bipolarons. May be repeated for credit. Prerequisite: 272 or PHYSICS 172 or equivalent. Recommended: 280.
3 units, Spr (Beasley, M)

APPPHYS 483. Optics and Electronics Seminar—Current research topics in lasers, quantum electronics, optics, and photonics by faculty, students, and invited speakers. May be repeated for credit.
1 unit, Aut (Miller, D), Win (Byer, R), Spr (Fan, S)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOSCI 232. Advanced Imaging Lab in Biophysics—(Same as BIOPHYS 232, MCP 232.)
4 units, Spr (Block, S; Schnitzer, M; Smith, S; Stearns, T)

BIOSCI 217. Neuronal Biophysics
4 units, Spr (Schnitzer, M)

EE 222,223. Applied Quantum Mechanics I and II
3 units, **222:** *Aut,* **223:** *Win (Miller, D)*

EE 231. Introduction to Lasers
3 units, Win (Digonnet, M)

EE 232. Laser Dynamics
3 units, Spr (Fan, S)

EE 248. Fundamentals of Noise Processes
3 units, Aut (Yamamoto, Y)

EE 268. Introduction to Modern Optics
3 units, Aut (Byer, R)

EE 346. Introduction to Nonlinear Optics
3 units, Spr (Harris, S)

EE 366. Introduction to Fourier Optics
3 units, Aut (Hesselink, L)

MATSCI 205. Waves and Diffraction in Solids
3-4 units, Win (Clemens, B)

PHYSICS 172. Solid State Physics
3 units, Spr (Manoharan, H)

PHYSICS 210. Advanced Particle Mechanics
3 units, Aut (Laughlin, R)

PHYSICS 212. Statistical Mechanics
3 units, Spr (Peskin, M)

PHYSICS 220. Classical Electrodynamics
3 units, Win (Silverstein, E)

PHYSICS 221. Classical Electrodynamics
3 units, Spr (Tantawi, S)

PHYSICS 230. Quantum Mechanics
3 units, Aut (Shenker, S)

PHYSICS 231. Quantum Mechanics
3 units, Win (Shenker, S)

PHYSICS 372. Condensed Matter Theory I
3 units, Win (Laughlin, R)

PHYSICS 373. Condensed Matter Theory II
3 units, Spr (Laughlin, R)

ARCHAEOLOGY PROGRAM

Director: Ian Hodder (Anthropology)
Professors: Ian Hodder (Anthropology), Richard Klein (Anthropology), Gail Mahood (Geological and Environmental Sciences), Lynn Meskell (Anthropology), Ian Morris (Classics, History), Amos Nur (Geophysics), Michael Shanks (Classics)
Associate Professors: Jody Maxmin (Art History, Classics), John Rick (Anthropology), Jennifer Trimble (Classics)
Assistant Professors: Giovanna Ceserani (Classics), David DeGusta (Anthropology), Ian Robertson (Anthropology), Barbara Voss (Anthropology), Michael Wilcox (Anthropology)
Associated Staff: Laura Jones (Campus Archaeologist), Tom Seligman (Cantor Center)
Fellows: Patrick Hunt, Bill Rathje, James Truncer

Program Offices: Building 500, Main Quad
Mail Code: 94305-2170
Program Phone: (650) 723-5731
Web Site: http://archaeology.stanford.edu

Human beings and their ancestors have roamed the earth for at least five million years, but only invented writing five thousand years ago. And for most of the period since its invention, writing only tells us about small elite groups. Archaeology is the only discipline that gives direct access to the experiences of all members of all cultures, everywhere in the world. Stanford's Archaeology Program is unique in providing students with an interdisciplinary approach to the material remains of past societies, drawing in equal parts on the humanities, social sciences, and natural sciences.

The program has three goals:

1. To provide a broad and rigorous introduction to the analysis of the material culture of past societies, drawing on the questions and methods of the humanities, social sciences, and natural sciences.
2. To relate this analysis to the practice of archaeology in the contemporary world.
3. To help each student achieve a high level of understanding through concentrated study of a particular research area.

The Archaeology curriculum draws on faculty from a wide range of University departments and schools. To complete the requirements for the major, students must take courses from the offerings of the program and from the listings of other University departments. The program culminates in a B.A. in Archaeology.

Archaeology majors are well prepared for advanced training in professional schools such as education, law, and journalism, and, depending on their choice of upper-division courses, graduate programs in the humanities, social sciences, and natural sciences.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The B.A. in Archaeology requires a minimum of 65 units in the major, divided among five components:

1. *Core Program* (20 units), consisting of:
   a) Gateway: ARCHLGY 1, Introduction to Prehistoric Archaeology (5 units)
   b) Intermediate: ARCHLGY 102, Archaeological Methods and Research Design (5 units)
   c) Intermediate: ARCHLGY 103, History of Archaeological Thought (5 units; Writing in the Major)
   d) Capstone: ARCHLGY 107A, Archaeology as a Profession (5 units)

   ARCHLGY 1 is recommended as a first course, and many upper-level courses in Archaeology require this course as a prerequisite. Students should normally take the capstone course in their final year of course work in the major.
2. *Analytical Methods and Computing* (at least 3-5 units): quantitative skills and computing ability are indispensable to archaeologists. It is recommended that students take either ANTHSCI 192, Data Analysis in Anthropological Science, or ANTHSCI 208, Models and Imaging in Archaeological Computing. Other courses that may satisfy this requirement are PSYCH 10/STATS 60, ECON 102A, and GES 160.
3. *Archaeological Skills* (at least 10 units): archaeological skills include archaeological formation processes, botanical analysis, cartography, ceramic analysis, dating methods, faunal analysis, geographic information systems, geology, geophysics, genetics, osteology, remote sensing, soil chemistry, and statistics. Students are required to take at least 5 units from section A, Formation Processes, and at least 5 units from section B, Archaeological Methods. Students are encouraged, whenever possible, to take GES 186, Geoarchaeology, to fulfill the formation processes requirement. With the approval of the instructor and Archaeology director, undergraduates may fulfill part of this requirement from graduate-level courses (i.e., courses with numbers of 200 or higher). Note: this list combines historical and current offerings subject to change; contact the Archaeology program administrator for course planning beyond this year and check the web site.

Section A: Formation Processes

GES 1. Fundamentals of Geology	5
GES 49N. Field Trip to Death Valley and Owens Valley	5
GES 102. Earth Materials	5
GES 144. Fundamentals of Geographic Information Science	4
GES 160. Statistical Methods for Earth and Environmental Sciences: General Introduction	5
GES 186/286. Geoarchaeology	5
GEOPHYS 140. Introduction to Remote Sensing	3

Section B: Archaeological Methods

ANTHSCI 133A. Human Osteology	5
ANTHSCI 133B. Advanced Human Osteology	5
CASA 103. Laboratory Methods in Historical Archaeology	5
CASA 150. Archaeological Methods and Research Design	5
CLASSART 150. Archaeological Fieldwork in the Mediterranean	5

4. *Theory* (at least 10 units): topics include archaeological, art-historical, sociocultural, historical, and material culture theory. With the approval of the instructor, undergraduates may fulfill part of this requirement from graduate-level courses (i.e., courses with numbers of 200 or higher). Note: the following list is a combination of historical and current offerings; contact the Archaeology administrator for course planning beyond this year and check the web site.

ANTHSCI 143. Ethnoarchaeology	5
ANTHSCI 190. Social Theory in the Anthropological Sciences	5
CASA 108. History of Archaeological Thought	5
CASA 112/212. Archaeology of Modern Urbanism	5
CASA 172. Object Lessons	5

5. *Area of Concentration* (at least 20 units): in consultation with their faculty advisers, students choose an area of concentration in archaeological research. Concentrations can be defined in terms of time and space such as small-scale societies or the archaeology of complex societies, or in terms of research problems such as new world archaeology or Mediterranean archaeology. An area of concentration should provide both breadth and depth in a specific research area. Courses should be chosen from the list below. Courses other than those on this list can be used to fulfill this requirement with the prior approval of the student's faculty adviser and the program director. With the approval of the instructor, undergraduates may fulfill part of this requirement from graduate-level courses, typically courses numbered 200 or higher. Some courses, such as ANTHSCI 140, Stone Tools in Prehistory, can be taken either to fulfill the skills requirement or as part of an area of concentration. However, each course may only count toward one component of the program. Students are encouraged to design their own area of concentration, with the prior approval of the student's faculty adviser and the program director.

Concentrations—In addition to the following components, majors must participate in an archaeological field project, and complete a collateral language requirement. Note: this list combines historical and current offerings subject to change. Contact the Archaeology program administrator for course planning beyond this year.

Small Scale Societies:

CASA 117 . Archaeology of the American Southwest	5
ANTHSCI 143. Ethnoarchaeology	5

Archaeology of Complex Societies:

CLASSART 101. Archaic Greek Art	5
CASA 79. Anthropological Perspectives on Israeli-Palestinian Conflict	5
CLASSART 102. Classical and 4th-Century Greek Art	4-5
ARCHLGY 104C/304C. The Archaeology of Ancient China	5

Mediterranean Archaeology:

CASA 79. Anthropological Perspectives on Israeli-Palestinian Conflict	5
CASA 158. Sex, Death and Body in Ancient Egypt	5
CLASSART 61. The Archaeology of the Greek World	5
CLASSART 81. Introduction to Roman Archaeology	5
CLASSART 101. Archaic Greek Art	5
CLASSART 102. Classical and 4th-Century Greek Art	4-5
CLASSART 105. The Body in Roman Art	3-5

New World Archaeology:

ARCHLGY 102B. Intro to Andean Archaeology	5
ANTHSCI 22. Archaeology of North America	5
ANTHSCI 27. Introduction to Mesoamerican Archaeology	5
ANTHSCI 111. Language and Prehistory	5
ANTHSCI 141. Hunter-Gatherers in an Archaeological Perspective	5
ANTHSCI 142. Incas and their Ancestors: Peruvian Archaeology	5
ANTHSCI 144. Urbanism in the Pre-Hispanic New World	5
ANTHSCI 146A. Aztecs and Their Ancestors: Introduction to Mesoamerican Archaeology	5
CASA 117/217. Archaeology of the American Southwest	5

Archaeological Fieldwork—Students may meet this requirement in three ways:

1. ANTHSCI 149, Archaeological Field Methods.
2. taking part in a month-long field project directed by a Stanford faculty member, and taking a directed reading during the returning academic year for credit. In 2007-08, field projects are underway in Peru, Rome, Sicily, Switzerland, and Turkey.
3. completing a field school offered by another institution. Such field schools must be approved in advance by the student's undergraduate adviser and by the director of the Archaeology Program.

Collateral Language Requirement—All Archaeology majors must demonstrate competence in a foreign language beyond the first-year level. Students can meet this requirement by completing a course beyond the first-year level with a grade of 'B' or better, and are encouraged to choose a language that has relevance to their archaeological region or topic of interest. Students may petition to take an introductory-level course in a second language to fulfill this requirement by demonstrating the connection between the language(s) and their research interest(s).

To declare a major in Archaeology, students should contact the program administrator, who provides an application form, answers initial questions, and helps the student select a faculty adviser and area of concentration. All majors must complete 65 units, which must form a coherent program of study and be approved by the student's faculty adviser and the program director.

Students who plan to pursue graduate work in Archaeology should be aware of the admission requirements of the particular departments to which they intend to apply. These vary greatly. Early planning is advisable to guarantee completion of major and graduate school requirements.

MINOR

A minor in Archaeology provides an introduction to the study of the material cultures of past societies. It can complement many majors, including but not limited to Anthropology, Applied Physics, Art and Art History, Classics, Earth Systems, Geological and Environmental Sciences, History, and Religious Studies.

To minor in Archaeology, the student must complete at least 27 units of relevant course work, including:

1. *Core Program* (10 units), consisting of:
   a) Gateway: ARCHLGY 1, Introduction to Prehistoric Archaeology (5 units)
   b) Capstone: ARCHLGY 103, History of Archaeological Thought (5 units; Writing in the Major)

   ARHCLGY 1 is recommended as a first course, and many of the upper-level courses in archaeology require this course as a prerequisite. Students should normally take the capstone course in their final year of course work in the minor.
2. *Archaeological Skills* (2-5 units): archaeological skills include dating methods, faunal analysis, botanical analysis, ceramic analysis, geology, geophysics, soil chemistry, remote sensing, osteology, genetics, statistics, cartography, and geographic information systems. The course(s) must be selected from either section in the list above.
3. *Theory* (5 units): topics include archaeological, art-historical, sociocultural, historical, and material-culture theory. The course(s) must be selected from the list given above.
4. *Area of Concentration* (10 units): in consultation with their faculty advisers, students choose an area of concentration in archaeological research. Concentrations can be defined in terms of time and space such as small-scale societies or the archaeology of complex societies, or in terms of research problems such as new world archaeology or Mediterranean archaeology. An area of concentration should provide both breadth and depth in a specific research area. Courses must be selected from the list above. Students are encouraged to design their own area of concentration, with the prior approval of both the student's faculty adviser and the program director.

Students must complete the declaration process (both the planning form submission and Axess registration) by the last day of the quarter, two quarters prior to degree conferral (for example, by the last day of Autumn Quarter if Spring graduation is intended).

HONORS PROGRAM

The honors program in Archaeology gives qualified Archaeology majors the chance to work closely with faculty on an individual research project culminating in an honors thesis. Students may begin honors research from a number of starting points including topics introduced in the core or upper-division courses, independent interests, research on artifacts in Stanford's collections, or fieldwork experiences.

Candidates of sophomore and junior standing with an overall Stanford grade point average (GPA) of 3.0 or better should submit an application to the program administrator no later than the end of the fourth week of the Spring Quarter. It must include a brief statement of the project, a transcript, a short paper, and a letter of recommendation from the faculty member who supervises the honors thesis. Students are notified of their acceptance by the undergraduate committee.

Approved candidates must complete all of the requirements for their major and submit an honors thesis no later than four weeks prior to the end of the quarter in which graduation is anticipated. The thesis is read by the candidate's adviser and a second reader appointed by the undergraduate committee. Honors candidates may enroll in one of the honors or thesis courses in Anthropology, Classics, Geological and Environmental Sciences, or Geophysics for up to three quarters during their senior year (15 units maximum). No more than 5 of those units may count toward the 65-unit degree requirement.

COURSES

CORE COURSES

These courses are required of all Archaeology majors.

ARCHLGY 1. Introduction to Prehistoric Archaeology—(Same as ANTHSCI 3.) Aims, methods, and data in the study of human society's development from early hunters through late prehistoric civilizations. Archaeological sites and remains characteristic of the stages of cultural development are examined for selected geographic areas, emphasizing methods of data collection and analysis appropriate to each. GER:DB-SocSci, EC-GlobalCom

3-5 units, Aut (Robertson, I)

ARCHLGY 99A. Historical Archaeology in the Archive, Lab, and Underground: Methods—The practice of historical archaeology through methodologies including archival research, oral history, material culture analysis, and archaeological excavation; their relationship to big questions of archaeological research. Hands-on exercises.

5 units, Aut (Williams, B)

ARCHLGY 101B/301B. Humanized Landscapes: Archaeological Approaches to Human/Environment Interactions—(Graduate students register for 301B.) Perspectives, methods, and data that archaeology brings to human/environment interaction issues such as environmental variability and change, sustainability, and human impacts. How to use paleoenvironmental data in archaeological research; how to recover and analyze such data to reconstruct human/environment interactions in prehistory.
3-5 units, Aut (Contreras, D)

ARCHLGY 102. Archaeological Methods—(Same as CASA 150.) Methodological issues related to the investigation of archaeological sites and objects. Aims and techniques of archaeologists including: location and excavation of sites; dating of places and objects; analysis of artifacts and technology and the study of ancient people, plants, and animals. How these methods are employed to answer the discipline's larger research questions.
5 units, Spr (Hodder, I)

ARCHLGY 102B. Incas and their Ancestors: Peruvian Archaeology—(Same as ANTHSCI 142/242A.) The development of high civilizations in Andean S. America from hunter-gatherer origins to the powerful, expansive Inca empire. The contrasting ecologies of coast, sierra, and jungle areas of early Peruvian societies from 12,000 to 2,000 B.C.E. The domestication of indigenous plants which provided the economic foundation for monumental cities, ceramics, and textiles. Cultural evolution, and why and how major transformations occurred. GER:DB-SocSci, EC-GlobalCom
3-5 units, Aut (Staff), Spr (Contreras, D)

ARCHLGY 103. History of Archaeological Thought—(Same as CASA 108.) Introduction to the history of archaeology and the forms that the discipline takes today, emphasizing developments and debates over the past five decades. Historical overview of culture, historical, processual and post-processual archaeology, and topics that illustrate the differences and similarities in these theoretical approaches. WIM
5 units, Aut (Meskell, L)

ARCHLGY 103C/303C. Visualizing Archaeological Knowledge in the Information Age—(Graduate students register for 303C.) Why should archaeologists be concerned with new media? The emergence of new media in the popular and technical realms; why archaeology has begun to use new media and how it can benefit; how representing and distributing archaeological information is being changed, and epistemological and ethical implications. Hands-on application of new media to an archaeological project using blogs, wikis, and 3-D immersive environments.
3-5 units, Win (Webmoor, T)

ARCHLGY 104. Archaeology of Modern Times—(Same as ANTHSCI 147.) Archaeological theory, method, and data are used to approach an issue of contemporary public concern. Issues include resource and energy management strategies such as the electricity situation in California, biodegradation and solid waste management, the relationship between human beings and dogs, ethnic wars in the Balkans and elsewhere, and Bill Gates' strategies in the rise of Microsoft. GER:DB-SocSci
5 units, not given this year

ARCHLGY 104C/304C. The Archaeology of Ancient China—(Graduate students register for 304C.) Early China from the perspective of material remains unearthed from archaeological sites; the development of Chinese culture from early hominid occupation nearly 2 million years ago through the development of agriculture in the Neolithic period and complex society in the Bronze Age to the political unification of China under the Qin Dynasty. Continuity of Chinese culture from past to present, history of Chinese archaeology, relationships between archaeology and politics, and food in early China.
5 units, Spr (Reinhart, K)

ARCHLGY 105A/305A. Global Heritage and Cultural Property—(Graduate students register for 305A.) Focus is on the international trade in antiquities, and associated ethical and legal issues.
3-5 units, Spr (Staff)

ARCHLGY 106A/306A. Museums and Collections—(Graduate students register for 306A.) Global organization of museums; their history and roles in society. Social issues involved in the management of collections, and their public role. The role of the curator in contemporary society.
3-5 units, Spr (Staff)

ARCHLGY 107A. Archaeology as a Profession—Academic, contract, field, laboratory, museums, and heritage aspects of the archaeological profession.
5 units, Win (Camp, S)

ARCHLGY 108A. Archaeological Field Methods—Student participation in on-campus excavation at the site of the old gymnasium. Excavation skills, laboratory processing, and primary recording.
5 units, Win (Jones, L)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ANTHSCI 3. Introduction to Prehistoric Archaeology—(Same as ARCHLGY 1.)
3-5 units, Aut (Robertson, I)

ANTHSCI 6/206. Human Origins—(Same as BIOSCI 106, HUMBIO 6.)
5 units, Win (Klein, R)

ANTHSCI 13. Bioarchaeology
3-5 units, not given this year

ANTHSCI 14. Introduction to Anthropological Genetics—(Same as HUMBIO 14.)
3-5 units, Win (Jobin, M), Spr (Horsburgh, K)

ANTHSCI 22. Archaeology of North America
3-5 units, Win (Truncer, J)

ANTHSCI 28. Australia and New Guinea Ethnology
4 units, not given this year

ANTHSCI 106B. Maya Mythology and the Popol Vuh
5 units, Win (Fox, J)

ANTHSCI 111/211. Language and Prehistory
3 units, Aut (Ruhlen, M; Fournier, R)

ANTHSCI 114/214. The Biology and Evolution of Language
4-5 units, Spr (Fox, J)

ANTHSCI 115/215. Maya Hieroglyphic Writing
5 units, not given this year

ANTHSCI 117/217. Introduction to the Language and Culture of the Aztecs
3-5 units, not given this year

ANTHSCI 130C/230C. Current Issues in Paleoanthropology—(Same as BIOSCI 130.)
1 unit, Aut, Win, Spr (DeGusta, D; Klein, R)

ANTHSCI 133A/233A. Human Osteology—(Same as HUMBIO 180.)
5 units, Win (DeGusta, D)

ANTHSCI 133B/233B. Advanced Human Osteology
5 units, Spr (DeGusta, D)

ANTHSCI 141/241. Hunter-Gatherers in Archaeological Perspective
4-5 units, Aut (Truncer, J)

ANTHSCI 143/243. Ethnoarchaeology
3-5 units, Spr (Bird, D)

ANTHSCI 144/244. Ancient Cities in the New World
3-5 units, Spr (Robertson, I)

ANTHSCI 144B. India's Forgotten Empire: The Rise and Fall of Indus Civilization
3 units, Aut (Truncer, J)

ANTHSCI 144C/204. Archaeology of Central Mexico
3-5 units, not given this year

ANTHSCI 145B/245B. Evolution of Civilizations
3-5 units, not given this year

ANTHSCI 146A. The Aztecs and Their Ancestors: Introduction to Mesoamerican Archaeology
3-5 units, Win (Robertson, I)

ANTHSCI 149B/208. Digital Methods in Archaeology
3-5 units, Win (Contreras, D)

ANTHSCI 190. Social Theory in the Anthropological Sciences
5 units, Win (Brown, M)

ANTHSCI 191A/291A. Communicating Science: Proposals, Talks, Articles
4-5 units, Win (DeGusta, D)

ANTHSCI 192/292. Data Analysis in the Anthropological Sciences
5 units, Spr (Robertson, I)

ANTHSCI 242. Beginnings of Social Complexity
5 units, not given this year

ANTHSCI 290B. Advanced Evolutionary Theory in Anthropological Sciences
5 units, Win (Bird, R)

ARTHIST 203. Greek Art in and out of Context—(Same as CLASSART 109.)
5 units, Aut (Maxmin, J)

ARTHIST 204A. Appropriations of Greek Art—(Same as CLASSART 110.)
5 units, Spr (Maxmin, J)

CASA 16. Native Americans in the 21st Century: Encounters, Identity, and Sovereignty in Contemporary America
5 units, not given this year

CASA 94. Postfield Research Seminar
5 units, Aut (Burce, A)

CASA 103/203. Laboratory Methods in Archaeology
5 units, not given this year

CASA 112/212. The Archaeology of Modern Urbanism
5 units, Win (Voss, B)

CASA 117/217. Archaeology of the American Southwest: Contemporary Peoples, Contemporary Debates
5 units, not given this year

CASA 137E/237E. Excavation at Catalhoyuk, Turkey
3-5 units, Spr (Hodder, I)

CASA 138/238. Archaeology of Sex, Sexuality, and Gender
5 units, Spr (Voss, B)

CASA 152/252. Archaeology: World Cultural Heritage
5 units, not given this year

CASA 156. Interpreting Space and Place: An Introduction to Mapmaking
5 units, Aut (Engel, C)

CASA 158/258. Sex, Death, and the Body in Ancient Egypt
5 units, Win (Meskell, L)

CASA 172/272. Object Lessons
3-5 units, Aut (Meskell, L)

CASA 346A. Sexuality Studies in Anthropology
5 units, not given this year

CASA 360. Archaeological Methods and Research Design
5 units, Spr (Hodder, I)

CASA 373. Introduction to Archaeological Theory
5 units, Win (Hodder, I)

CASA 375. Archaeology and Globalism
4-5 units, not given this year

CASA 380. Practice and Performance: Bourdieu, Butler, Giddens, de Certeau
5 units, Win (Voss, B)

CLASSART 61. Introduction to Greek Archaeology
3-5 units, Aut (Krotscheck, U)

CLASSART 81. Introduction to Roman Archaeology
4-5 units, Win (Butler, M)

CLASSART 101/201. Archaic Greek Art—(Same as ARTHIST 101/301.)
4 units, Aut (Maxmin, J)

CLASSART 102/202. Classical and 4th-Century Greek Art—(Same as ARTHIST 102/302.)
4 units, Win (Maxmin, J)

CLASSART 126. Alpine Archaeology
3-5 units, Spr (Hunt, P)

CLASSART 250. Cultural Heritage and Classical Antiquities
5 units, Win (Trimble, J)

CLASSART 323. Archaeology of the Roman Economy
5 units, Spr (Trimble, J)

EE 140. The Earth From Space: Introduction to Remote Sensing
3 units, Win (Zebker, H)

GEOPHYS 190. Near-Surface Geophysics
3 units, not given this year

GES 1. Dynamic Earth: Fundamentals of Earth Science
4 units, Aut, Spr (Scherer, H)

GES 7A. An Introduction to Wilderness Skills
1 unit, Aut (Bird, D)

GES 49N. Field Trip to Death Valley and Owens Valley
3 units, Win (Mahood, G)

GES 102. Earth Materials
5 units, Aut (Brown, G; Mattinson, C)

GES 144. Fundamentals of Geographic Information Science (GIS)—(Same as EARTHSYS 144.)
4 units, Spr (Seto, K)

GES 160. Statistical Methods for Earth and Environmental Sciences: General Introduction
3 units, Spr (Switzer, P)

GES 185. Volcanology
3-4 units, Spr (Mahood, G), alternate years, not given next year

GES 186/286. Geoarchaeology
5 units, alternate years, not given this year

ECON 102A. Introduction to Statistical Methods (Postcalculus) for Social Scientists
5 units, Aut, Win (Steiner, F)

PSYCH 10. Introduction to Statistical Methods: Precalculus—(Same as STATS 60/160.)
5 units, Aut (Thomas, E), Win (Walther, G), Spr, Sum (Staff)

ART AND ART HISTORY

Emeriti: (Professors) Keith Boyle, Kristina Branch, Elliot Eisner, Lorenz Eitner, Suzanne Lewis, Frank Lobdell, Dwight C. Miller, Nathan Oliveira, Richard Randell, Michael Sullivan, Paul V. Turner
Chair: Kristine Samuelson
Area Director for Art History: Maria Gough
Area Director for Film and Media Studies: Kristine Samuelson
Area Director for Studio Art and Director of Undergraduate Studies for Studio Art: Enrique Chagoya
Director of Undergraduate Studies for Art History: Jody Maxmin
Director of Undergraduate Studies for Film and Media Studies: Scott Bukatman
Directors of Graduate Studies in Art History: Pavle Levi
Director of Graduate Studies in Studio Art: Gail Wight
Director of Graduate Studies in Documentary Film: Jan Krawitz
Professors: Wanda M. Corn (American Art), David Hannah (Painting/Drawing), Matthew S. Kahn (Design), Jan Krawitz (Documentary Film), Michael Marrinan (18th- and 19th-century European Art), Kristine Samuelson (Documentary Film), Melinda Takeuchi (Japanese Art), Richard Vinograd (Chinese Art; on leave Autumn and Winter), Bryan Wolf (American Art)
Associate Professors: Scott Bukatman (Film Studies; on leave Winter and Spring), Enrique Chagoya (Painting/Drawing/Printmaking), Paul DeMarinis (Electronic Media), Maria Gough (Modern Art), Pamela M. Lee (Contemporary Art; on leave), Jody Maxmin (Ancient Art), Gail Wight (Electronic Media; on leave)
Assistant Professors: Morten Hansen (Renaissance Art), Pavle Levi (Film Studies), Jean Ma (Film Studies), Barbaro Martinez-Ruiz (African Art; in Oxford Spring), Jamie Meltzer (Documentary Film), Bissera Pentcheva (Medieval Art; on leave)
Professor (Teaching): Joel Leivick (Photography)
Fellow: Ara Merjian (Modern Art)
Lecturers: Robert Dawson (Photography), John Edmark (Design), Lukas Felzmann (Photography)
Visiting Assistant Professor: Jennifer Marshall (American Art)
Affiliated Professor: John H. Merryman (Law; emeritus)

Department Offices: Room 101, Cummings Art Building
Mail Code: 94305-2018
Phone: (650) 723-3404
Web Site: http://art.stanford.edu

Courses given in Art have the subject codes ARTHIST, ARTSTUDI, FILMSTUD, and FILMPROD. For a complete list of subject codes, see Appendix.

The department offers courses of study in: (1) the history of art, (2) the practice of art (studio), and (3) film and media studies, leading to the following degrees: B.A. degrees in Art with fields of study in: Art History and Studio Art; B.A. degrees in Film and Media Studies with fields of study in: Film History; Film and Culture; Avant Garde Aesthetics and Performance; Film, Media, and Technology; and Writing, Criticism, and Practice in Film and Media Studies; M.F.A. degrees with fields of study in: Design; New Genres; Painting; Photography; and Sculpture; an M.F.A. degree in Documentary Film and Video; Ph.D. degrees in Art with fields of study in: Art History and Humanities; and History of Art; and a joint Ph.D. in Art History and Humanities.

The undergraduate program is designed to help students to think critically about the visual arts and visual culture. Courses focus on the meaning of images and media, and their historical development, roles in society, and relationships to disciplines such as literature, music, and philosophy. Work performed in the classroom, studio, and screening room is designed to develop a student's powers of perception, capacity for visual analysis, and knowledge of technical processes.

The Iris and B. Gerald Cantor Center for Visual Arts at Stanford University is a major resource for the department. The center offers a 22,000 object collection on view in rotating installations in 18 galleries, the Rodin Sculpture Garden, and special exhibitions, educational programs, and events. Through collaborations with the teaching program, student internships, and student activities, the center provides a rich resource for Stanford students.

ART HISTORY

Over the past two decades the study of Art History has changed dramatically to include the study of art forms made far afield from the traditional core of Western Europe and to re-examine its objects in light of new critical frameworks. The Art History program promotes a plurality of approaches to the study of art by encouraging majors to construct a program of study drawn from the offerings of the Art History curriculum and the University at large.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Art majors with an Art History field of study are defined by a passion for the visual; for traditional fine arts, including painting, sculpture, architecture, prints, and the decorative arts; for the study of everyday objects, including advertisements, billboards, commercial signs, and visual culture; and for film, new media, and computer graphics. They share close observation and curiosity about how society represents itself. Students majoring in Art with an Art History field of study pursue the ways in which cultures express themselves through the arts, and acquire the tools for visual analysis and historical understanding. They learn to analyze works of art in many media as they become proficient in cultural analysis and historical interpretation.

Majors combine courses in art, film, and visual culture with an area of concentration tailored to individual interests. The requirements are grouped into three clusters: foundation courses introduce students to visual analysis and provide an overview of the fields within Art History; distribution courses acquaint students with the art of different historical periods and geographical regions; individual areas of concentration, developed in consultation with a faculty adviser, allow students to pursue their specific interests. Majors are also required to take the junior seminar, offered each year in Autumn Quarter, in which they investigate methods and theories that have defined art historical scholarship. In their senior year, majors may elect to write an honors thesis, exploring a single topic in depth across several quarters of study in close collaboration with several professors.

Students who want to major in Art History declare the Art major with a field in Art History on Axess. All courses for the major must be taken for a letter grade.

Foundation Courses—Focus is on visual analysis, introducing students to the specialized vocabulary, forms of analysis, and principal concerns of Art History. ARTHIST 1, Introduction to the Visual Arts, provides training in art analysis and cultural interpretation; this course is required of majors and should be taken early in a student's career.

Other foundation courses introduce students to the broad concerns of Asian art (ARTHIST 2), architecture (ARTHIST 3), and film (FILMSTUD 4). In addition to ARTHIST 1, majors are required to take at least one other foundation course.

Majors are also required to complete at least one introductory Studio Art course using the traditional materials of painting, sculpture, drawing, photography, or printmaking.

Distribution Courses—In order for students to acquire a broad overview of different historical periods and different geographic regions, majors must take at least four art history courses distributed among the following categories: ancient and medieval; Renaissance and early modern; modern, contemporary, and the United States; Asia, Africa, and the Americas; and film studies.

Area of Concentration—The department encourages students to pursue their interests by designing an area of concentration tailored to their own intellectual concerns. This area of concentration provides the student with an in-depth understanding of a coherent topic in Art History. It must consist of five courses: two must be seminars or colloquia; four of the five courses must be in a single field or concentration constructed by the student in consultation with a faculty adviser.

There are no pre-defined areas of concentration; students create their own concentrations based on individual interests by focusing on topics, questions of genre, or historical or national traditions. Students with a strong interest in topics that cross disciplines may create an interdisciplinary concentration.

Students submit an area of concentration form, signed by their faculty adviser, during the Winter Quarter of the junior year. The form includes a brief statement defining the concentration and a list of the courses to be taken to complete it. Students must consult with their adviser in the Autumn Quarter of senior year to insure that all requirements for the major are being met.

Sample Areas of Concentration—

1. *Topical concentrations*: art and gender; art, politics, race, and ethnicity; art, science, and technology; urban studies; or any other concentration created by the student and approved by a faculty adviser.
2. *Genre concentrations*: architecture; painting; sculpture; film studies; prints and media; or decorative arts and material culture.
3. *Historical and national concentrations*: ancient and medieval; Renaissance and early modern; modern and contemporary; American; African; Asian; or the Americas.
4. *Interdisciplinary concentration*: students choosing the interdisciplinary concentration must take two upper-division courses outside Art History on topics related to their concentration; these courses are counted with three other courses within Art History to complete the concentration. Sample interdisciplinary areas of concentration include: art and literature, art and history; art and religion; art and economics; or any other interdisciplinary combination designed by the student and approved by a faculty adviser. The two outside courses for the interdisciplinary concentration are counted among the 13 courses required for the major.

Junior Seminar—This course is designed to introduce all majors to methods and theories underlying the practice of Art History. The seminar is offered annually in Autumn Quarter. Students are encouraged to take the seminar at the start of their junior year. The goals of the seminar are: to create a shared intellectual experience among all majors; provide majors with in-depth knowledge of their own discipline; and enrich the understanding that majors bring to other courses in Art History.

Research—An essential component of the major requires that students become familiar with works of art and how to write about them. This entails a familiarity with library research, the mechanics of art historical scholarship, the practice of focusing research on clearly defined problems, and the experience of presenting findings in written or oral form. Research requirements are designed to ensure that majors leave Stanford with a mastery of these skills.

Majors are required to attend an orientation session, presented by the professional staff of the Art Library, that introduces the tools of research and reference available on campus or through the Internet. This requirement should be completed no later than the quarter following the major declaration. In addition, majors are permitted to place materials on reserve in the Art Library to facilitate research for seminars or other projects such as honors theses (see below).

Majors are required to include within their program of study at least two research-oriented seminars that entail preparation of a research paper, a formal presentation, or both. In some cases, students are allowed to substitute a colloquium for one of these seminars, although in such cases it is understood that the course requirements must include a substantial research component.

HONORS THESIS

The purpose of the honors thesis is to extend and deepen work done in an art history class; the topic should have focus and clear parameters. Typically, an honors thesis is not an exploration of a new area that the student has never studied before.

The minimum requirement for admission to the honors program is an overall GPA of 3.5, and at least 3.5 in Art History courses. Students wishing to write an honors thesis must announce their intention by submitting a form signed by the thesis adviser (who need not be the student's academic adviser) by February 1 of their junior year. It is recommended, but not mandatory, that the thesis adviser be on campus and in residence during the candidate's senior year.

Candidates for the honors program must submit to the art history faculty a five-page thesis proposal, including bibliography and illustrations, and one completed paper that demonstrates the student's ability to conceptualize and write about issues. This complete proposal must be submitted to the department's undergraduate coordinator no later than the third week of Spring Quarter of the candidate's junior year so that it can be read, discussed, and voted upon at the faculty's regular meeting in early May. A candidate is accepted into the honors program by a simple majority.

Once admitted to the honors program, students work with their thesis advisers to define the scope of the study, establish a research and writing timetable, and enlist one other faculty member to serve on the thesis reading committee. The summer between junior and senior years is usually devoted to refining the topic and pursuing any off-campus research. Students may apply for UAR research grants to help finance trips or expenses relative to preparing the research for their honors thesis.

During the senior year, students may register for up to 10 units of ARTHIST 297, Honors Thesis Writing, 5 units of which may count towards the student's concentration in Art History. To aid the process of research and writing, students preparing an honors thesis are paired with a graduate student mentor. Students should contact the graduate student mentor in their junior year as soon as they begin to think about writing an honors thesis. Through regular meetings, mentors guide students through the proposal process and the research and writing year.

Students and thesis advisers should plan their schedule of work so that a complete, final manuscript is in the hands of each member of the thesis reading committee by the beginning of the seventh week of the student's final quarter at Stanford. The thesis adviser assigns a letter grade; both faculty readers must approve the thesis for honors before the student is qualified to graduate with honors.

REQUIREMENTS FOR THE ART (HISTORY OF ART) MAJOR

Foundation:	*Number of courses*
ARTHIST 1 and one other introductory-level course, from among ARTHIST 2, 3, or FILMSTUD 4	2
One introductory course in Studio Art	1
Distribution:	
Four Art History courses distributed among the following five categories: ancient and medieval; Renaissance and early modern; modern, contemporary, and the U.S.; Asia, Africa and the Americas; film studies	4
Concentration:	
Five courses, of which two must be seminars or colloquia. At least 4 of the 5 must be in a single field or concentration constructed by the student in consultation with an adviser	5
Junior Seminar:	
A methods and theory seminar to be taken by all majors, preferably in Autumn Quarter of junior year	1
Honors Essay (optional)	
Total number of courses	13

MINOR IN ART HISTORY

A student declaring a minor in Art History must complete 25 units of course work in one of the following four tracks: Open, Modern, Asian, or Architecture. Upon declaring the minor, students are assigned an adviser with whom they plan their course of study and electives. A proposed course of study must be approved by the adviser and placed in the student's departmental file. Only one class may be taken for credit outside of the Stanford campus (this includes the Stanford Overseas Studies Programs). All minors are required to attend an orientation session presented by the professional staff of the Art Library, which introduces the many tools of research and reference available on campus or through the Internet. This requirement should be completed no later than the quarter following the minor declaration.

Requirements for the Open Track: ARTHIST 1 plus five lecture courses, colloquia or seminars in any field.

Requirements for the Modern Track: ARTHIST 1 plus five lecture courses, colloquia, or seminars in any aspect of 19th- to 20th-century art.

Requirements for the Asian Track: ARTHIST 2 plus five lecture courses, colloquia, or seminars in Asian art (ARTHIST 1 may be one of the five courses).

Requirements for the Architecture Track: ARTHIST 3 plus five lecture courses, colloquia, or seminars in architectural history (ARTHIST 1 may be one of the five courses).

GRADUATE PROGRAMS

MASTER OF ARTS

The Department of Art and Art History offers M.A. and Ph.D. degrees. The M.A. is granted as a step toward fulfilling requirements for the Ph.D. The department does not admit students who wish to work only toward the master's degree.

The University's basic requirements for the master's degree are set forth in the "Graduate Degrees" section of this bulletin. Completing the University's requirements for a B.A. degree in Art with an Art History field of study, or equivalent training, is required of students entering a program of study for the M.A. The required curriculum for entering students is determined by the Director of Graduate Studies through an evaluation of transcripts and records during an individual meeting scheduled with each student prior to the opening of Autumn Quarter to discuss course deficiencies.

Requirements for the Degree—The requirements for the M.A. degree in Art are:

1. *Units:* completing a total of at least 45 units of graduate work at Stanford in the history of art in courses at the 200 level, including a seminar in art historiography/visual theory.
2. *Languages:* reading knowledge of two foreign languages, preferably German and French or Italian. Students in Chinese and Japanese art are ordinarily expected to demonstrate reading competence in modern and classical Chinese or Japanese depending on the student's area of focus. Final determination is made in consultation with the student's primary adviser.
3. *Papers:* submission for consideration by the faculty of two term papers from among those written during the year.
4. *Area Coverage:* demonstration to the faculty, by course work and/or examination, that the student has adequate knowledge of the major areas of the history of art.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree are set forth in the "Graduate Degrees" section of this bulletin. An expanded explanation of department requirements is given in the *Art History Graduate Student Handbook.*

Residence—To be eligible for the doctoral degree, the student must complete three years of full-time graduate work in Art History, at least two years of which must be in residence at Stanford.

Unit Requirements—To be eligible for the doctoral degree, the student must complete 135 units. Of these 135, the student must complete at least 100 units of graduate course work at the 200 level or above, including all required courses, with a minimum of 62 units in Art History lecture courses and seminars.

Collateral Studies—The student is required to take at least three courses in supporting fields of study (such as anthropology, classics, history, literature, or philosophy), determined in consultation with the department advisers. These courses are intended to strengthen the student's interdisciplinary study of art history.

Graduate Student Teaching—As a required part of their training, all graduate students in Art History, regardless of their source of funding, must participate in the department's teaching program. At least two one-quarter assignments in ARTHIST 1, 2, 3, or FILMSTUD 4 are required, with concurrent registration in the Seminar in Teaching Praxis (ARTHIST 610). Students receiving financial aid are required to serve as a teaching assistant for a minimum of four quarters. Further opportunities for teaching may be available.

Admission to Candidacy—A graduate student's progress is formally reviewed at the end of Spring Quarter of the second year. The applicant for candidacy must put together a candidacy file showing that he/she has completed the requirements governing the M.A. program in the History of Art (see above), and at least an additional 18-24 units by the end of Winter Quarter of the second year. The graduate student does not become a formal candidate for the Ph.D. degree until he/she has fully satisfied these requirements and has been accepted as a candidate by the department.

Area Core Examination—All graduate students conceptualize an area core and bibliography in consultation with their primary adviser and two other Stanford faculty members, one of whom is drawn from a field other than Art History, or, if in Art History, has expertise outside of the student's main area of interdisciplinary concentration. Students are required to pass an area core examination, in either written or oral form, sometime in the third year of study. To prepare for the exam, students may enroll in up to three five-unit reading courses (ARTHIST 620), no more than one per quarter.

Reading Committee—After passing the area core examination, each student is responsible for the formation of a Dissertation Reading Committee consisting of a principal adviser and three readers. Normally, at least two of the three readers are drawn from the department and one may come from outside the department.

Dissertation Proposal—By the beginning of the fourth year, students should have defined a dissertation subject and written a proposal in consultation with their principal adviser. To prepare the proposal, students may take one five-unit independent study course (ARTHIST 640) and apply for a funded Summer Quarter to research and write the proposal. The proposal is submitted to the Art History faculty at the beginning of the fourth year for comments. The student then meets with the adviser to discuss the proposal and faculty comments no later than 30 days after the submission of the proposal, at which time necessary revisions are determined.

Dissertation—A member of the Art History faculty acts as the student's dissertation adviser and as chair of the reading committee. The final draft of the dissertation must be in all the readers' hands at least four weeks before the date of the oral defense. The dissertation must be completed within five years from the date of the student's admission to the candidacy for the Ph.D. degree. A candidate taking more than five years must apply for an extension of candidacy.

Oral Defense Examination—Each student arranges an oral examination with the four members of the reading committee and a chair chosen from outside the department. The oral examination consists mainly of a defense of the dissertation but may range, at the committee's discretion, over a wider field. The student is required to discuss research methods and findings at some length and to answer all questions and criticisms put by members of the examining committee. At the end of the defense, the committee votes to pass or fail the student on the defense. The committee also makes recommendations for changes in the dissertation manuscript before it is submitted to the University as the final requirement for the granting of the Ph.D. degree in the History of Art. After incorporating the changes, the manuscript is given a final review and approval by the student's principal adviser.

PH.D. MINOR

For a minor in History of Art, a candidate is required to complete 24 units of graduate-level art history courses (200 level or above), in consultation with a department adviser.

JOINT PH.D. IN ART HISTORY AND HUMANITIES

The department participates in the Graduate Program in Humanities leading to the joint Ph.D. in Art History and Humanities. For a description of this program, see the "Interdisciplinary Studies in Humanities" section of this bulletin.

PRACTICE OF ART (STUDIO)

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The studio program is designed to develop in-depth skills in more than one area of the visual arts. It emphasizes the expressive potential of an integration of media, often via a crossdisciplinary, interactive path. Through collaboration and connections with scientists, engineers, and humanities scholars, the program addresses a breadth of topical and artistic concerns central to a vital undergraduate education.

The studio program requirements are divided into lower and upper level course work. Lower level courses introduce visual fundamentals through medium-based courses in drawing, painting, photography, video and digital art, printmaking, sculpture, and design, focusing on subject matter from historical motifs such as figure, still life, and landscape, to contemporary design ideas. Upper level courses cross area boundaries and combine practices to expand understanding of materials and techniques. Upper level requirements include a senior capstone experience, ARTSTUDI 249, Advanced Undergraduate Seminar, which emphasizes investigation of visual concepts interpreted by a single medium, by cross-practices, or by collaboration among students working in a variety of materials. Advanced courses with a focus such as design, photography, or painting are offered on a rotational basis. Independent study supervised by a member of the permanent faculty is available to advanced students.

Students are encouraged to move through the requirements for the major in the sequence outlined. Students are exposed to a range of practices early in their development in order to have a good basis of comparison if they choose to concentrate on a particular medium.

The Art major program in the Practice of Art (Studio) must total 64 units and include the following:

1. Six lower level courses (23 units) including ARTSTUDI 30 and five courses from ARTSTUDI 60, 70, 80, 130, 131, 136, 138, 140, 145, 148, 151, 161, 166, 167, 170, 176, 177, 178, 179, 276.
2. Six upper level courses (24 units) including ARTSTUDI 249, Advanced Undergraduate Seminar, and five courses from ARTSTUDI 132, 135, 137, 141, 142, 146, 147, 149, 152, 160, 169, 171, 172, 174A, 177A, 179A, 184, 248, 268, 269, 270, 271.
3. Four art history courses (17 units) including ARTHIST. At least one of the courses must be in the modern art series, ARTHIST 140-159.
4. Total units: 64. Required course work must be taken for a letter grade. University units earned by placement tests or advanced placement work in secondary school are not counted within the 64 units.
5. Each undergraduate major is required to attend an Art Library orientation session no later than the quarter following the major declaration. Majors are to consult with the Art Library staff for scheduling information.
6. Studio majors are required to meet with both their adviser and the department's undergraduate curriculum adviser during the first two weeks of each quarter to have course work approved and to make certain they are meeting degree requirements. The adviser's role is important both in regard to guiding the student's decisions within the program as well as in discussing plans for summer study and graduate work. An adviser is chosen by the student or assigned by the department.

Transfer Credit Evaluation—Upon declaring an Art major, with a field of study in Studio Art, a student transferring from another school must have his or her work evaluated by a Department of Art and Art History adviser. A maximum of 13 transfer units are applied toward the 64 total units required for the major. A student wishing to have more than 13 units applied toward the major must submit a petition to the adviser and then have his or her work reviewed by a studio committee.

MINOR

The minor program in the Practice of Art (Studio) must include the following:

1. Three lower level courses (11 units) including ARTSTUDI 30 and five courses from ARTSTUDI 60, 70, 80, 130, 131, 136, 138, 140, 145, 148, 151, 161, 166, 167, 170, 176, 177, 178, 179, 276.
2. Three Upper Level courses (12 units) including ARTSTUDI 249, Advanced Undergraduate Seminar, and five courses from ARTSTUDI 132, 135, 137, 141, 142, 146, 147, 149, 152, 160, 169, 171, 172, 174A, 177A, 179A, 184, 248, 268, 269, 270, 271.
3. Three art history courses (13 units), including ARTHIST 1 and one course from the modern art series ARTHIST 140-159.
4. Total units: 36. All required course work must be taken for a letter grade. University units earned by placement tests or advanced placement work in secondary school are not counted within the 36 units.
5. Each undergraduate minor is required to attend an Art Library orientation session no later than the quarter following the minor declaration. Minors are to consult with the Art Library staff for scheduling information.
6. Minors are required to meet with both their adviser and the department's undergraduate curriculum adviser during the first two weeks of each quarter to have course work approved and to make certain they are meeting degree requirements.

OVERSEAS CAMPUS CREDIT

A minimum of 51 of the 64 units required for the Studio Art major and a minimum of 32 of the 36 units required for the Studio Art minor must be taken at the Stanford campus. A student must meet with his or her adviser before planning an overseas campus program.

GRADUATE PROGRAMS

MASTER OF FINE ARTS

Fields of study for the M.F.A. degree are offered in Painting, Sculpture, New Genres, Photography, and Product or Visual Design.

PROGRAM IN PAINTING, SCULPTURE, NEW GENRES, AND PHOTOGRAPHY

The program provides a demanding course of study designed to challenge advanced students. Participants are chosen for the program on the basis of work that indicates artistic individuality, achievement, and promise. Candidates should embody the intellectual curiosity and broad interests appropriate to, and best served by, work and study within a university context.

Admission Requirements for the M.F.A.—

1. Applicants must have a B.A. or B.S. from an accredited school. It is expected that the applicant have a strong background in studio art, either an undergraduate degree or at least three years of independent studio practice.
2. Applications and portfolios for the studio program must be submitted by January 15, 2008. Students accepted to the program are admitted for the beginning of the following Autumn Quarter. No applicants for mid-year entrance are considered.
3. Portfolio Specifications: 20 slides of creative work. Some of these can be drawings if relevant to the overall project. Send in a Kodak Universal carousel; no actual work is accepted. All slides must be labeled with the applicant's name and an accompanying slide list must be included indicating the size, date, and medium of each work.

Requirements for the M.F.A. Degree—

1. Completing a minimum of two years (six quarters) of graduate work in residence or its equivalent at Stanford.
2. Completing 48 units of study. Students must discuss their programs of study with the department's student services administrator to ensure that the most favorable registration arrangement is made.
3. Six quarters of the Master's Project, which includes two weekly seminars (the Object Seminar and the Concept Seminar) and Studio Practice, which is an individual tutorial with a selected member of the faculty. In addition, three courses of academic electives are required in the first year. These courses can be chosen from a large variety of disciplines in consultation with the faculty adviser.
4. The student is expected to pass three faculty reviews: (1) at the end of the first quarter (anyone judged to be making inadequate progress is placed on probation and requires an additional review at the end of the second quarter), (2) at the end of the third quarter, and (3) at the time

of the M.F.A. exhibition. The purpose of these reviews is to evaluate development and to assess the progress of the student.

5. During the final quarter in the program, students must write a thesis paper addressing the development of their work over the two-year period at Stanford. Participation in the M.F.A. exhibition at the end of the year is required.
6. All students, regardless of their source of funding, are required to assist with the department's teaching program for a minimum of eight hours per week over the period of six quarters; the particulars of this assignment are at the department's convenience.

The studio faculty reserve the right to make use of graduate paintings, sculpture, and photographs in exhibitions serving the interests of the graduate program.

Graduate students must remain in residence at Stanford for the duration of the program.

THE GRADUATE PROGRAM IN DESIGN

Working jointly, the departments of Art and Art History and Mechanical Engineering offer graduate degrees in product and visual design. A large physical environment, the Design Yard, provides professional caliber studio space and well equipped shops. Flexible programs may include graduate courses in fields such as engineering design, biotechnology, marketing, microcomputers, or the studio and art history curriculum. The program centers on a master's project and may also include work in advanced art and design. The program is structured to balance independent concentration with use of the University and community, and interaction with the students and faculty of the graduate Design program. Crossdisciplinary interaction is encouraged by a four-person graduate Design faculty.

Admission Requirements for the M.F.A.—

1. Applicants must have a B.A. or B.S. from an accredited school. It is expected that the applicant have a strong background in studio art, either an undergraduate degree or at least three years of independent studio practice.
2. Applications and portfolios for the design program must be submitted by January 15, 2008. Students accepted to the program are admitted for the beginning of the following Autumn Quarter. No applicants for mid-year entrance are considered.
3. *Portfolio Specifications:* 12 slides or photographs of creative work. Slides must be labeled with the applicant's name. If a carousel is sent, an accompanying slide list must be included indicating the size, date, and medium of each work; otherwise, slides should be labeled with the same information and sent in the standard cardboard box received from processing.

Requirements for the Degree—The M.F.A. degree with a specialization in design requires:

1. Completing a minimum of two years (six quarters) of graduate work in residence or its equivalent at Stanford.
2. Completing 54 units of course work chosen in consultation with an adviser. At least 18 of the 54 units must be in ARTSTUDI 360A,B,C and ME 316 A,B,C.
3. Participating in a weekly seminar in which the student's work is criticized and discussed in detail.
4. Graduate students must remain in residence at Stanford for the duration of the program.

FILM AND MEDIA STUDIES

The undergraduate major in Film and Media Studies is designed to develop the critical vocabulary and intellectual framework for understanding the role of cinema and related media within broad cultural and historical contexts.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The Bachelor of Arts in Film and Media Studies provides an introduction to film aesthetics, national cinematic traditions, modes of production in narrative, documentary, and experimental films, the incorporation of moving image media by contemporary artists, and the proliferation of new forms of digital media. After completing a nine-course core that combines the history of cinema with an overview of the theory, techniques, and institutions central to moving images, students pursue a concentration tailored to their interests.

All undergraduate majors complete a minimum of 65 units and 16 courses of 3-5 units each, or 15 courses plus an honors thesis. All courses for the major must be taken for a letter grade.

CORE COURSES

Students considering a major in film and media studies should take ARTHIST 1, Introduction to the Visual Arts, or FILMSTUD 4, Introduction to Film Study, during their freshman or sophomore year. These courses anchor the major through exposure to film language, genre, and visual and narrative structures. Majors are also required to take at least one course in the fundamentals of film and video production and should take a studio course in new media.

FIELDS OF STUDY

Advanced undergraduate courses are offered in five fields of study: Film History; Film and Culture; Film, Media, and Technology; Writing, Criticism, and Practice; and Avant Garde Aesthetics and Performance. Working with a faculty adviser, students select at least six courses in their field from course offerings in Art and Art History and other departments across the University. These fields are declared on Axess.

SENIOR SEMINAR

FILMSTUD 290, Movies and Methods, offered once a year, represents the culminating intellectual experience for Film Studies majors choosing not to write an honors thesis. Honors thesis writers may also take the senior seminar. Seniors who may not be in residence in the quarter that the senior seminar is offered may enroll in the junior year. Movies and Methods provides majors with an opportunity to synthesize their previous work in Film Studies and work in an advanced setting with a faculty member. The senior seminar must be taken for a letter grade.

HONORS THESIS

Students who want to write an honors thesis should consult with a potential adviser by the beginning of junior year. The adviser must be a faculty member in residence during the student's senior year who can oversee the student's progress throughout the project.

The minimum requirements for admission to the honors program in the department are an overall GPA of 3.5 and at least 3.5 in Film and Media Studies courses. Students wishing to write an honors thesis must announce their intention by submitting a form signed by the thesis adviser, who need not be the student's academic adviser, by February 1 of their junior year. It is recommended, but not mandatory, that the thesis adviser be on campus and in residence during the candidate's senior year.

Candidates for the honors program must submit to the Film and Media Studies faculty a 3-5 page thesis proposal outlining the themes of the thesis, a bibliography, a tentative schedule for research and writing, and one completed paper that demonstrates the student's ability to conceptualize and write about ideas. This complete proposal must be submitted to the department's undergraduate coordinator no later than the third week of Spring Quarter of the candidate's junior year so that it can be read, discussed, and voted upon at the faculty's regular meeting in early May. A candidate is accepted into the honors program by a simple majority.

Once admitted to the honors program, students work with their thesis advisers to research, organize, and write the thesis, and to enlist one other faculty member to serve on the thesis reading committee.

To aid the process of research and writing, students preparing an honors thesis are paired with a graduate student mentor. Students should contact the graduate student mentor in their junior year as soon as they begin to think about writing an honors thesis. Honors thesis writers may register for up to 10 units of FILMSTUD 199, Independent Study, while working on the thesis. Students may apply for UAR research grants to help finance trips or expenses relative to preparing the research for their honors thesis.

Students and thesis advisers should plan the work schedule so that a final manuscript is in the hands of each member of the thesis reading committee by the beginning of the seventh week of the student's final quarter at Stanford. The thesis adviser assigns a letter grade; both faculty readers must approve the thesis for honors before the student is qualified to graduate with honors.

FILM AND MEDIA STUDIES MAJOR REQUIREMENTS

	Number of courses
Core:	9
ARTHIST 1	
FILMSTUD 4	
FILMSTUD 5 *or* FILMSTUD 101	
FILMSTUD 100A,B,C	
FILMSTUD 102	
FILMPROD 114	
One course in new media, from a list supplied by the department	
Concentration:	6
Six courses, four of which must be in a single film and media studies concentration developed by the student in consultation with an adviser. Concentration areas are: film history; film and culture; avant garde aesthetics and performance; film, media, and technology; and writing, criticism, and practice. The remaining two courses must be related, situating the student's concentration in a broader context.	
FILMSTUD 290. Senior Seminar	1
Total number of courses	16

FILM AND MEDIA STUDIES MINOR

A minor in Film Studies requires four core courses and three elective courses for a total of seven courses. The required core courses are: FILMSTUD 4, Introduction to Film Study; FILMSTUD 102, Theories of the Moving Image; one course from the film history sequence FILMSTUD 100A,B,C; and either a course in a national cinema or an additional course in film history. Electives can be chosen from courses in other departments approved for the Film Studies minor by the coordinator and core faculty for their stress on methods of film analysis. These may include courses in national cinemas, film genres, experimental and documentary film, or film theory. Courses must focus on film and use the method of film study to be used towards completion of the minor; courses that use film to illustrate a cultural topic are not eligible. Film Production and Studio Art courses may not be used towards the requirements.

Upon declaring the minor, students are assigned an adviser with whom they plan their course of study and electives. A proposed course of study must be approved by the adviser and placed in the student's departmental file. Only one class may be taken for credit outside the Stanford campus, including Stanford Overseas Studies programs. Minors are required to attend an orientation session presented by the professional staff of the Art Library, which introduces the many tools of research and reference available on campus or through the Internet. This requirement should be completed no later than the quarter following the minor declaration.

GRADUATE PROGRAMS

MASTER OF FINE ARTS

PROGRAM IN DOCUMENTARY FILM AND VIDEO

The Master of Fine Arts program in documentary production provides a historical, theoretical, and critical framework within which students master the conceptual and practical skills for producing nonfiction film and video. The M.F.A. is a terminal degree program with a two-year, full-time curriculum representing a synthesis of film praxis and film and media history, theory, and criticism. Courses provide an intellectual and theoretical framework within which students' creative work is developed. Students proceed through the program as a cohort. The program does not allow leaves of absence.

The M.F.A. degree is designed to prepare students for professional careers in film, video, and digital media. Graduates are qualified to teach at the university level. The philosophy of the program is predicated on a paradigm of independent media that values artistic expression, aesthetics, social awareness, and an articulated perspective. Students become conversant with the documentary tradition as well as with alternative media and new directions in documentary. Training in documentary production is combined with the development of research skills in film criticism and analysis. The film studies, art history, and elective courses provide an intellectual and theoretical framework within which creative work is realized. The dual emphasis on production and film studies courses prepares students for an academic position that typically requires the teaching of both film studies and media production.

DEPARTMENTAL REQUIREMENTS

A minimum of 81 units is required for the M.F.A. degree. In the production core, students are required to conceptualize and visualize their ideas in a series of writing and producing courses that focus on documentary story structure. These courses are taken in tandem with project-based production courses that provide training in the technical and conceptual aspects of cinematography, sound recording, and editing. An ongoing discussion of form and content is a signature component of the writing and production courses. The production core is complemented by a series of core film studies courses plus elective courses in the history, aesthetics, ideology, and theory of all genres of moving image media. Core film production courses are offered S/NC only. All other courses must be taken for a letter grade.

COURSE ASSISTANTSHIPS

Course assistants for the program are chosen during Spring Quarter of the first year. The appointment is made on a quarterly basis in the second year. Course assistants begin working several days prior to the academic term and may be required to work several days after the last day of finals in order to close down the facilities in an orderly manner. Course assistants are chosen on the basis of faculty and staff's assessment of the applicant's technical competence and ability to work with others. In addition to salary, compensation includes some tuition remission in the second year, depending on the number of hours worked.

M.F.A. THESIS PROJECT

In the second year of the program, each student produces a 20-minute film or video documentary that constitutes the thesis project. In FILMPROD 405, students choose a topic, research and develop their project, and write a proposal for submission. A project may not begin production until the final proposal has been approved. Most of the production and post-production occurs in FILMPROD 406A,B. Once a project has been approved, the student is eligible to submit it to the Enersen Foundation for possible funding.

CURRICULUM

Core Production Courses: (8 courses, 32 units)—Core courses must be taken in sequence.

FILMPROD 400. Film/Video Writing and Directing
FILMPROD 401. Nonfiction Film Production
FILMPROD 402. Digital Video
FILMPROD 403. Advanced Documentary Directing
FILMPROD 404. Advanced Film and Video Production
FILMPROD 405. Producing Practicum
FILMPROD 406A,B. Documentary MFA Thesis Seminar I and II

Core Film Studies Courses: (6 courses, 25 units)

FILMSTUD 4. Introduction to Film Study
FILMSTUD 302. Theories of the Moving Image
FILMSTUD 315. Contemporary Issues in Documentary
FILMSTUD 316. International Documentary
FILMSTUD 410A,B. Documentary Perspectives I and II

Electives: (7 courses, 28 units)—To be chosen in consultation with the student's adviser.

Art History: (1 course, 4 units)—Choose one lecture or seminar in the history of visual art, not including film studies.

Studio Art and/or Communications: (3 courses, 12 units)

Film Studies: (3 courses, 12 units)

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

HISTORY OF ART

BASIC

ARTHIST 1. Introduction to the Visual Arts—Multicultural rather than historical approach. GER:DB-Hum, WIM

5 units, Aut (Marrinan, M)

ARTHIST 2. Asian Art and Culture—(Same as JAPANGEN 60.) Religious and philosophical ideas and social attitudes of India, China, and Japan; how they are expressed in architecture, painting, woodblock prints, sculpture, and in forms such as garden design and urban planning. GER:DB-Hum, EC-GlobalCom

5 units, Win (Takeuchi, M)

ARTHIST 3. Introduction to the History of Architecture—From antiquity to the 20th century, mostly Western with some non-Western topic. Buildings and general principles relevant to the study of architecture. GER:DB-Hum

5 units, not given this year

ARTHIST 99A. Student Guides at the Cantor Center for the Visual Arts—Open to all Stanford students. Introduction to museum administration; art registration, preparation, and installation; rights and reproductions of images; exhibition planning; and art storage, conservation, and security. Skill building in public speaking, inquiry methods, group dynamics, theme development, and art-related vocabulary. Students research, prepare, and present discussions on art works of their choice.

1 unit, Aut (Young, P)

OVERVIEW COURSES

THE CLASSICAL WORLD

ARTHIST 101/301. Archaic Greek Art—(Same as CLASSART 101/201.) The development of Greek art and culture from protogeometric beginnings to the Persian Wars, 1000-480 B.C.E. The genesis of a native Greek style; the orientalizing phase during which contact with the Near East and Egypt transformed Greek art; and the synthesis of East and West in the 6th century B.C.E. GER:DB-Hum

4 units, Aut (Maxmin, J)

ARTHIST 102/302. Classical and 4th-Century Greek Art—(Same as CLASSART 102/202.) The formation of the classical ideal in 5th-century Athenian art, and its transformation and diffusion in the 5th and 4th centuries against changing Greek history, politics, and religion. GER:DB-Hum

4 units, Win (Maxmin, J)

THE MEDIEVAL WORLD

ARTHIST 106/306. Byzantine Art and Architecture, 300-1453 C.E.—Art-historical developments, and monuments and works of art. Topics include: the transition from naturalism to abstraction; imperial art and court culture; pilgrimage and cult of saints; and secular art and luxury objects. GER:DB-Hum

4 units, not given this year (Pentcheva, B)

ARTHIST 106A/306A. Historical Monuments in Jerusalem: Signs and Symbols of the Three Monotheistic Religions—Architectural roles of Judaism, Christianity, and Islam in manifesting the symbolic significance attributed to the city by these religions. Architectural history of the city from foundation to the present, emphasizing historical events which have determined its alternating urban layouts. The Islamic period whose historical monuments dominate the skyline of the Old City. GER:DB-Hum

4 units, Spr (Shani, R)

ARTHIST 107/307. Age of Cathedrals—Gothic art and architecture in W. Europe, 1150-1500. The structuring of a modern visual discourse within the ideological framework of a new monarchical church and state, emerging towns and universities, the rise of literacy, the cultivation of self, and the consequent shifts in patterns of art patronage, practice, and reception in Chartres, Paris, Bourges, Strasbourg, Canterbury, London, Oxford, and Cambridge. GER:DB-Hum

4 units, not given this year (Pentcheva, B)

ARTHIST 108/308. Virginity and Power: Mary in the Middle Ages—The most influential female figure in Christianity whose state cult was connected with the idea of empire. The production and control of images and relics of the Virgin and the development of urban processions and court ceremonies though which political power was legitimized in papal Rome, Byzantium, Carolingian and Ottonian Germany, Tuscany, Gothic France, and Russia. GER:DB-Hum

4 units, not given this year (Pentcheva, B)

EUROPE 1400-1900

ARTHIST 114/314. Vision and Emblem: Netherlandish Painting from Van Eyck to Brueghel—How 15th-century pictorial illusionism transformed the devotional image and portraiture, calling for a new kind of engagement with the image on the part of the beholder. How 16th-century humanist knowledge influenced the creation of new pictorial subjects and representational forms. The reflection of religious crises triggered by the Reformation in art. GER:DB-Hum

4 units, Win (Hansen, M)

ARTHIST 116/316. European Baroque Sculpture—Characteristics of and innovations in sculpture in 17th-century Europe. The integration of sculpture with architecture in theatrical settings by Gian Lorenzo Bernini. Idealized images of statehood for mercantile republics, absolutist monarchs, and the papacy. Smaller works for private contemplation, ideas of classical versus modern style, and workshop practices. GER:DB-Hum

4 units, Spr (Hansen, M)

ARTHIST 121/321. 18th-Century Art in Europe, ca 1660-1780—Major developments in painting across Europe including the High Baroque illusionism of Bernini, the founding of the French Academy, and the revival of antiquity during the 1760s, with parallel developments in Venice, Naples, Madrid, Bavaria, and London. Shifts in themes and styles amidst the emergence of new viewing publics. Artists: the Tiepolos, Giordano, Batoni, and Mengs; Ricci, Pellegrini, and Thornhill; Watteau and Boucher; Chardin and Longhi; Reynolds and West; Hogarth and Greuze; Vien, Fragonard, and the first works by David. Additional discussion for graduate students. GER:DB-Hum

4 units, not given this year (Marrinan, M)

ARTHIST 122/322. The Age of Revolution—Painting in Europe during the French Revolution and the Napoleonic conquest. As political events altered social formations, practices in the visual arts were similarly affected by shifts in patronage, public, and the social function of image making. An attempt to align ruptures in the tradition of representation with the unfolding historical situation. The first manifestations of a romantic alternative to the canons of classical beauty and stylistic restraint. GER:DB-Hum

4 units, Aut (Marrinan, M)

ARTHIST 124/324. The Age of Naturalism, ca 1830-1874—The origins, development, and triumph of naturalist painting in Europe. The creative tensions that emerged between traditional forms of history painting and the challenge of modern subjects drawn from contemporary life. Emphasis is on the development of open-air painting as an alternative to traditional studio practice, and to the rise of new imaging technologies, such as lithography and photography, as popular alternatives to the hand-wrought character and elitist appeal of high art. GER:DB-Hum

4 units, Spr (Marrinan, M)

ARTHIST 126/326. Post-Naturalist Painting—How conceptual models from language, literature, new technologies, and scientific theory affected picture making following the collapse of the radical naturalism of the 1860s and 1870s. Bracketed in France by the first Impressionist exhibition (1874) and the first public acclamation of major canvases by Matisse and Picasso (1905), the related developments in England, Germany, Belgium, and Austria. Additional weekly discussion for graduate students. Recommended: some experience with 19th-century art. GER:DB-Hum

4 units, not given this year (Marrinan, M)

BRITAIN AND AMERICA 1600-1900

ARTHIST 132/332. American Art and Culture, 1528-1860—The visual arts and literature of the U.S. from the beginnings of European exploration to the Civil War. Focus is on questions of power and its relation to culture from early Spanish exploration to the rise of the middle classes. Cabeza de Vaca, Benjamin Franklin, John Singleton Copley, Phillis Wheatley, Charles Willson Peale, Emerson, Hudson River School, American Genre painters, Melville, Hawthorne and others. GER:DB-Hum

4 units, not given this year (Wolf, B)

MODERN EUROPE

ARTHIST 142/342. Varieties of Modern Architecture—The development of competing versions of modern and postmodern architecture and design in Europe and America, from the early 20th century to the present. Recommended: 141. GER:DB-Hum

4 units, Win (Beischer, T)

ARTHIST 144A/344A. Apollinaire's Avant Gardes: Modernism in Paris, 1910-1920—Focus is on cubism, futurism, orphism, simultanéism, and early metaphysical painting. Artists include: Picasso, Braque, Picabia, de Chirico, Delaunay, Boccioni, Léger, Matisse, Severini, Friesz, Laurencin, and Chagall. Collaborations among painters, poets, and critics. Themes include: the problem of literary painting and the legacies of symbolism; emergence of abstraction; tensions and polemics between cubism and futurism; sub-sects of cubism; rise of collage; role of journals and salons in the development of the avant garde.

4 units, Aut (Merjian, A)

ARTHIST 145/345. European Modernism and the International Avant Gardes, 1895-1945—How modern and avant garde artists have interrogated the nature of signification or how form produces meaning; their relationship to revolutionary politics. Fauvism and cubism in Paris, German expressionism, Italian futurism, pittura metafisica, Berlin Dada, Mondrian and de Stijl in the Netherlands, suprematism, Russian constructivism, and surrealism. Vocabulary and analytical and visual tools to come to grips with the works and debates in European modernism and the international avant gardes. Readings include manifestos, artists' writings, and art criticism. GER:DB-Hum

4 units, Aut (Gough, M)

ARTHIST 145A/345A. Art of Postwar Europe—Major movements, themes, figures, and critical issues. Focus is on the art of France, Germany, Italy, and England as distinct from and intertwined with the aesthetic production of postwar U.S. The question of a political, engaged, or committed art and the status of the avant garde; the rise of consumer culture and the practice of everyday life. Recommended: some art history.

4 units, not given this year (Lee, P)

ARTHIST 149/349. Art Between the Wars: Dada, De Stijl, Constructivism, Surrealism—Historical avant garde movements and anti-modernist tendencies such as socialist realism and Nazi art. Issues: artistic responses to wartime trauma; attempts to develop the progressive potential of technology and the political utility of art; and attempts to reorder relations between body and machine, art object and commodity, and private and public life. Artists: Richter, Heartfield, Tzara, Rodchenko, Tatlin, Bellmer, Man Ray, and Ernst. Readings: the modern subject, mass culture, the modernism/anti-modernism debates of the 30s, and the uses of art in totalitarian regimes. GER:DB-Hum

4 units, Spr (Gough, M)

MODERN AMERICA

ARTHIST 143A/343A. American Architecture—A historically based understanding of what defines American architecture. What makes American architecture American, beginning with indigenous structures of pre-Columbian America. Materials, structure, and form in the changing American context. How these ideas are being transformed in today's globalized world. GER:DB-Hum

4 units, not given this year (Beischer, T)

ARTHIST 153A/353A. American Art, 1900-1945—Painting, sculpture, photography, and design. Focus is on the emergence of diverse cultural forms in the search for a modern, American form of artistic expression. Topics include: Robert Henri and the Ash Can school; the Armory Show and the influence of European modernism; Marcel Duchamp and plumbing; futurism, cubism, and the machine aesthetic; Stuart Davis and jazz; Dorothea Lange and documentary photography; Alfred Stieglitz and his Seven Americans; Thomas Hart Benton and regionalism; the arts of the WPA; and the role of artists in wartime propaganda. GER:DB-Hum

4 units, Spr (Marshall, J)

ARTHIST 158A/358A. History of Photography—From its invention in 1839 to the present. Emphasis is on the evolution of photography as a fine art. Photographs as a universal democratic art form to record familial events and express personal creativity. Development of photography as it relates to other art forms, journalism, architecture, portraiture, landscape, documentation, time, and personal expression. The technology of photography; photographic techniques. GER:DB-Hum

4 units, Spr (Dawson, R)

ARTHIST 159A/359A. Photography in America—The history of American photography as fine art and social tool. Topics include: defense of photography as a legitimate art form; role of portraits and photo albums in social self-fashioning; technological and market aspects of photography; politics of straight or documentary aesthetics; role of women; and how the idea of America has been shaped by photographs. Artists include Mathew Brady, Alfred Stieglitz, Edward Weston, Walker Evans, Dorothea Lange, Robert Frank, Garry Winogrand, William Eggleston, and Mary Ellen Mark. GER:DB-Hum

4 units, Win (Marshall, J)

ASIA

ARTHIST 182/382. Arts of China, 900-1500: Cultures in Competition—The era from the Five Dynasties and Song to the mid-Ming period was marked by competition in cultural arenas such as between Chinese and formerly nomadic regimes, or between official court art modes and scholar-official and literati groups. Topics include: innovations in architectural and ceramic technologies; developments in landscape painting and theory; the proliferation of art texts and discourses; the rise of educated artists; official arts and ideologies of the Song, Liao, Jin, Yuan, and Ming regimes; new roles for women as patrons and cultural participants; and Chan and popular Buddhist imagery. GER:DB-Hum, EC-GlobalCom

4 units, not given this year (Vinograd, R)

ARTHIST 184/384. Aristocrats, Warriors, Sex Workers, and Barbarians: Lived Life in Early Modern Japanese Painting—The changes marking the transition from medieval to early modern Japanese society generated a revolution in visual culture. This paradigm shift as exemplified in subjects deemed fit for representation; how commoners joined elites in pictorializing their world, catalyzed by interactions with the Dutch. GER:DB-Hum

4 units, Aut (Takeuchi, M)

ARTHIST 185/385. Art in China's Modern Era—From the late Ming period to contemporary arts. Topics: urban arts and print culture; commodification of art; painting theories; self portrayals; court art, collection, and ideological programs; media and modernity in Shanghai; politics and art in the People's Republic; and contemporary avant garde and transnational movements. GER:DB-Hum

4 units, not given this year (Vinograd, R)

ARTHIST 186A/386A. Japanese Art Since 1850—Visual culture of modern and contemporary Japan, emphasizing Japan's reaction to and engagement with the West. Two-dimensional arts before 1950 including painting, prints, photography; and two- and three-dimensional arts after 1950. GER:DB-Hum

4 units, not given this year (Takeuchi, M)

AFRICA

ARTHIST 190/390. African Art and Writing Traditions—Classic African graphic writings south of the Sahara in historical and social context. What makes an African graphic writing system, and how they are used as visual art, and as markers of identity, religion, and moral philosophy. Civilizations include Mali, Asante, Yoruba, Ejagham, and Kongo.

4 units, not given this year (Martinez-Ruiz, B)

ARTHIST 192/392. Introduction to African Art—Form, space, media, medium, and visual expression in African art. Rock art to contemporary art production. Major works and art expression in terms of function and historical context. GER:DB-Hum

4 units, Win (Martinez-Ruiz, B)

ARTHIST 193A/393A. Caribbean and Latin American Art: Empire, Identity, and Society—Visual culture from 1505 to 1889 and its relation to current debates on cultural identity, hybridity, syncretism, and creolization. Painting, travel books, and printmaking by artists including De Bry, Belisario, Rugendas, Debret, and Landaluce. Visual analysis of works at the Yale Center for the British Art and Stanford's Green Library. GER:DB-Hum

4 units, not given this year (Martinez-Ruiz, B)

ARTHIST 195/395. Introduction to Black Atlantic Visual Traditions—African cultural expression in the Americas. How politics, religion, and culture influence the art of the Black Atlantic. Focus is on the period when cultures were brought from Africa to the Americas through the slave trade and came into contact and conflict with western colonial powers. GER:DB-Hum

4 units, not given this year (Martinez-Ruiz, B)

SEMINARS AND COLLOQUIA

ARTHIST 203. Greek Art in and Out of Context—(Same as CLASSART 109.) The cultural contexts in which art served religious, political, commercial, athletic, sympotic, and erotic needs of Greek life.

5 units, Aut (Maxmin, J)

ARTHIST 204A. Appropriations of Greek Art—(Same as CLASSART 110.) The history of the appropriation of Greek art by Rome, the Renaissance, Lord Elgin, and Manet.

5 units, Spr (Maxmin, J)

ARTHIST 212. Renaissance Florence, 1440-1540—Notions of cultural superiority in light of changes in Florentine society as it went from being a republic to a duchy ruled by the Medici. Artists and architects such as Donatello, Brunelleschi, Botticelli, Michelangelo, and Pontormo praised as having revived the arts and returned them to a level of ancient splendor. The role of the sacred in daily life and uses of the pagan past for poetic and scholarly expressions and as vehicles for contemporary experience.

5 units, Spr (Hansen, M)

ARTHIST 232. Rethinking American Art—Painting and some sculpture of the 18th and 19th centuries, focusing on works in the de Young Museum. Each student studies a single work using documents of social and cultural history. Emphasis is on recent scholarship, genre, and the biography of objects as they shift in context and meaning over time. Weekly meetings at the de Young with Professor Margaretta Lovell and UC Berkeley students.

5 units, not given this year (Wolf, B)

ARTHIST 233. The Art Museum: History and Practice—Workshop. Contemporary museum culture emphasizing the collecting and exhibiting practices of art museums. Readings, field trips, and discussions with museum professionals. Each student creates a detailed proposal for a museum exhibition and presents it to a panel of faculty and curators.

5 units, Spr (Marshall, J)

ARTHIST 234A. The Harlem Renaissance—African American artistic expression in the 20s that reflected changing conditions of urban modernity and racial identity. The forms and meanings of African American modernism; social politics of black self-representation and white patronage; and how high culture became the primary front in the struggle for racial uplift. Cultural figures include: Aaron Douglas, W.E.B. Du Bois, Marcus Garvey, Langston Hughes, Jacob Lawrence, Zora Neale Hurston, and Carl Van Vechten. Sources include painting, sculpture, music, and literature.

5 units, not given this year (Marshall, J)

ARTHIST 235A. Art and the Machine Age—Artistic and intellectual responses to modernization. Topics include: artistic uses of the machine as a metaphor for nature, the body, and sexuality; adaptation of mechanical technologies to art making; appreciation of machines as works of art; and how changing technologies in the industrial sphere impacted the artist's role in the cultural sphere. The place of the machine in architecture; historical role of industrial design; machine-themed museum exhibitions; and works by Fernand Léger, Le Corbusier, Rube Goldberg, Charles Sheeler, Charlie Chaplin, Raymond Loewy, and George Gershwin.

5 units, Aut (Marshall, J)

ARTHIST 244A. Prints and Visual Communication: History and Techniques—Examination of original examples of major printmaking techniques including relief, intaglio, lithography, and monotype by artists including Dürer, Rembrandt, Goya, Whistler, Picasso, and Johns. Phototransfer techniques and printed textiles. Historical background. Sources include prints in the Mary Tanenbaum seminar room at the Cantor Arts Center, demonstrations, and field trips to printmaking studios. Team-taught by curators, professors, and printmakers.

5 units, Win (Fryberger, W)

ARTHIST 249. Picasso and Cubism

5 units, not given this year (Gough, M)

ARTHIST 252A. Place: Making Space Now—Premise is that architects are place makers; what that means in the contemporary world. The difference between place and space. Traditional notions of place by scale such as home, city, and nation state. Challenges to traditional notions of place such as: being out of place; nomadic place; and how architects can design for non-places. Reconceptualizations of contemporary space such as the role of digital and cyber technologies; how locality is constructed in a global world; and the sense of place in the in-between places created by a world in flux.

5 units, Win (Beischer, T)

ARTHIST 254. Utopia and Reality in Modern Urban Planning—(Same as URBANST 164.) Primarily for Urban Studies and Art majors. Utopian urbanist thinkers such as Ebenezer Howard, Le Corbusier, and Frank Lloyd Wright who established the conceptual groundwork of contemporary urban planning practice. Research paper. GER:DB-Hum

5 units, Spr (Stout, F; Turner, P)

ARTHIST 281A. Making Art History in Republican China—The construction of modern art historical discourses under a new national regime and within an international context; the role of public institutions and media such as museums, art academies, and art journals in forming a new public role for art and art collecting; and the cultural politics of art production.

5 units, not given this year (Vinograd, R)

ARTHIST 282A. Imagining the Imperial: Images of the Court in Late Ming Dynasty Public Culture—Themes of palace and court life popular in vernacular painting, print illustrated books, and fiction. Dimensions of the imperial palace and court in late Ming public imaginary, including strategies of historical displacement, disguised political critique, commerce in imperial objects, the taste for scandal, and mythologies of court life.

5 units, not given this year (Vinograd, R)

ARTHIST 283A. Paris and Shanghai, 1880-1940: Mediating the City—Offered in conjunction with the Stanford Humanities Laboratory. Mediations of the cosmopolitan cities of Shanghai and Paris as frames and stages for representation and social presentation, including: conventional visual, pictorial, and art media such as painting, lithography, photography, and film; and complex, multimedia and social spaces such as illustrated periodicals, cabarets, theaters, shopping streets, and expositions. The materiality of media, social and economic systems, cultural spaces, and the construction of urban imaginaries.

5 units, Spr (Vinograd, R)

ARTHIST 287. Pictures of the Floating World: Images from Japanese Popular Culture—Printed objects produced during the Edo period (1600-1868), including the *Ukiyo-e* (pictures of the floating world) and lesser-studied genres such as printed books (*ehon*) and popular broadsheets (*kawaraban*). How a society constructs itself through images. The borders of the acceptable and censorship; theatricality, spectacle, and slippage; the construction of play, set in conflict against the dominant neo-Confucian ideology of fixed social roles. Prerequisites: 2, 186, 187, 188. GER:DB-Hum

5 units, not given this year (Takeuchi, M)

ARTHIST 290. Mapping Africa: Cartography and Architecture—Visual forms of spatial representation of Africa and implications for understanding the cultures they depict. Examples include early Renaissance cartography and written accounts by explorers, travelers, geographers, and missionaries. African concepts of design, meaning in architecture, and spatial solutions. Case studies of African models.

5 units, Win (Martinez-Ruiz, B)

ARTHIST 291. African and Afro-Atlantic Graphic Writing Systems—African notions of communication and visual writing informed by Western linguistic and semiotic theory. Examples of African graphic writing systems emphasizing rupestrian art, wall painting, scarification, textiles, furniture, pottery, and metal work. Gestures, music, and oral literature. Negotiations between traditional practices and modernity.

5 units, not given this year (Martinez-Ruiz, B)

ARTHIST 292A. Researching Africa: Problem and Theory in African Art

5 units, not given this year (Martinez-Ruiz, B)

ARTHIST 293. Latino American Avant Garde—African contribution to modern art practices in Latino America. Mexico, Brazil, and Cuba as models. Cultural and historical context.

5 units, not given this year (Martinez-Ruiz, B)

ARTHIST 296. Junior Seminar: The Practice of Art Criticism—Historiography and methodology.

5 units, Win (Corn, W)

ARTHIST 297. Honors Thesis Writing—May be repeated for credit.

1-5 units, Aut, Win, Spr (Staff)

ARTHIST 298. Individual Work: Art History—For approved independent research with individual faculty members. Letter grades only.

1-15 units, Aut, Win, Spr (Staff)

ARTHIST 299. Research Project: Art History

1-15 units, Aut, Win, Spr (Staff)

GRADUATE SEMINARS

HISTORICAL STUDIES

ARTHIST 410. Aesthetics of the Icon—How medieval objects were experienced through sight, touch, sound, smell, and taste; how this multisensory richness has been reduced to visual studies of medieval art. Focus is on the Byzantine icon to restore its synaesthetic power; how its performance is tied to culturally-specific modes of seeing. Byzantine liturgy, prayer, epigrams, and literary genres of description such as ekphrasis.

5 units, not given this year (Pentcheva, B)

ARTHIST 412. Problems in Italian Mannerism—Questions of the bella maniera, anti-classicism, and center and periphery in mannerist art in light of developments in scholarship from the 70s to the present. Authors include Arasse, Cropper, Cole, Nova, Summers, and Vickers.

5 units, Aut (Hansen, M)

ARTHIST 430A. Modernity and 19th-Century Visual Culture—The relationship between visuality and modernity; the privileged role played by seeing. Sources include paintings and literary texts organized around questions of perception. Topics include: visuality and the public sphere; landscape and depoliticized speech; genre and hegemony; race and identity; post-liberal and postmodern culture.

5 units, Spr (Wolf, B)

ARTHIST 430B. Modernity and 19th-Century Visual Culture—Writing workshop and reading group. The relationship between publication and professionalization. Students submit publishable papers to an appropriate journal. Recommended: 430A.

5 units, not given this year (Wolf, B)

ARTHIST 437. The Art of Visual Humor—Humor in 19th- and 20th-century painting, sculpture, cartoons, and caricatures. How visual differs from literary and oral humor. Readings on theories of humor and puns, parodies, in-jokes, and unconscious humor in modern images. Students select projects to research and interpret.

5 units, Win (Corn, W)

ARTHIST 443A. Untimely Aesthetics: Nietzsche and Early 20th-Century Modernism—Nietzsche's philosophies of art and their adaptation and expropriation by specific authors and artist including: Gabriele d'Annunzio, Giorgio de Chirico, F.T. Marinetti, Georges Bataille, Louis Aragon, and Pierre Klossowski. Texts include *The Birth of Tragedy*, *The Gay Science*, *Thus Spoke Zarathustra*, *The Case of Wagner*, *Nietzsche Contra Wagner*. Topics include: modernism and anti-positivism; theory of the avant garde; Nietzsche and nationalist propaganda; the relationship between painting and philosophy; and fascism and aesthetics.

5 units, Spr (Merjian, A)

ARTHIST 446. The Russian and Soviet Avant Garde

5 units, Aut (Gough, M)

ARTHIST 447. Extreme Drawing—What happened to drawing in the mass-media-saturated environment of the 20s and beyond? The impact of advances in photolithographic reproduction, film, and radio. The role of drawing in urban environments and social spaces, and transgression of the medium's traditional constraints through the introduction of montage, cut-outs, and unconventional supports. Focus is on the 20s (Le Corbusier, El Lissitzky, Klucis, Vesnin, and Leonidov), and the 50s-60s (Constant, Price, Archigram, Friedman, the NER group, and Superstudio).

5 units, not given this year (Gough, M)

ARTHIST 448. Theories and Practices of Abstraction—Focus is on Europe and the Americas: movements such as Orphism, Suprematism, Neoplasticism, Constructivism, concrete art, Concretism, Neoconcretismo, Kineticism, Minimalism, op art, and neo-geo. The relative significance of form and historical context in the determination of meaning in abstract art. How abstract artists theorized their struggle against representation in relation to self-reflexivity, universalism, mysticism, socialism, utopia, scientific rationality, furniture, and interior design. Readings from artists under study, and Brett, Fer, Bois, Krauss, Wagner, Clark, Fried, Greenberg, Schapiro, Cooper, Lee, Mehring, Leja, Buchloh, and Foster.

5 units, not given this year (Gough, M)

ARTHIST 473. Minimalism: Seriality, Systems, Repetition—Minimalist or minimal art, primary structures, or ABC art in the 60s. New scholarship on the theories, criticism, and genealogies of minimalism in sculpture, painting, performance, music, and film. Considerations of the afterlife of minimalism in contemporary art.

5 units, not given this year (Lee, P)

ARTHIST 485. The Situation of the Artist in Traditional Japan—(Same as JAPANGEN 220.) Topics may include: workshop production such as that of the Kano and Tosa families; the meaning of the signature on objects including ceramics and tea wares; the folk arts movement; craft guilds; ghost painters in China; individualism versus product standardization; and the role of lineage. How works of art were commissioned; institutions supporting artists; how makers purveyed their goods; how artists were recognized by society; the relationship between patrons' desires and artists' modes of production.

5 units, Spr (Takeuchi, M)

CRITICAL STUDIES

ARTHIST 501. The Vision of Art History—How the project of art history connects to general issues of historical writing and evidence. Focus is on modes of vision, such as the perceptual, conceptual, and historical, and the clusters of related limitations they bring to the problem of art history. The overlapping areas of blindness inherent in art-historical scholarship. How options within the field are conditioned and shaped by the central, founding activity of the discipline.

5 units, not given this year (Marrinan, M)

ARTHIST 507. Medieval Image Theory—The Middle Ages saw the development of a theoretical framework on visual representation in response to charges of idolatry. The defenders of religious images drew on the dogma of Incarnation; as the Virgin gave human flesh to the Logos/Christ, the image offered a material manifestation of the divine. Focus is on the change in perception and staging of the image. Early in the period, the icon or relic expressed the presence of the sacred; later in the period, visual representation was designed to trigger an emotional response that led the viewer to a union with the divine.

5 units, not given this year (Pentcheva, B)

ARTHIST 512. The Time of the Object—How artists, art historians, philosophers, and critics have theorized the temporality of the art object. Topics: the origin of the work of art, duration, repetition, entropy, kineticism, the monument, the end of death of art, schizophrenia. Writers: Bergson, Deleuze, Focillon, Fried, Hegel, Heidegger, Jameson, Kubler, Krauss, Riegl.

5 units, not given this year (Lee, P)

ARTHIST 513. Methods and Historiography of Art History

5 units, not given this year (Lee, P)

ARTHIST 516. Narrative Theory and Visual Form—The theoretical terrain of narrative studies in literary criticism and historiography. The critical implications of narrative analysis for the writing of history in general. Readings integrated with students' current research projects.

5 units, not given this year (Marrinan, M)

ARTHIST 521A. Material Culture Studies: Theories and Methodologies—The interdisciplinary roots of contemporary material culture studies, including: the Frankfurt School and British cultural studies; archaeology and ethnographic anthropology; psychoanalysis and feminist theory; and art history and connoisseurship. How objects mean differently than images, and what this thingness means for the practice of art history. Readings include Karl Marx, Theodor Adorno, Daniel Miller, Ian Hodder, Igor Kopytoff, Sigmund Freud, William Pietz, Jules Prown, James Deetz, Bill Brown, Alexander Nemerov, and Christina Kiaer.

5 units, not given this year (Marshall, J)

RESEARCH

ARTHIST 600. Art History Bibliography and Library Methods

3 units, Aut (Staff)

ARTHIST 601. Graduate Studies in Art History—For first-year art history graduate students only. Fields, issues, and practices in art history.

2 units, Aut (Staff)

ARTHIST 610. Teaching Praxis

1-5 units, Aut, Win, Spr (Staff)

ARTHIST 620. Area Core Examination Preparation—For Art History Ph.D. candidates. Prerequisite: consent of instructor.

5 units, Aut, Win, Spr, Sum (Staff)

ARTHIST 640. Dissertation Proposal Preparation

5 units, Aut, Win, Spr, Sum (Staff)

ARTHIST 650. Dissertation Research

5 units, Aut, Win, Spr, Sum (Staff)

ARTHIST 660. Independent Study—For graduate students only. Approved independent research projects with individual faculty members.

1-15 units, Aut, Win, Spr, Sum (Staff)

ARTHIST 670. Dissertation Seminar—For graduate students writing and researching dissertations and dissertation proposals. How to define research projects, write grant proposals, and organize book-length projects.

3-5 units, not given this year

PRACTICE OF ART

ARTSTUDI 14. Drawing for Non-Majors

2 units, Spr (Rodriguez, L)

ARTSTUDI 16. Sculpture for Non-Majors

2 units, Aut (Jones, M)

ARTSTUDI 17. Photography for Non-Majors

2 units, Win (Vanderkindren, N)

ARTSTUDI 30. Introductory Survey: Concepts and Strategies—The diversity of artistic concepts and strategies; artists who use the different media taught in the department's studio program such as painting, drawing, video and digital art, printmaking, photography, and sculpture. Field trips to local museums and collections, artists studios, and libraries. Student research. Priority to Art Studio majors and minors.

3 units, Win (Staff)

ARTSTUDI 60. Design I : Fundamental Visual Language—Formal elements of visual expression (color, composition, space, and process) through hands-on projects. Two- and three-dimensional media. Emphasis is on originality and inventiveness. Content is realized abstractly. Centered in design; relevant to visual art study and any student seeking to develop visual perception. (lower level)

3-4 units, Aut (Kahn, M), Win, Spr (Edmark, J)

ARTSTUDI 70. Introduction to Photography—Critical, theoretical, and practical aspects of creative photography through camera and lab techniques. Field work. Cantor Art Center and Art Gallery exhibitions. 35mm camera required. (lower level)

4 units, Aut, Win, Spr (Dawson, R; Felzmann, L)

ARTSTUDI 80. Color—Hands-on study of color to develop color sensitivity and the ability to manipulate color to exploit its expressive potential. Guided experimentation and observation. Topics include color relativity, color and light, color mixing, color harmony, and color and content. (lower level)

3-4 units, Aut (Edmark, J)

ARTSTUDI 130. Interactive Art I: Objects—The basics of sensors, processors, and actuators needed to create artworks that interact, record, and communicate. Emphasis is on the sculpture and interactive dimensions. (lower level)

4 units, not given this year (DeMarinis, P)

ARTSTUDI 131. Sound Art I—Acoustic, digital and analog approaches to sound art. Familiarization with techniques of listening, recording, digital processing and production. Required listening and readings in the history and contemporary practice of sound art. (lower level)

4 units, Aut (DeMarinis, P)

ARTSTUDI 136. Future Media, Media Archaeologies—Hand-on. Media technologies from origins to the recent past. Students create artworks based on Victorian era discoveries and inventions, early developments in electronic media, and orphaned technologies. Research, rediscover, invent, and create devices of wonder and impossible objects. Readings in history and theory. How and what media technologies mediate. (lower level)

3-4 units, Spr (DeMarinis, P)

ARTSTUDI 138. Sound and Image—Practices that combine audio and visual media. Topics include synesthesia, visual music, film soundtracks, and immersive multimedia practices that combine sound, music, still and moving images, projections, and performance. (lower level)

4 units, Win (DeMarinis, P)

ARTSTUDI 140. Drawing I—Functional anatomy and perspective as they apply to problems of drawing the form in space. Individual and group instruction as students work from still life set-ups, nature, and the model. Emphasis is on the development of critical skills and perceptual drawing techniques for those with little or no previous experience with pastels, inks, charcoal, conte, and pencil. Lectures alternate with studio work. (lower level)

4 units, Aut (Bean, K), Win (Chagoya, E), Spr (Bean, K)

ARTSTUDI 141. Drawing II—Intermediate/advanced. Observation, invention, and construction. Development of conceptual and material strategies, with attention to process and purpose. May be repeated for credit. Prerequisite: 140 or consent of instructor. (upper level)

4 units, Win (Bean, K)

ARTSTUDI 145. Painting I—Introduction to techniques, materials, and vocabulary in oil painting. Still life, landscape, and figure used as subject matter. Emphasis is on painting and drawing from life. (lower level)

4 units, Aut, Win, Spr (Staff)

ARTSTUDI 146. Painting II—Symbolic, narrative, and representational self-portraits. Introduction to the pictorial strategies, painting methods, and psychological imperatives of Dürer, Rembrandt, Cézanne, Kahlo, Beckmann, Schiele, and Munch. Students paint from life, memory, reproductions, and objects of personal significance to create a world in which they describe themselves. Prerequisites: 140, 145, or consent of instructor. (upper level)

4 units, Aut (Bean, K), Spr (Chagoya, E)

ARTSTUDI 148. Printmaking—Introduction to printmaking using monotype, a graphic art medium used by such artists as Blake, Degas, Gauguin, and Pendergast. May be repeated for credit. Prerequisite: 140. (upper level)

4 units, Aut (Chagoya, E), Win, Spr (Staff)

ARTSTUDI 149. Collage—The generative principles of this characteristic 20th-century art form. Along with assemblage (its three dimensional equivalent) and montage (its counterpart in photography, film, and video), collage introduced crucial aesthetic issues of the modern and postmodern eras. Typically, collage creates an expressive visual language through juxtaposition and displacement, and through materiality, difference, and event. Issues of location (where it happens), object (what it is), process (how it is realized), and purpose (why it is). Prerequisites: 140, 145, or consent of instructor. (upper level)

4 units, Win (Hannah, D)

ARTSTUDI 151. Sculpture I—(lower level)

4 units, Aut, Win (Berlier, T)

ARTSTUDI 152. Sculpture II—Three dimensional understanding of form, time, and space, and applications to topics such as installation, special materials and processes, and site-specific works. Demonstrations, slide lectures, and discussion of work. Technical and conceptual skills. (upper level)

4 units, Spr (Berlier, T)

ARTSTUDI 160. Design II: The Bridge—The historical spectrum of design including practical and ritual. The values and conceptual orientation of visual fundamentals. Two- and three-dimensional projects sequentially grouped to relate design theory to application, balancing imaginative and responsible thinking. Prerequisite: 60. (upper level)

3-4 units, Win (Kahn, M), Spr (Edmark, J)

ARTSTUDI 161. Catalysts for Design—Nature and science as sources of design inspiration. Projects in natural pattern formation, biological growth and form, Fibonacci numbers and the golden section, planar and spatial symmetry, mechanics, chaos, and fractals. Emphasis is on importance of creative synthesis to the design process. Projects take the form of physical constructions as opposed to renderings or computer models. Field trips. (lower level)

3-4 units, not given this year

ARTSTUDI 166. Design in Motion—Design areas for which movement and transformation are essential. Experimentation with mechanical means such as linking, hinging, inflating, and rotating. Projects in lighting, automata, tools and utensils, chain reactions, toys and games, festival props, and quasi-architecture emphasize the creation of works in which motion is a significant agent for aesthetic gratification. No experience in mechanical engineering required. (lower level)

3-4 units, Aut (Edmark, J)

ARTSTUDI 167. Introduction to Animation—Projects in animation techniques including flipbook, cutout/collage, stop-motion such as claymation, pixilation, and puppet animation, rotoscoping, and time-lapse. Films. Computers used as post-production tools, but course does not cover computer-generated animation. (lower level)

3-4 units, Win (Edmark, J)

ARTSTUDI 169. Professional Design Exploration—Six to eight mature projects are stimulated by weekly field trips into significant areas of design activity or need. (upper level)

4 units, not given this year (Kahn, M)

ARTSTUDI 170. Projects in Photography—Students pursue a topic of their own definition. Further exploration of darkroom and other printing techniques; contemporary theory and criticism. (lower level)

4 units, Aut (Felzmann, L), Win (Dawson, R)

ARTSTUDI 171. Color Photography—Intermediate. Topics include techniques, history, color theory, and perception of color. Contemporary color photography issues and concepts. Students work with color slides and negatives, digital color, and non-traditional techniques. Field trip to a color lab. Prerequisite: 70. (upper level)

4 units, Aut (Dawson, R)

ARTSTUDI 172. Alternative Processes—Priority to advanced students. Technical procedures and the uses of primitive and hand-made photographic emulsions. Enrollment limited to 10. Prerequisites: 70, 170, 270, or consent of instructor. (upper level)

4 units, Spr (Leivick, J)

ARTSTUDI 175A. Light as a Sculptural Element—The application of light as a transformative medium in visual art practices. Artists such as Thomas Wilfred, Nam June-Paik, James Turrell, Ann Hamilton, Won Ju Lim, Diana Thater, Wolfgang Laib, Cai Guo-Qiang, Robert Irwin, Shirin Neshat, Bill Viola, and Olafur Eliasson.

4 units, Win (Buckholtz, E)

ARTSTUDI 177. Video Art I—Students create experimental video works. Conceptual, formal, and performance-based approaches to the medium. The history of video art since the 70s and its influences including experimental film, television, minimalism, conceptual art, and performance and electronic art. Topics: camera technique, lighting, sound design, found footage, cinematic conventions, and nonlinear digital editing. (lower level)

4 units, Aut (Hicks, A)

ARTSTUDI 177A. Video Art II—Advanced. Video, criticism, and contemporary media theory investigating the time image. Students create experimental video works, addressing the integration of video with traditional art media such as sculpture and painting. Nonlinearity made possible by Internet and DVD-based video. Prerequisite: 177 or consent of instructor. (upper level)

4 units, Win (Hicks, A)

ARTSTUDI 178. Electronic Art I—Analog electronics and their use in art. Basic circuits for creating mobile, illuminated, and responsive works of art. Topics: soldering; construction of basic circuits; elementary electronics theory; and contemporary electronic art. (lower level)

4 units, Aut (McKay, J)

ARTSTUDI 179. Digital Art I—Contemporary electronic art focusing on digital media. Students create works exploring two- and three-dimensional, and time-based uses of the computer in fine art. History and theoretical underpinnings. Common discourse and informative resources for material and inspiration. Topics: imaging and sound software, web art, and rethinking the comptuer as interface and object. (lower level)

4 units, Spr (Hicks, A)

ARTSTUDI 179A. Digital Art II—Advanced. Interactive art works using multimedia scripting software. Experimental interfaces, computer installation work, and mobile technologies. Contemporary media art theory and practice. (upper level)
4 units, not given this year (Wight, G)

ARTSTUDI 184. Art and Biology—Rather than how art has assisted the biological sciences as in medical illustration, focus is on how biology has influenced art making practice. New technologies and experimental directions, historical shifts in artists' relationship to the living world, the effects of research methods on the development of theory, and changing conceptions of biology and life. Projects address these themes and others that emerge from class discussions and presentations. (upper level)
4 units, Spr (Tromble, M)

ARTSTUDI 246. Individual Work: Drawing and Painting—Prerequisites: two quarters of painting or drawing and consent of instructor.
1-15 units, Aut, Win, Spr (Staff)

ARTSTUDI 248. Advanced Printmaking—Continuation of monotype, dealing with advanced technical and aesthetic problems in the medium. Prerequisite: 148. (upper level)
1-15 units, not given this year (Chagoya, E)

ARTSTUDI 249. Advanced Undergraduate Seminar—Capstone experience for majors in Studio Art. Interdisciplinary. Methods of research, crossmedia critiques, and strategies for staging and presenting work. Guest artists from the Bay Area. (upper level)
4 units, Win (Bell, C)

ARTSTUDI 250. Individual Work: Sculpture—May be repeated for credit.
1-15 units, Aut, Win, Spr (Staff)

ARTSTUDI 260. Individual Work: Design—May be repeated for credit.
1-15 units, Aut, Win, Spr (Staff)

ARTSTUDI 268. Design Synthesis—Mature semi-elective problems in composite and multimedia design areas. May be repeaed for credit. Prerequisites: two design courses above 160. (upper level)
4-6 units, Spr (Kahn, M)

ARTSTUDI 269. Advanced Creative Studies—Seminar based on elective design projects in areas of individual specialization. May be repeated for credit. Prerequisite: consent of instructor. (upper level)
1-15 units, Aut, Win (Kahn, M)

ARTSTUDI 270. Advanced Photography Seminar—Student continues with own work, showing it in weekly seminar critiques. May be repeated for credit. (upper level)
1-5 units, Aut (Leivick, J), Win (Felzmann, L), Spr (Leivick, J)

ARTSTUDI 271. The View Camera: Its Uses and Techniques—For students of photography who wish to gain greater control and refine skills in image making. 4x5 view cameras provided. Enrollment limited to 8. (upper level)
4 units, Win (Leivick, J)

ARTSTUDI 272. Individual Work: Photography—Student continues with own work, showing it in weekly seminar critiques. May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

ARTSTUDI 273. Individual Work: Digital Media—May be repeated for credit.
1-15 units, Aut, Win, Spr (Staff)

ARTSTUDI 274. Individual Work: Digital Art—May be repeated for credit.
1-15 units, Aut, Win, Spr (Staff)

ARTSTUDI 276. The Photographic Book—Grouping and sequencing photographic images to produce a coherent body of work with a thematic structure. (lower level)
4 units, Spr (Felzmann, L)

ARTSTUDI 310A,B,C. Directed Reading: Studio
1-15 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

ARTSTUDI 342. MFA Project: Studio—Two weekly seminars, studio practice, and individual tutorials. Object seminar: student work is critiqued on issues of identity, presentation, and the development of coherent critical language. Concept seminar: modes of conceptualization to broaden the base of cognitive and generative processes. May be repeated for credit.
1-15 units, Aut (Chagoya, E; DeMarinis, P), Win (Hannah, D), Spr (Staff)

ARTSTUDI 360A,B,C. Master's Project: Design
1-15 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Kahn, M)*

COGNATE COURSES

See degree requirements above or the department's student services office for applicability of these courses to a major or minor program. See sponsoring department for course description.

CEE 139. Design Portfolio Methods
3 units, Spr (Barton, J)

DRAMA 110. Identity, Diversity, and Aesthetics: The Institute for Diversity in the Arts
5 units, Win (Elam, H)

ME 120. History and Philosophy of Design
3-4 units, Spr (Katz, B)

URBANST 113. Introduction to Urban Design: Contemporary Urban Design in Theory and Practice
5 units, Win (Gast, G)

FILM STUDIES

INTRODUCTORY

FILMSTUD 4. Introduction to Film Study—Formal, historical, and cultural issues in the study of film. Classical narrative cinema compared with alternative narrative structures, documentary films, and experimental cinematic forms. Issues of cinematic language and visual perception, and representations of gender, ethnicity, and sexuality. Aesthetic and conceptual analytic skills with relevance to cinema. GER:DB-Hum
5 units, Aut (Ma, J)

FILMSTUD 100A/300A. History of World Cinema I, 1895-1929—From cinema's precursors to the advent of synchronized sound. GER:DB-Hum
4 units, Aut (Bukatman, S)

FILMSTUD 100B/300B. History of World Cinema II, 1930-1959—The impact of sound to the dissolution of Hollywood's studio system. GER:DB-Hum
4 units, Win (Todd, J)

FILMSTUD 100C/300C. History of World Cinema III, 1960-Present—From the rise of the French New Wave to the present. GER:DB-Hum
4 units, Spr (Ma, J)

FILMSTUD 101/301. Fundamentals of Cinematic Analysis—The close analysis of film. Emphasis is on formal and narrative techniques in structure and style, and detailed readings of brief sequences. Elements such as cinematography, mise-en-scène, composition, sound, and performance. Films from various historical periods, national cinemas, directors, and genres. Recommended: 4 or equivalent. GER:DB-Hum
4 units, not given this year

FILMSTUD 102/302. Theories of the Moving Image—Major theoretical arguments and debates about cinema: realism, formalism, poststructuralism, feminism, postmodernism, and phenomenology. Prerequisites: ARTHIST 1, FILMSTUD 4. GER:DB-Hum, WIM
4 units, Spr (Levi, P)

FILMSTUD 103/303. History of Experimental Film—The avant garde as locating cinematic art in spatio-temporal experiments against the background of film's novelty in the early 20th century and movements towards an art derivative of literature and theater. How the avant gardes of Europe, the U.S.S.R., and the U.S. produced films that opposed narrative cinematic conventions through a reflexive engagement with the medium's metamorphic fluidity, film produced abstraction, political argument, an entry into the rhetoric of the unconscious and the realm of cognition, refusals of meaning, and explorations of perception.
4 units, not given this year

GENRE

FILMSTUD 111/311. The Body in American Genre Film: From Chaplin to *The Matrix*—The American genre film as a mass form that shares elements with a carnivalesque, folk culture such as a rejection of politeness and piety, and an emphasis on the physical. Genres include comedy, western, war, science fiction, musical, horror, melodrama, gangster, and cult, exploitation, and blaxploitation films. The place of the body onscreen. How does the body exist in relation to the world, other bodies, and the act of perception? What meaning does bodily movement have in relation to narrative? GER:DB-Hum
4 units, not given this year (Bukatman, S)

FILMSTUD 112/312. Hollywood Musicals, 1927-1944—The sense of physical, emotional, aesthetic, and social liberation in early film musicals. Musicals as a place for the staging of issues of identity, including the impact of African American and Jewish culture, and issues of gay reception and interpretation. Attention to technologies of sound and color, the relation to Broadway, and ethnic and aesthetic diversity. GER:DB-Hum, EC-AmerCul
4 units, not given this year (Bukatman, S)

FILMSTUD 112A/312A. Hollywood Musicals, 1945-1971—Musicals as the epitome of filmic illusionism; the implications of their seduction of audiences; the meaning of spectacle. The era of Cole Porter, the Arthur Freed unit at MGM, the Gene Kelly/Stanley Donan collaborations, self-examination in Vicente Minnelli's work, choreographers such as Bob Fosse and Eugene Loring, and 60s road-show Broadway adaptations. GER:DB-Hum
4 units, not given this year (Bukatman, S)

FILMSTUD 113/313. Gender and Desire: Feminist Perspectives—The representation of gender in narrative cinema. How theories such as feminist and queer studies approach narrative cinema's engendering of men and women. Filmic structures that shape how spectators view men and women on the screen. Desire as a literal and figurative subject and engine of narrative. Focus is on classical American cinema.
4 units, Win (Staff)

FILMSTUD 115/315. Documentary Issues and Traditions—Issues include objectivity/subjectivity, ethics, censorship, representation, reflexivity, responsibility to the audience, and authorial voice. Parallel focus on form and content. GER:DB-SocSci
4 units, Aut (Krawitz, J)

FILMSTUD 116/316. International Documentary—Historical, aesthetic, and formal developments of documentary through nonfiction films in Europe, Asia, Latin America, and Africa. GER:DB-Hum
4 units, not given this year (Samuelson, K)

FILMSTUD 118A/318A. Gender, Globalism, Cinema—Political and aesthetic dimensions of gender and global cinematic practices. Focus is on borders, nationalism and nationalist liberation movements, and the notion of the global from conquest to the present. Militant cinemas from Africa, Asia, and the Americas; relationships among cinema, culture, colonialism, decolonization, and globalization. How gendered discourses and practices influence the ideological orientation and infrastructural implementation of border policing. nationalist liberation, and capitalist economic processes and realities. GER:DB-Hum
4 units, Win (Campos, D)

AUTHOR STUDIES

FILMSTUD 120B/320B. Studies in Authorship: The Films of Vincente Minnelli—GER:DB-Hum
4 units, not given this year (Bukatman, S)

NATIONAL CINEMAS

FILMSTUD 130/330. Italian Cinema: Neorealism and Beyond—The post-WW II era. Aesthetic and sociopolitical dimensions of neorealism; 60s cinema of economic miracle; and Italian variations on popular film genres such as the spaghetti western. Filmmakers include Rossellini, De Sica, Visconti, Pasolini, and Antonioni. GER:DB-Hum
4 units, Win (Levi, P)

FILMSTUD 131/331. Politics and Aesthetics in East European Cinema—From 1945 to the mid-80s, emphasizing Polish, Hungarian, Czech, Slovak, and Yugoslav contexts. The relationship between art and politics; postwar establishment of film industries; and emergence of national film movements such as the Polish school, Czech new wave, and new Yugoslav film. Thematic and aesthetic preoccupations of filmmakers such as Wajda, Jancso, Forman, and Kusturica. GER:DB-Hum
4 units, Aut (Levi, P)

FILMSTUD 132/332. East Asian Cinema—Social, historical, and aesthetic dimensions of the cinemas of Japan, Hong Kong, Taiwan, mainland China, and Korea. Topics such as nation and gender, form and genre, and local and transnational conditions of practice and reception. Screenings include popular and art films from the silent to contemporary eras, including, directors Zhang Yimou, Wong Kar-wai, Hou Hsiao-hsien, Ozu Yasujiro, Kurosawa Akira, and Im Kwon-taek.
4 units, not given this year (Ma, J)

AESTHETICS

FILMSTUD 141/341. Cinematic Spectacle—How cinematic spectacle has been theorized; the adoption of new technologies such as sound, color, or special effects; theories of the sublime and the grotesque. Spectacle as a vehicle for propaganda or pedagogy, and its relation to narrative and gender. The role of spectacle in experimental cinema and its deconstruction by Godard and others. Recommended: 4 or equivalent. GER:DB-Hum
4 units, not given this year

FILMSTUD 144/344. Experimental Video Workshop—Theory and practice of the moving image. Students work on video exercises and experiments as applied theory: attempts at practically implementing, verifying, or challenging ideas about sound, image, and performance. Prerequisites: FILMPROD 114 or equivalent, and consent of instructor.
4 units, not given this year (Levi, P)

OTHER

FILMSTUD 152/352. Cinema-Machine—The film medium as culmination of the industrial and electronic revolutions of the 19th and 20th centuries, and the apotheosis of modernist impulses around the problematic of a perfect vision and visibility. The ideal of cinema in relation to its technological basis: the film apparatus as mechanical artifact, desiring machine, phenomenological toy, and instrument of knowledge. Screenings. GER:DB-Hum
4 units, not given this year (Bukatman, S; Levi, P)

SEMINARS

FILMSTUD 230. Cinema and Ideology—The relationship between cinema and ideology from theoretical and historical perspectives, emphasizing Marxist and psychoanalytic approaches. The practice of political filmmaking, and the cinema as an audiovisual apparatus and socio-cultural institution. Topics include: dialectics; revolutionary aesthetics; language and power; commodity fetishism; and nationalism. Filmmakers include Dziga Vertov, Jean-Luc Godard, Bruce Conner, and Marco Ferreri. Theoretical writers include Karl Marx, Sergei Eisenstein, and Slavoj Zizek. Prerequisite: consent of instructor.
5 units, not given this year (Levi, P)

FILMSTUD 290. Senior Seminar: Movies and Methods—Capstone course for majors. Topics vary year to year. Focus is on historiography and theory.
5 units, Win (Ma, J)

FILMSTUD 299. Independent Study: Film and Media Studies—May be repeated for credit.
1-15 units, Aut, Win, Spr (Staff)

GRADUATE SEMINARS

FILMSTUD 400. Cinema and Surrealist Imagination—Theoeretical and practical approaches to cinema in the framework of ideas and aesthetic principles pursued by 20s and 30s European writers and artists associated with Dada and Surrealism. Forms of avant garde filmmaking and cine-writing engaged in a rebellion against reason and logic, and invested in explorations of the unconscious through automatism, oneirism, chance, and visualization of desire. Writers include Breton, Bataille, and Artaud; filmmakers include Buñuel, Dali, Man Ray, and Duchamp.
5 units, not given this year (Levi, P)

FILMSTUD 404. Postwar American Avant Garde Cinema—History and theory of post-WW II American independent and experimental film. Emphasis is on issues of audiovisual form, structure, and medium specificity. Films and writings include Maya Deren, Stan Brakhage, Michael Snow, and Hollis Frampton.
5 units, Aut (Levi, P)

FILMSTUD 410A. Documentary Perspectives I—Restricted to M.F.A. documentary film students. Topics in nonfiction media. Presentations and screenings by guest filmmakers. Prerequisite: consent of instructor.
4 units, Win (Krawitz, J)

FILMSTUD 410B. Documentary Perspectives II—Restricted to M.F.A. documentary film students. Continuation of 402A. Topics in nonfiction media. Presentations and screenings by guest filmmakers. Prerequisite: consent of instructor.
4 units, not given this year

FILMSTUD 660. Independent Study—For graduate students only. Approved independent research projects with individual faculty members.
1-15 units, Aut, Win, Spr, Sum (Staff)

PRACTICE OF FILM

FILMPROD 101/301. Screenwriting—Priority to Film and Media Studies majors. Craft, form, and approaches to writing for the screen. Prerequisites: ENGLISH 90, 190F, and consent of instructor.
5 units, Spr (Staff)

FILMPROD 114. Introduction to Film and Video Production—Hands-on. Techniques of film and video making including conceptualization, visualization, story structure, cinematography, sound recording, and editing.
5 units, Aut (Staff), Spr (Meltzer, J)

FILMPROD 400. Film/Video Writing and Directing—Restricted to M.F.A. documentary students. Emphasis is on the development of the research, conceptualization, visualization, and preproduction skills required for nonfiction filmmaking. Prerequisite: consent of instructor.
4 units, Aut (Meltzer, J)

FILMPROD 401. Nonfiction Film Production—Restricted to M.F.A documentary students. 16mm production techniques and concepts. Final project is a short black-and-white film with multitrack sound design. Prerequisite: consent of instructor.
4 units, Aut (Krawitz, J)

FILMPROD 402. Digital Video—Restricted to M.F.A. documentary students. Fundamentals of digital storytelling. Working with small format cameras, interviewing techniques, and nonlinear editing skills. Prerequisite: consent of instructor.
4 units, Win (Samuelson, K)

FILMPROD 403. Advanced Documentary Directing—Restricted to M.F.A. documentary students. Further examination of structure, emphasizing writing and directing nonfiction film. Prerequisite: consent of instructor.
4 units, Spr (Samuelson, K)

FILMPROD 404. Advanced Film and Video Production—Restricted to M.F.A. documentary students. Techniques of visual storytelling and observational shooting. Final quarter of professional training in 16mm motion picture production. Prerequisite: consent of instructor.
4 units, Spr (Meltzer, J)

FILMPROD 405. Producing Practicum—Restricted to M.F.A. documentary students. Advanced producing principles through the preproduction of the M.F.A. thesis project, including development of a professional film proposal. Practical training in fundraising. Prerequisite: consent of instructor.
4 units, Aut (Samuelson, K)

FILMPROD 406A. Documentary M.F.A. Thesis Seminar I—Restricted to M.F.A. documentary students. Production of film or video project. Focus is on shooting strategies, ethical challenges, and practical production issues. Prerequisite: consent of instructor.
4 units, Win (Meltzer, J)

FILMPROD 406B. Documentary M.F.A. Thesis Seminar II—Restricted to M.F.A. documentary students. Editing and post-production of film or video project. Emphasis is on aesthetic choices (structure, narration, music), distribution, contracts, and audience. Prerequisite: consent of instructor.
6 units, Spr (Krawitz, J)

COGNATE COURSES

COMM 1B. Media, Culture, and Society
5 units, not given this year

ENGLISH 190F. Fiction Writing for Film
5 units, Win (O'Keefe, J)

OVERSEAS STUDIES

BERLIN

OSPBER 17. Split Images: A Century of Cinema
4-5 units, Aut (Kramer, K)

OSPBER 55. Filmed Experience: Berlin at Eye-Level
5 units, Spr (Maerker, C)

OSPBER 60. Cityscape as History: Architecture and Urban Design in Berlin
4-5 units, Aut (Pabsch, M)

OSPBER 67. Sissy Sits, Lola Runs: Gender Moves in German Movies
5 units, Win (Kramer, K)

FLORENCE

OSPFLOR 34. The Woman in Florentine Art
4 units, Aut (Verdon, T)

OSPFLOR 41. The Contemporary Art Scene in Tuscany: Theory and Practice
3-5 units, Aut (Rossi, F)

OSPFLOR 48. Sharing Beauty: Florence and the Western Museum Tradition
4 units, Win (Rossi, F; Verdon, T)

OSPFLOR 49. The Cinema Goes to War: Fascism and World War II as Represented in Italian and European Cinema
5 units, Win (Campani, E)

OSPFLOR 54. High Renaissance and Maniera
5 units, Spr (Verdon, T)

OSPFLOR 55. Academy of Fine Arts: Studio Art
1-5 units, Aut, Win, Spr (Staff)

OSPFLOR 71. Becoming an Artist in Florence: Contemporary Art in Tuscany and New Tendencies in the Visual Future
3-5 units, Spr (Rossi, F)

OSPFLOR 94. Photography in Florence
4 units, Win (Loverme, C)

OSPFLOR 111Y. From Giotto to Michelangelo: Introduction to the Renaissance in Florence
4 units, Win (Verdon, T)

OSPFLOR 115Y. The Duomo and Palazzo della Signoria: Symbols of a Civilization
4 units, Aut (Verdon, T)

OSPFLOR 134F. Modernist Italian Cinema
5 units, Aut (Campani, E)

KYOTO

OSPKYOTO 28. Kyoto: History of Urban and Architectural Space
4-5 units, Spr (Langner-Teramoto, B)

OXFORD

OSPOXFRD 84. African Art and Writing Traditions
5 units, Spr (Martinez-Ruiz, B)

OSPOXFRD 85. African Art and Museum Display
5 units, Spr (Martinez-Ruiz, B)

OSPOXFRD 221Y. Art and Society in Britain
4-5 units, Aut (Tyack, G)

PARIS

OSPPARIS 92. Building Paris: Its History, Architecture, and Urban Design
4 units, Spr (Halevi, E)

OSPPARIS 107Y. The Age of Cathedrals: Religious Art and Architecture in Medieval France
4 units, Aut (Deremble, C; Deremble, J)

OSPPARIS 120X. French Painting
4 units, Win (Halevi, E)

OSPPARIS 42. EAP: Drawing with Live Models
2 units, Aut, Win, Spr (Halevi, E)

OSPPARIS 43. EAP: Painting and Use of Color
2 units, Aut, Win, Spr (Halevi, E)

OSPPARIS 44. EAP: Graphic Art
2 units, Aut, Win, Spr (Halevi, E)

ASIAN LANGUAGES

Emeriti: (Professors) Albert E. Dien, David S. Nivison, Makoto Ueda; *(Associate Professor)* Susan Matisoff; *(Senior Lecturer)* Yin Chuang*
Chair: Steven D. Carter
Directors of Graduate Studies: Indra Levy (Japanese), Chao Fen Sun (Chinese)
Directors of Undergraduate Studies: Steven D. Carter (Japanese), Yiqun Zhou (Chinese)
Professors: Steven D. Carter, Mark E. Lewis (Asian Languages, History), Melinda Takeuchi (Asian Languages, Art and Art History), Ban Wang, John C. Y. Wang
Associate Professors: Yoshiko Matsumoto, James Reichert, Chao Fen Sun
Assistant Professors: Indra Levy, Yiqun Zhou
Senior Lecturer: Kazuko Busbin
Consulting Professor: Richard Dasher
Visiting Professor: Stuart Sargent
Postdoctoral Fellows: Alexander Cook (Humanities Fellow), Elena Chiu (Center for East Asian Studies), Michael Dylan Foster (Freeman Spogli Institute for International Studies), Daniel O'Neill (Freeman Spogli Institute for International Studies), Ayelet Zohar (Freeman Spogli Institute for International Studies)

Chinese-Japanese Area Studies Faculty:
Professors: Masahiko Aoki (Economics, emeritus), Carl W. Bielefeldt (Religious Studies), Richard Dasher (Integrated Systems), Peter Duus (History, emeritus), Harold L. Kahn (History, emeritus), Lawrence Lau (Economics), John W. Lewis (Political Science, emeritus), Jean Oi (Political Science), Daniel I. Okimoto (Political Science), David Palumbo-Liu (Comparative Literature), Richard Vinograd (Art and Art History), Andrew Walder (Sociology), Arthur P. Wolf (Anthropology), Lee H. Yearley (Religious Studies)
Associate Professors: Matthew Sommer (History), Kären Wigen (History)
Assistant Professors: Melissa Brown (Anthropology), Miyako Inoue (Anthropology), Matthew Kohrman (Anthropology), Jean Ma (Film Studies), Thomas Mullaney (History), Jun Uchida (History)

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Web Site: http://asianlanguages.stanford.edu

Courses given in Asian Languages have subject codes CHINGEN, CHINLIT, JAPANGEN, JAPANLIT, and KORGEN. For a complete list of subject codes, see Appendix.

The Department of Asian Languages offers programs for students who want to engage with the cultures of China and Japan as articulated in language, linguistics, literature, film, and the newly developing field of cultural studies. Students emerge with a sophisticated understanding of culture as a dynamic process embodied in language and other representational forms, especially the verbal and visual forms that are central to humanistic study. Department faculty represent a broad range of research interests and specialties, and visiting scholars and postdoctoral fellows from the Stanford Humanities Center, the Freeman Spogli Institute for International Studies, and the Center for East Asian Studies add to the intellectual vitality of the department.

Asian Languages offers a full range of courses at the undergraduate and graduate levels. Undergraduate courses concentrate on language, literature, and other cultural forms from the earliest times to the present, covering traditional and contemporary topics from Confucian conceptions of self and society to inflections of gender in the twentieth century, from traditional arts such as Peking opera to recent developments in animé. Emphasis in classes is on developing powers of critical thinking and expression to serve students well no matter what their ultimate career goals. Graduate programs offer courses of study involving advanced language training, engagement with primary texts and other materials, and training in research methodologies and critical approaches.

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* Recalled to active duty.

Asian language skills provide a foundation for professional careers in fields such as business, diplomacy, education, and law. The department also offers opportunities for students who choose to double-major or minor in other academic disciplines, including anthropology, art, economics, education, history, linguistics, philosophy, political science, religious studies, and sociology.

The department accepts candidates for the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy in Chinese and Japanese. It also offers an undergraduate degree and a Ph.D. minor in Chinese or Japanese language and literature.

For information concerning other opportunities for study about Asian history, societies, and cultures, see the following departments and programs: Anthropology, Art and Art History, Business, Comparative Literature, East Asian Studies, Economics, History, Interdisciplinary Studies in Humanities, Law, Linguistics, Philosophy, Political Science, Religious Studies, and Sociology. Courses in Chinese, Japanese, and Korean language instruction are listed in the "Language Center" section of this bulletin. Students interested in Asian languages not listed should contact the Special Language Program at the Language Center.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The B.A. degree is granted both in Chinese and in Japanese. The following courses and their prerequisites must be completed with a grade point average (GPA) of 2.0 or better:

1. Concentrations in Chinese:
   a) CHINGEN 91 and JAPANGEN 92
   b) Chinese language requirement:
      1) first-year modern Chinese (one of the following series: CHINLANG 1, 2, 3, or CHINLANG 1B, 2B, 3B, or CHINLANG 5)
      2) second-year modern Chinese (one of the following series: CHINLANG 21, 22, 23, or CHINLANG 21B, 22B, 23B, or CHINLANG 25)
      3) third-year modern Chinese (one of the following series: CHINLANG 101, 102, 103, or CHINLANG 101B, 102B, 103B, or CHINLANG 105) *or* beginning classical Chinese (CHINLIT 125, 126, 127)
   c) three courses offered by Asian Languages at the 100 level with one in each of the following areas, pre-modern China, modern China, and Chinese language/linguistics
   d) four other content courses dealing with China primarily at the 100 level, as approved by the undergraduate adviser
   e) CHINGEN 133 is the required Writing in the Major (WIM) course.
2. Concentrations in Japanese:
   a) CHINGEN 91 and JAPANGEN 92
   b) Japanese language requirement:
      1) first-year modern Japanese (one of the following series: JAPANLNG 1, 2, 3, or JAPANLNG 7B, 8B, 9B, or JAPANLNG 10)
      2) second-year modern Japanese (one of the following series: JAPANLNG 21, 22, 23, or JAPANLNG 17B, 18B, 19B, or JAPANLNG 20)
      3) third-year modern Japanese (one of the following series: JAPANLNG 101, 102, 103, or JAPANLNG 127B, 128B, 129B, or JAPANLNG 130)
   c) three courses offered by Asian Languages at the 100 level with one in each of the following areas: premodern Japan, modern Japan, and Japanese language/linguistics
   d) four other content courses dealing with Japan primarily at the 100 level, as approved by the undergraduate adviser
   e) JAPANGEN 138 is the required WIM course.

   JAPANGEN 71N can be used to satisfy the Japanese language/linguistics area requirement. JAPANGEN 51/251 and JAPANLNG 130 are not counted toward the major. Students who complete third-year Japanese at KCJS satisfy the language requirement but are required to take a placement test if they wish to enroll in JAPANLNG 211, 212, 213.

Students who want to concentrate in Chinese or Japanese language/linguistics can substitute the four other content courses primarily at the 100 level with LINGUIST 1 and three other linguistic courses at the 100 level, as approved by the undergraduate adviser in consultation with the student's academic adviser.

These requirements are in addition to the University's basic requirement for the bachelor's degree. Letter grades are mandatory for all required courses.

MINORS

The undergraduate minor in Asian Languages has been designed to give students majoring in other departments an opportunity to gain a substantial introduction to Chinese (Mandarin) or Japanese language, as well as an introduction to the culture and civilization of East Asia. The minor consists of:

1. Completion of one year of language study at the second-year level (that is, CHINLANG 21, 22, 23 or JAPANLNG 21, 22, 23 or 17B, 18B, 19B) for students with no previous training in Chinese or Japanese. Students who already have first-year competence in Chinese or Japanese must complete the third-year course (CHINLANG 101, 102, 103 or JAPANLNG 101, 102, 103 or 127B, 128B, 129B) before undertaking any training in the Department of Asian Languages. Students who already have a competence at the second-year level may fulfill the language component of the minor by taking three courses in the department using materials in either Chinese or Japanese. These courses may be language courses such as the third-year sequence mentioned above, or they may be advanced literature and linguistics courses, depending on the capabilities and interests of the student in question.
2. The core courses, CHINGEN 91, Traditional East Asian Civilization: China, and JAPANGEN 92, Traditional East Asian Civilization: Japan.
3. Two courses selected from among the department's other offerings in the literature, linguistics, and civilization of a given minor area. All courses for the minor must be completed with a GPA of 2.0 or better.

MINOR IN LITERATURE AND MINOR IN MODERN LANGUAGES

The Division of Literatures, Cultures, and Languages offers two undergraduate minor programs, the minor in Literature and the minor in Modern Languages. These minors draw on literature and language courses offered in this and other literature departments. See the "Literatures, Cultures, and Languages" section of this bulletin for further details about these minors and their requirements.

HONORS PROGRAM

Majors with an overall grade point average (GPA) of 3.5 may apply for the honors program by submitting a senior thesis proposal to the honors committee during Winter or Spring Quarter of the junior year. The proposal must include a thesis outline, a list of all relevant courses the student has taken or plans to take, a preliminary reading list including a work or works in Chinese or Japanese, and the name of a faculty member who has agreed to act as honors supervisor.

If the proposal is approved, research begins in Spring Quarter of the junior year, when the student may enroll in CHINLIT 189B or JAPANLIT 189B for 2 units of credit for independent study. In Autumn Quarter of the senior year, honors students must enroll in DLCL 189, a 5-unit seminar that focuses on researching and writing the honors thesis. In Winter Quarter, students enroll for 5 units in directed reading (CHINLIT 189A or JAPANLIT 189A) with the thesis supervisor while writing the thesis, and the finished essay (normally about 15,000 words) is submitted to the committee no later than the end of the Winter Quarter in the senior year. Students who did not enroll in a 189B course in junior year may enroll in CHINLIT 189B or JAPANLIT 189B in Spring Quarter of senior year while revising the thesis, if approved by the thesis supervisor. 10-12 units of credit are granted for honors course work and the finished thesis.

COTERMINAL PROGRAMS

With department approval, students may be able to combine programs for the B.A. and M.A. degrees in Chinese or Japanese. Prospective applicants must consult with the graduate adviser. A Graduate Record Examination (GRE) score is not required. For details, see the "Graduate Degrees" section of this bulletin or http://registrar.stanford.edu/shared/publications.htm#Coterm.

EAST ASIAN STUDIES THEME HOUSE

EAST House, located at Governor's Corner, is an undergraduate residence that houses 60 students and offers them opportunities to expand their knowledge, understanding, and appreciation of East Asia. Assignment is made through the regular undergraduate housing draw.

SUMMER PROGRAM

A nine-week summer program of intensive instruction is offered, on three different levels, in both Chinese and Japanese. The intensive courses provide the equivalent in instruction to regular academic-year courses. (See courses CHINLANG 5, 25, 105, and JAPANLNG 10, 20, 130, as described in the "Language Center" section of this bulletin.) For detailed information about these and other aspects of the summer program, inquire at the Language Center.

GRADUATE PROGRAMS

Admission—All students contemplating application for admission to graduate study must have a creditable undergraduate record. The applicant need not have majored in Chinese or Japanese as an undergraduate, but must have had the equivalent of at least three years of training in the language in which he or she intends to specialize, and must also demonstrate a command of English adequate for the pursuit of graduate study. Applicants should not wish merely to acquire or improve language skills, but to pursue study in one of the following fields: Chinese history (premodern), Chinese linguistics, Chinese literature, Chinese philosophy, Japanese cultural history, Japanese literature, and Japanese linguistics.

MASTER OF ARTS

The M.A. is granted in Chinese and in Japanese. The normal length of study for the degree is two years.

Applicants who wish to obtain only the M.A. and who do not intend to proceed to the Ph.D. are considered only if no financial aid is requested.

Students who wish to spend the first year of graduate study at the Beijing or Yokohama centers must obtain department approval first.

Candidates for the degree must be in residence at Stanford in California during the final quarter of registration.

A thesis or an annotated translation of a text of suitable literary or historical worth is required for the M.A. degree. Under special circumstances, a paper approved by the graduate adviser may be substituted.

The University's basic requirements for the master's degree, including a 45-unit minimum requirement, are given in the "Graduate Degrees" section of this bulletin. Department requirements are set forth below.

CHINESE

The candidate must:

1. Meet department's requirements for the B.A. in Chinese or equivalent.
2. Demonstrate proficiency in both modern and classical Chinese through either:
   a. completion for a letter grade of 'B' or higher of third-year Chinese through CHINLANG 103 and advanced classical Chinese through CHINLANG 223, or
   b. passing examinations to certify that the student has attained the equivalent level of proficiency
3. Complete the following for a letter grade of 'B' or higher:
   a. four courses in Chinese literature or linguistics numbered between CHINLIT 230 and 292
   b. CHINLIT 201. Proseminar: Bibliographic and Research Methods in Chinese Studies
   c. two upper-division or graduate-level courses in fields such as Chinese anthropology, art, history, philosophy, politics, and religion, as approved by the graduate adviser in consultation with the student's individual adviser
   d. a master's thesis; CHINLIT 299. Master's Thesis or Translation

JAPANESE

The candidate must:

1. Meet department's requirements for the B.A. in Japanese or equivalent.
2. Demonstrate proficiency in both modern and pre-modern Japanese through either:
   a. completion for a letter grade of 'B' or higher of fourth-year Japanese through JAPANLANG 213 and classical Japanese through JAPANLANG 246 and 247, or
   b. passing examinations to certify that the student has attained the equivalent level of proficiency
3. Complete the following for a letter grade of 'B' or higher:
   a. four courses in Japanese literature or linguistics numbered between JAPANLIT 260 and 298
   b. JAPANLIT 201. Proseminar: Introduction to Graduate Study in Japanese
   c. two upper-division or graduate-level courses in fields such as Japanese anthropology, art, history, philosophy, politics, and religion, as approved by the graduate adviser in consultation with the student's individual adviser
   d. a master's thesis; JAPANLIT 299. Master's Thesis or Translation

DOCTOR OF PHILOSOPHY

The Ph.D. degree is granted in Chinese and Japanese. Candidates for the degree are expected to acquire a thorough familiarity with Chinese or Japanese literature, an adequate command of both languages, and a comprehensive knowledge of East Asian history, social institutions, and thought. The University's basic requirements for the Ph.D. are given in the "Graduate Degrees" section of this bulletin. Department requirements are set forth below.

ADMISSION TO CANDIDACY

Students admitted with a B.A. only are evaluated by the graduate faculty during the Autumn Quarter of their second year at Stanford. The evaluation is based on written work and at least a portion of the M.A. thesis or translation. If the faculty have serious doubts about a student's ability to work for the Ph.D., they convey this to the student. During the subsequent Spring Quarter, the faculty formally decides whether a student should be admitted to candidacy for the Ph.D. or be terminated. In the case of a student who already has an M.A. in Chinese or Japanese when admitted to the department, the evaluation takes place in the Spring Quarter of the student's first year. If a student goes to the Inter-University Program for Chinese Language Studies (IUP) at Tsinghua University or the Inter-University Center (IUC) for Japanese Language Studies in Yokohama (see "Study Abroad" below) during the first two years of study, the department may consider an extension for admission to candidacy. The timing of the evaluation of a student admitted with an M.A. in East Asian Studies is decided on an individual basis.

Admission to candidacy does not mean that the student has fulfilled all requirements for the degree except the dissertation, but that the department faculty consider the student qualified to pursue a program of study leading to the Ph.D. and that, subject to continued satisfactory progress, the student's status in this department is secure.

REQUIREMENTS

A candidate must fulfill the following requirements:

1. Meet the department's requirements for the M.A. in Chinese or Japanese.
2. Acquire or demonstrate reading proficiency in at least one supporting language, normally an East Asian or European language, chosen in consultation with the adviser(s) in accordance with the student's research goals. Reading proficiency is certified through written examination or an appropriate amount of course work determined on an individual basis. Students specializing in premodern Japanese literature are normally expected to demonstrate proficiency in classical Chinese equivalent to one year of classical Chinese at Stanford, and to acquire proficiency in *kanbun* by completing JAPANLIT 248 or 249. Course work must be completed with a letter grade of 'B' or higher. When deemed necessary by the student's adviser(s), working knowledge of a third language may also be required.

3. Complete two relevant seminars at the 300 level. These seminars must be in different subjects.
4. Pass a set of four comprehensive written examinations, one of which tests the candidate's methodological competence in the relevant discipline. The remaining three fields are chosen, with the approval of the graduate adviser in consultation with the student's individual adviser, from the following: anthropology, art, Chinese literature, history, Japanese literature, linguistics, philosophy, and religion. With the adviser's approval, a Ph.D. minor in a supporting field may be deemed equivalent to the completion of one of these four examinations.
5. Demonstrate pedagogical proficiency by serving as a teaching assistant for a minimum of one quarter, and taking APPLLING 201, The Learning and Teaching of Second Languages.

University Oral Examination—General regulations governing the oral examination are found in the "Graduate Degrees" section of this bulletin. The candidate is examined on questions related to the dissertation after acceptable parts of it have been completed in draft form.

Dissertation—The candidate must write a dissertation demonstrating ability to undertake original research based on primary materials in Chinese or Japanese.

PH.D. MINOR

A student taking a minor in Asian Languages must complete at least 30 units of work within the department at the 200 and 300 level, chosen in consultation with a department adviser. The student must elect either CHINLIT or JAPANLIT 201 unless the department is satisfied that work done elsewhere has provided similar training. The student must also pass a written examination in the Chinese or Japanese language.

STUDY ABROAD

Students interested in Japanese language, history, culture, and social organization are encouraged to apply to the Kyoto Center for Japanese Studies (KCJS), a two-semester academic program primarily for undergraduates wishing to do advanced work in the Japanese language and in Japanese studies.

In Spring Quarter, the Stanford Center for Technology and Innovation (SCTI), also in Kyoto, focuses on Japanese organizations and the political economy of research, development, and production of high technology and advanced industries, followed by an optional two-to-three month internship in an agency, firm, or laboratory in Japan. For information about either program in Kyoto, students should contact the Overseas Studies office in Sweet Hall.

Undergraduates interested in studying Chinese language, history, culture, and society are encouraged to apply to the Stanford Program in Beijing also offered through the Overseas Studies Program in Sweet Hall. This program is located at Peking University and is open Autumn and Spring quarters.

Students should take note of the Inter-University Program for Chinese Language Studies (IUP) at Tsinghua University (http://ieas.berkeley.edu/iup/; iub@socrates.berkeley.edu; 510-642-3873) and the Inter-University Center (IUC) for Japanese Language Studies in Yokohama (http://www.stanford.edu/dept/IUC/; stacey.campbell@stanford.edu; 650-725-1490). Stanford is a member of these consortia programs.

Students interested in the exchange program with the Department of Chinese at Peking University in Beijing should consult the chair of the department early in the academic year.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

Students interested in literature and literary studies should also consult course listings in the departments of Classics, Comparative Literature, English, French and Italian, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese, and in the Program in Modern Thought and Literature.

Undergraduate and graduate majors should also consult the listings of the Division of Literatures, Cultures, and Languages.

Since unavoidable changes occasionally have to be made in course offerings after the *Stanford Bulletin* has gone to print, students are advised to consult the department each quarter.

For possible future offerings, see http://www.stanford.edu/dept/asianlang/courses/

GENERAL

These courses are open to all undergraduates and graduate students, are taught in English, and do not require a knowledge of an Asian language.

CHINESE

CHINGEN 51. Chinese Calligraphy—Practice in writing Chinese characters with a brush, emphasizing standardized script and the composition of the characters and improving handwriting. Limited enrollment. May be repeated for credit. Prerequisite: CHINLANG 3 or equivalent.
1-2 units, Spr (Chuang, Y)

CHINGEN 91. Traditional East Asian Culture: China—Required for Chinese and Japanese majors. Introduction to Chinese culture in a historical context. Topics include political and socioeconomic institutions, religion, ethics, education, and art and literature. GER:DB-Hum, EC-GlobalCom
5 units, Aut (Chiu, E)

CHINGEN 131/231. Chinese Poetry in Translation—(Graduate students register for 231.) From the first millennium B.C. through the 12th century. Traditional verse forms representative of the classical tradition; highlights of the most distinguished poets. History, language, and culture. Chinese language not required. GER:DB-Hum, EC-GlobalCom
4 units, Aut (Sargent, S)

CHINGEN 132/232. Chinese Fiction and Drama in Translation—(Graduate students register for 232.) From early times to the 18th century, emphasizing literary and thematic discussions of major works in English translation. GER:DB-Hum, EC-GlobalCom
4 units, Win (Wang, J)

CHINGEN 133/233. Literature in 20th-Century China—(Graduate students register for 233.) Required for Chinese majors. The historical and cultural context of modern Chinese writing; critical approaches to its study. Themes include: the politics of representing gender and romance in literature; dislocations of colonial modernity; and political, cultural, and economic revolution. Sources include elite and popular fiction. In English. GER:DB-Hum, EC-GlobalCom, WIM
4 units, Aut (Cook, A)

CHINGEN 134/234. Early Chinese Mythology—(Graduate students register for 234.) The definition of a myth. Major myths of China prior to the rise of Buddhism and Daoism including: tales of the early sage kings such as Yu and the flood; depictions of deities in the underworld; historical myths; tales of immortals in relation to local cults; and tales of the patron deities of crafts.
3-5 units, Win (Lewis, M)

CHINGEN 136/236. The Chinese Family—(Graduate students register for 236.) History and literature. Institutional, ritual, affective, and symbolic aspects. Perspectives of gender, class, and social change.
3-5 units, Spr (Zhou, Y)

CHINGEN 137/237. Modern Chinese Literature: Tradition, Memory, and Modernity—(Graduate students register for 237.) How modern Chinese culture makes connections to its past when its traditional structures have been altered by the processes of modernity. Traumatic theory, redemptive narratives, and cultural transformations. Sources include fiction and film clips. Chinese language not required.
4 units, Win (Wang, B)

CHINGEN 138. Passion and Love in Chinese Film—How films work as expressions of desire, impulse, emotional connection, and communal attachment during times of social upheaval and reconstruction. Film theory and aesthetics, and alternative paradigms about world and social relations. Chinese language not required.
4 units, Win (Wang, B)

CHINGEN 200. Directed Readings in Asian Languages—For Chinese literature. Prerequisite: consent of instructor.
1-12 units, Aut, Win, Spr, Sum (Staff)

JAPANESE

JAPANGEN 51/251. Japanese Business Culture—(Graduate students register for 251.) Japanese group dynamics in industrial and corporate structures, negotiating styles, decision making, and crisis management. Strategies for managing intercultural differences.
3-5 units, Win (Dasher, R)

JAPANGEN 60. Asian Art and Culture—(Same as ARTHIST 2.) The religious and philosophical ideas and social attitudes of India, China, and Japan and how they are expressed in architecture, painting, woodblock prints, sculpture, and in such forms as garden design and urban planning. GER:DB-Hum, EC-GlobalCom
5 units, Win (Takeuchi, M)

JAPANGEN 71N. Language and Gender in Japan: Myths and Reality—Stanford Introductory Seminar. Preference to freshmen. Ideology and practice of gender in the Japanese society as reflected in and created by stylistic choices in the Japanese language. Past and present speech styles of women and men, speech situations, age, class, identities of the individual speakers and their relationships with others. How belief and reality are refracted through mass media and fictional representations. Comparisons with similar phenomena in other cultures. GER:DB-SocSci, EC-Gender
4 units, Spr (Matsumoto, Y)

JAPANGEN 75N. Around the World in Seventeen Syllables: Haiku in Japan, the U.S., and the Digital World—Stanford Introductory Seminar. Preference to freshmen. Origins of the haiku form in Japan, its place in the discourse of Orientalism during the 19th and early 20th centuries in the West, its appropriation by U.S.devotees of Zen and the beat poets after WW II, and its current transformation into a global form through the Internet.
3-4 units, Aut (Carter, S)

JAPANGEN 84. Aristocrats, Warriors, Sex Workers, and Barbarians: Lived Life in Early Modern Japanese Painting—Changes marking the transition from medieval to early modern Japanese society that generated a revolution in visual culture, as exemplified in subjects deemed fit for representation; how commoners joined elites in pictorializing their world, catalyzed by interactions with the Dutch.
4 units, Aut (Takeuchi, M)

JAPANGEN 92. Traditional East Asian Culture: Japan—Required for Chinese and Japanese majors. Introduction to Japanese culture in historical context. Focus is on shifting paradigms of gender relations and performance. Topics include ancient mythology, court poetry and romance, medieval war tales, and the theaters of Noh, Bunraku, and Kabuki. GER:DB-Hum, EC-GlobalCom
5 units, Win (Levy, I)

JAPANGEN 138/238. Survey of Modern Japanese Literature in Translation—(Graduate students register for 238.) Required for Japanese majors. Japanese literature since 1868. Authors include Futabatei Shimei, Higuchi Ichiyo, Natsume Soseki, and Yoshimoto Banana. WIM
2-4 units, Spr (Reichert, J)

JAPANGEN 149/249. Screening Japan: Issues in Crosscultural Interpretation—(Graduate students register for 249.) Is the cinematic language of moving images universal? How have cultural differences, political interests, and genre expectations affected the ways in which Japanese cinema makes meaning across national borders? Sources include the works of major Japanese directors and seminal works of Japanese film criticism, theory, and scholarship in English. No Japanese language skills required. GER:DB-Hum
3-4 units, Aut (Levy, I)

JAPANGEN 200. Directed Reading in Asian Languages—For Japanese literature. Prerequisite: consent of instructor.
1-12 units, Aut, Win, Spr, Sum (Staff)

JAPANGEN 201. Teaching East Asian Humanities—Prepares graduate students to teach E. Asian humanities at the undergraduate level. Topics include syllabus development and course design, techniques for generating discussion, effective grading practices, and issues particular to the subject matter.
1 unit, Win (Levy, I)

JAPANGEN 220. The Situation of the Artist in Traditional Japan—(Same as ARTHIST 485.) Topics may include: workshop production such as that of the Kano and Tosa families; the meaning of the signature on objects including ceramics and tea wares; the folk arts movement; craft guilds; ghost painters in China; individualism versus product standardization; and the role of lineage. How works of art were commissioned; institutions supporting artists; how makers purveyed their goods; how artists were recognized by society; the relationship between patrons' desires and artists' modes of production.
5 units, Spr (Takeuchi, M)

CHINESE

CHINESE LANGUAGE COURSES

The following courses in Chinese language instruction represent a typical sequence for three years of Chinese language study. Majors and prospective majors should consult the requirements for a B.A. in Chinese above. For descriptions, other information, and additional courses including special emphasis, intensive, and summer courses, see the "Language Center" section of this bulletin.

CHINLANG 1,2,3. First-Year Modern Chinese
5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Zeng, H)*

CHINLANG 21,22,23. Second-Year Modern Chinese
5 units, **21:** *Aut,* **22:** *Win,* **23:** *Spr (Chung, M; Wang, Y)*

CHINLANG 101,102,103. Third-Year Modern Chinese
5 units, **101:** *Aut,* **102:** *Win,* **103:** *Spr (Wang, H)*

CHINESE COURSES: ADVANCED UNDERGRADUATE AND GRADUATE

CHINLIT 125,126,127. Beginning Classical Chinese—(Graduate students register for 205.) Goal is reading knowledge of classical Chinese. Students with no background in classical Chinese who are taking 127 to satisfy Chinese major requirements must begin with 125. Basic grammar and commonly used vocabulary. Prerequisite: CHINLANG 23 or equivalent.
2-5 units, **125:** *Aut,* **126:** *Win (Sun, C),* **127:** *Spr (Zhou, Y)*

CHINLIT 174/274. Modern Chinese Literature: Short Stories—(Graduate students register for 274.) From the May Fourth movement to the 40s. Themes include enlightenment, democracy, women's liberation, revolution, war, urban culture, and love. Prerequisite: advanced Chinese.
4 units, Spr (Wang, B)

CHINLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.
5 units, Win (Staff)

CHINLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.
2 units, Spr (Staff)

CHINLIT 192/292. The History of Chinese—(Graduate students register for 292.) Emphasis is on syntactic and semantic changes in the last 2,000 years and grammaticalization. Students use a computer corpus to do research on the history of Chinese. Prerequisite: 206 or consent of instructor. GER:DB-SocSci
4 units, Aut (Sun, C)

CHINLIT 199. Individual Reading in Chinese—Asian Language majors only. Prerequisite: CHINLANG 103 or consent of instructor. Units by arrangement.
1-4 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

CHINLIT 200. Directed Reading in Chinese
1-12 units, Aut, Win, Spr, Sum (Staff)

CHINLIT 201. Proseminar: Bibliographic and Research Methods in Chinese Studies—Bibliographic and research methods in Chinese studies. Prerequisite: 127/207 or equivalent.
5 units, Win (Zhou, Y)

CHINLIT 221. Advanced Classical Chinese: Philosophical Texts—Prerequisite: 207 or equivalent.
3-5 units, Spr (Lewis, M)

CHINLIT 222. Advanced Classical Chinese: Historical Narration—Prerequisite: 127/207 or equivalent.
2-5 units, Win (Wang, J)

CHINLIT 234. The World of Confucius—Society in late Bronze Age China, 1000-250 B.C.E. Social structure, human relationships, religion, ritual, poetry, and material culture.
4-5 units, Win (Zhou, Y)

CHINLIT 265. Major Figures in Classical Chinese *Shi* Poetry—Focus is on a major poet and relationships to previous and later poetry. Poetic form, including meter and rhyme schemes. Historical context. This year's poet is Tao Yuanming. May be repeated for credit. Prerequisites: 201, 207.
2-4 units, Win (Sargent, S)

CHINLIT 271. Traditional Chinese Fiction: Short Stories—Early times to Qing. Prerequisite: 127/207 or consent of instructor.
2-4 units, Spr (Wang, J)

CHINLIT 273. Chinese Drama—Yuan, Ming, and Qing periods emphasizing literary not theatrical qualities. Prerequisite: 127/207 or consent of instructor.
2-4 units, Spr (Wang, J)

CHINLIT 289. Revolution and Social Change: Cinema and History in Modern China—Films that depict the Chinese Revolution, critiques of it, and reforms since the 90s. Film theory, politics, revolutionary aesthetics, and social movements.
3-5 units, Spr (Wang, B)

CHINLIT 299. Master's Thesis or Translation—A total of 5 units taken in one or more quarters.
1-5 units, Aut, Win, Spr, Sum (Staff)

CHINLIT 371. Seminar in Chinese Literary Criticism—Chinese critical texts in relation to Western literary theories. May be repeated for credit. Prerequisite: 127/207 or consent of instructor.
5 units, Spr (Wang, J)

CHINLIT 399. Dissertation Research
1-12 units, Aut, Win, Spr, Sum (Staff)

CHINLIT 400. Advanced Language Training—For students in the Inter-University Program for Chinese Language Studies in Beijing or Taipei. For more information, contact the consortium office at UC Berkeley: (510) 642-3873.
1-15 units, Aut, Win, Spr (Staff)

JAPANESE

JAPANESE LANGUAGE COURSES

The following courses in Japanese language instruction represent a typical sequence for three years of Japanese language study. Majors and prospective majors should consult the requirements for a B.A. in Japanese above. For descriptions, other information, and additional courses including advanced, special emphasis, and summer intensive courses, see the "Language Center" section of this bulletin.

JAPANLNG 7B,8B,9B. First-Year Japanese Language, Culture, and Communication B
5 units, **7B:** *Aut,* **8B:** *Win,* **9B:***Spr (Lipton, H)*

JAPANLNG 17B,18B,19B. Second-Year Japanese Language, Culture, and Communication B
5 units, **17B:** *Aut,* **18B:** *Win,* **19B:** *Spr (Lowdermilk, M)*

JAPANLNG 127B,128B,129B. Third-Year Japanese Language, Culture, and Communication B
5 units, **127B:** *Aut,* **128B:** *Win,* **129B:** *Spr (Tomiyama, Y)*

JAPANESE COURSES: ADVANCED UNDERGRADUATE AND GRADUATE

JAPANLIT 170/270. The *Tale of Genji* and Its Historical Reception—(Graduate students register for 270.) Approaches to the tale including 12th-century allegorical and modern feminist readings. Influence upon other works including poetry, Noh plays, short stories, modern novels, and comic book (*manga*) retellings. Prerequisite for graduate students: JAPANLNG 129B or 103, or equivalent. GER:DB-Hum
4 units, Win (Carter, S)

JAPANLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.
5 units, Win (Staff)

JAPANLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.
2 units, Spr (Staff)

JAPANLIT 199. Individual Reading in Japanese—Asian Languages majors only. May be repeated for credit. Prerequisites: JAPANLNG 129B or 103, and consent of instructor.
1-4 units, Aut, Win, Spr, Sum (Staff)

JAPANLIT 200. Directed Reading in Japanese
1-12 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

JAPANLIT 210. Japanese Tales of the Strange, 18th Century to the Present—Japanese texts dealing with strange, supernatural, or mysterious occurrences. Historical continuity and change in the representation of the strange, emphasizing notions of the outsider or stranger. Readings include literary fiction, urban legends, popular ghost stories, local folklore, and critical historical and theoretical texts. Prerequisite: consent of instructor.
3-5 units, Aut (Foster, M)

JAPANLIT 235,236. Academic Readings in Japanese—Strategies for reading academic writings in Japanese. Readings of scholarly papers and advanced materials in Japanese in students' research areas in the humanities and social sciences. Prerequisites: JAPANLNG 103, 129B, or equivalent; and consent of instructor.

2-4 units, **235:** *Win,* **236:** *Spr (Matsumoto, Y)*

JAPANLIT 266. Introduction to Sino-Japanese—Readings in Sino-Japanese (*kambun*) texts of the Heian, Kamakura, and Muromachi periods, with focus on grammar and reading comprehension. Prerequisite: 246 or equivalent.

3-5 units, Spr (Carter, S)

JAPANLIT 267. Readings in Sino-Japanese—Readings in Sino-Japanese (*kambun*) texts of the Edo and Meiji periods, with focus on grammar and reading comprehension. Prerequisite: 264 or equivalent.

2-5 units, given next year

JAPANLIT 281. Japanese Pragmatics—Sociocultural and discourse factors reflected in the choice of linguistic forms, and their theoretical implications. Prerequisites: one year of Japanese and a course in linguistics, or two years of Japanese, or consent of instructor.

4 units, Win (Matsumoto, Y)

JAPANLIT 298. The Theory and Practice of Japanese Literary Translation—Theory and cultural status of translation in modern Japanese and English. Comparative analysis of practical translation strategies. Final project is a literary translation of publishable quality. Prerequisite: fourth-year Japanese or consent of instructor.

2-5 units, Aut (Levy, I)

JAPANLIT 299. Master's Thesis or Translation—A total of 5 units, taken in one or more quarters.

1-5 units, Aut, Win, Spr, Sum (Staff)

JAPANLIT 396. Modern Japanese Literature—May be repeated for credit. Prerequisite: JAPANLNG 213.

3-5 units, Win (Reichert, J)

JAPANLIT 399. Dissertation Research—For doctoral students in Japanese working on dissertations.

1-12 units, Aut, Win, Spr, Sum (Staff)

JAPANLIT 400. Advanced Language Training—For students at the Yokohama Center. For more information, see the program description under the "Inter-University Center for Japanese Studies in Yokohama" section in this bulletin.

1-15 units, Aut, Win, Spr (Staff)

COGNATE COURSE

DLCL 189. Honors Thesis Seminar

5 units, Aut (Surwillo, L)

OVERSEAS STUDIES

Courses approved for the Asian Languages major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

ASTRONOMY COURSE PROGRAM

Emeriti: (Professors) Ronald N. Bracewell, Von R. Eshleman, Peter A. Sturrock, G. Leonard Tyler, Robert V. Wagoner

Committee in Charge: Vahé Petrosian *(Director),* Roger W. Romani, Sarah Church

Professors: Roger Blandford (Physics, SLAC), Blas Cabrera (Physics), Steven Kahn (Physics, SLAC), Peter Michelson (Physics, SLAC), Vahé Petrosian (Physics, Applied Physics), Roger W. Romani (Physics)

Associate Professors: Tom Abel (Physics, SLAC), Sarah Church (Physics)

Assistant Professors: Steve Allen (Physics, SLAC), Stefan Funk (Physics, SLAC), Chau-Lin Kuo (Physics, SLAC), Risa Wechsler (Physics, SLAC)

Professor (Research): Philip H. Scherrer (Physics)

Program Offices: Varian, Room 316

Mail Code: 94305-4060

Phone: (650) 723-1439

Web Site: http://www.stanford.edu/dept/astro/

Astronomy courses are offered primarily through the Physics Department with subject code PHYSICS. For a complete list of subject codes, see Appendix.

Although Stanford University does not have a degree program in astronomy or astrophysics, teaching and research in various branches of these disciplines are ongoing activities in the departments of Applied Physics, Electrical Engineering, and Physics. For the convenience of students interested in astronomy, astrophysics, and cosmology, a course program for undergraduate and graduate study is listed below.

The program provides introductory courses for the student who wishes to be informed about the fields of astronomy without the need for prerequisites beyond high school algebra and physics. Astronomy courses numbered below 100 are designed to serve this group of students.

Astronomy courses numbered 100-199 serve the student interested in an initial scientific study of astronomy. The courses numbered 200 and above are for graduate students and advanced undergraduates, subject to prior approval by the course instructor.

UNDERGRADUATE PROGRAMS

The University does not offer a separate undergraduate major in Astronomy. Students who intend to pursue graduate study in astronomy or space science are encouraged to major in physics, following the advanced sequence if possible, or in electrical engineering if the student has a strongly developed interest in radioscience. The course descriptions for these basic studies are listed under the appropriate department sections of this bulletin. Students desiring guidance in developing an astronomy-oriented course of study should contact the chair of the Astronomy Program Committee. The following courses are suitable for undergraduates and are recommended to students considering advanced study in astronomy or astrophysics: PHYSICS 100, Introduction to Observational and Laboratory Astronomy; PHYSICS 160, Introduction to Stellar and Galactic Astrophysics; PHYSICS 161, Introduction to Extragalactic Astrophysics and Cosmology; GES 222, Planetary Systems: Dynamics and Origins. Students planning study in astronomy beyond the B.S. are urged to take PHYSICS 260 and 262, Introduction to Astrophysics and to Gravitation, and to consider an undergraduate thesis (PHYSICS 169) or honors thesis in an astrophysics related area. The above-mentioned courses are required for physics majors who choose the curriculum with a concentration in astrophysics (see the "Physics" section of this bulletin). The student observatory, located in the hills to the west of the campus and equipped with a 24-inch and other small reflecting telescopes, is used for instruction of the observation-oriented courses.

MINORS

The minor program in Astronomy is described in the "Physics" section of this bulletin. The non-technical minor, intended for students whose major does not require the PHYSICS 40 series, requires 10 units of Physics courses (PHYSICS 21, 23, 25/26) and 9-10 units of Astronomy courses (3-4 units of PHYSICS 50 or 100, and 6 units of PHYSICS 15, 16, 17). The technical minor for other students consists of 14 units of PHYSICS 70, 100, 160, 161, and EE 164, in addition to the 40 series.

To be accepted to the minor program, students need to obtain an adviser selected from the faculty in the Astronomy Course Program. The minor declaration deadline is three quarters before graduation (that is, beginning Autumn Quarter if the student is graduating at the end of Spring Quarter). All courses for the minor must be taken at Stanford University, and a letter grade of 'C' or better must be received for all units applied toward the minor.

GRADUATE PROGRAMS

Graduate programs in astronomy and astrophysics and related topics are carried out primarily in the Department of Physics but also the departments of Applied Physics and Electrical Engineering. Students should consult the course listings, degree requirements, and research programs of these departments for more detailed information. Graduate research opportunities are available in many areas of theoretical and observational astronomy, including research projects using the Hobby Eberly telescope, a 10-meter-class telescope located at McDonald Observatory in Texas. Other observational and experimental opportunities are in ground-based observations of CMB and in the future, space observations by GLAST. For further information on graduate research opportunities see the "Center for Space Science and Astrophysics" section of this bulletin and the Kavli Institute of Particle Astrophysics and Cosmology at http://kipac.stanford.edu.

Students planning to conduct research in astronomy and astrophysics are required to take PHYSICS 360, Physics of Astrophysics, and at least one of the following: PHYSICS 361, Stellar and Galactic Astrophysics, 362, Extragalactic Astrophysics and Cosmology, or 363, Solar and Solar-Terrestrial Physics. Students lacking a background in astrophysics, gravitation, and plasma physics should take PHYSICS 260 and 262, Introduction to Astrophysics and to Gravitation, and PHYSICS 312, Basic Plasma Physics. Students with special interests in gravitation should take PHYSICS 364, Advanced Gravitation.

Students interested in research programs in space physics involving spacecraft studies of the planets, their satellites, and their near-space environments should see the "Center for Space Science and Astrophysics" section of this bulletin.

COURSES

ELEMENTARY LECTURES

The following courses provide a descriptive knowledge of astronomical objects and astrophysics of the universe. PHYSICS 15, 16, and 17 are for students not majoring in the sciences and are taught in different quarters by different instructors, and may be taken individually or in any order.

PHYSICS 15. The Nature of the Universe
3 units, Aut (Romani, R), Sum (Staff)

PHYSICS 16. Cosmic Horizons
3 units, Win (Linde, A)

PHYSICS 17. Black Holes
3 units, Spr (Abel, T)

OBSERVATORY

The following courses are intended to familiarize students with observational methods and analysis of astronomical data. PHYSICS 100 involves more advanced observations and is intended for students with a college level background in physics.

PHYSICS 50. Astronomy Laboratory and Observational Astronomy
3 units, Aut (Church, S), Sum (Staff)

PHYSICS 100. Introduction to Observational and Laboratory Astronomy
4 units, Spr (Church, S)

ADVANCED UNDERGRADUATE

The following courses are for students with a more advanced knowledge of basic physics and mathematics, and form the core courses for a concentration in astrophysics for Physics majors.

EE 106. Planetary Exploration
3 units, Spr (Fraser-Smith, A)

PHYSICS 160. Introduction to Stellar and Galactic Astrophysics
3 units, Win (Petrosian, V)

PHYSICS 161. Introduction to Extragalactic Astrophysics and Cosmology
3 units, Spr (Michelson, P)

PHYSICS 169A,B,C. Independent Study in Astrophysics and Honors Thesis: Selection of the Problem
1-9 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

GRADUATE

GES 222. Planetary Systems: Dynamics and Origins
3-4 units, Aut (Lissauer, J; Marley, M)

PHYSICS 260. Introduction to Astrophysics and Cosmology
3 units, Aut (Petrosian, V)

PHYSICS 262. Introduction to Gravitation
3 units, Win (Wagoner, R)

PHYSICS 301. Astrophysics Laboratory
3 units, alternate years, not given this year

PHYSICS 312. Basic Plasma Physics
3 units, alternate years, not given this year

PHYSICS 360. Physics of Astrophysics
3 units, Win (Romani, R)

PHYSICS 361. Stellar and Galactic Astrophysics
3 units, alternate years, not given this year

PHYSICS 362. Advanced Extragalactic Astrophysics and Cosmology
3 units, Spr (Wechsler, R)

PHYSICS 363. Solar and Solar-Terrestrial Physics
3 units, Win (Kosovichev, A)

PHYSICS 364. Advanced Gravitation
3 units, alternate years, not given this year

PHYSICS 463. Special Topics in Astrophysics: Theoretical Cosmology
3 units, alternate years, not given this year

ATHLETICS, PHYSICAL EDUCATION, AND RECREATION

Emeriti: (Professor) Wesley K. Ruff; *(Athletic Director)* Joseph H. Ruetz; *(Associate Director)* Robert C. Young; *(Assistant Director)* Shirley Schoof

Athletic Director: Bob Bowlsby

Deputy Athletic Director, Facilities, Operations, and Events: Ray Purpur

Senior Associate Athletic Director, Intercollegiate Services/Senior Woman Administrator: Beth Goode

Senior Associate Athletic Director, External Affairs: Chris Hutchins

Senior Associate Athletic Director, Intercollegiate Sports: Earl Koberlein

Senior Associate Athletic Director, Development: Jeff Shilling

Senior Associate Athletic Director, Program Services: Darrin Nelson

Associate Athletic Director, Development: Mike Izzi

Associate Athletic Director, Athletic Services: Scott Schuhmann

Associate Athletic Director, Physical Education, Recreation, and Wellness: Eric Stein

Senior Assistant Athletic Director, Media Relations: Gary Migdol

Assistant Athletic Director, Compliance Services: Megan Boone

Assistant Athletic Director, Facilities: Skip Braatz

Assistant Athletic Director, Student Services: Susan Burk

Assistant Athletic Director, Marketing, Tickets: Bob Carruesco

Assistant Athletic Director, Human Resources: Ron Coverson

Assistant Athletic Director, Physical Education, Club Sports, Intramurals, and Recreation: Sherry Posthumus

Assistant Athletic Director, Events and Operations: Carl Reed

Assistant Athletic Director, Capital Planning: David Schinski

Senior Lecturer: Anne Gould

Sport Directors: Al Acosta (Lightweight Crew, women), Craig Amerkhanian (Crew, men), John Dunning (Volleyball, women), Yasmin Farooq (Crew, women), Edrick Floreal (Track and Field, women), Lele Forood (Tennis, women), Thom Glielmi (Gymnastics, men), Jim Harbaugh (Football), Lesley Irvine (Field Hockey), Trent Johnson (Basketball, men), Jay Kehoe (Sailing), Skip Kenney (Swimming, men), John Kosty (Volleyball, men), Mark Marquess (Baseball), Lea Maurer (Swimming, women), Kerry McCoy (Wrestling), Lisa Milgram (Fencing), Caroline O'Connor (Golf, women), Heather Olson (Synchronized Swimming), George Pogosov (Fencing), Paul Ratcliffe (Soccer, women), Conrad Ray (Golf, men), John Rittman (Softball), Richard Schavone (Diving), Bret Simon (Soccer, men), Kristen Smyth (Gymnastics, women), Mark Talbott (Squash, women), John Tanner (Water Polo, women), Peter Tegen (Cross Country), Michele Uhlfelder (Lacrosse), Tara VanDerveer (Basketball, women), John Vargas (Water Polo, men), Robert Weir (Track and Field, men), John Whitlinger (Tennis, men)

Sport Assistant Coaches: Jessica Allister (Softball), Lance Anderson (Football), Jon Barnea (Water Polo, men), Alison Bartosik (Synchronized Swimming), Rob Becerra (Soccer, men), Jason Borrelli (Wrestling), Frankie Brennan (Tennis, women), Andy Buh (Football), Jay Cooney (Soccer, women), Denise Corlett (Volleyball, women), Chris Dalman (Football), Tim Drevno (Football), DJ Durkin (Football), Matt Ellis (Wrestling), Trisha Ford (Softball), Peter Giese (Crew, men), Donny Guerinoni (Basketball, Men), Bobbie Kelsey (Basketball, women), Ted Knapp (Swimming, men), Kris Mack (Track and Field), Jason Mansfield (Volleyball, women), Dave Nakama (Baseball), Valeriy Naulo (Fencing), Sarah Kate Noftsinger (Soccer, women), Doug Oliver (Basketball, men), Susan Ortwein (Water Polo, women), Jon Pascale (Soccer, men), Kate Paye (Basketball, women), Sam Puryear (Golf, men), J.D. Reive (Gymnastics, men), John Rembao (Track and Field), Nick Robinson (Basketball, men), Scott Shafer (Football), David Shaw (Football), Ken Shibuya (Volleyball, men), Jordan Steele (Field Hockey), Dean Stotz (Baseball), Chris Swircek (Gymnastics, women), Willie Taggart (Football), Amy Tucker (Basketball, women), David Vidal (Cross Country/Track and Field), Shane Whildin (Swimming, women), Clayton White (Football), Nicole Younts (Lightweight Crew, women)

Department Offices: Arrillaga Family Sports Center

Mail Code: 94305-6150

Phone: (650) 723-4591

Web Site: http://suwellness.stanford.edu

Courses in Athletics, Physical Education, and Recreation have the subject code ATHLETIC. For a complete list of subject codes, see Appendix.

From the founding of the University, Stanford's leaders have believed physical activity is valuable for its own sake and complementary to the educational purpose of the University. The mission of the Department of Athletics, Physical Education, and Recreation is to offer the widest possible range of quality programs for athletic participation and physical fitness at all levels of skill and interest. Within the limitations of its resources, the department provides a broad range of instructional, recreational, and intramural competitive programs for all who wish to participate. The intrinsic value to the participant is the primary criterion by which the worth of the programs should be judged.

The goals of the department's programs are to promote understanding of the value and role of physical activity as an important dimension of the human condition, to develop performance skills in sport, to develop the habit of participation, and to provide leadership opportunities in aquatics, sports, and other physical activities. To this end, the program encompasses a diversity of learning and participating opportunities from informal recreation through organized intramural competition, basic instructional classes, and theoretical study to, and including, intercollegiate athletic competition.

PROGRAMS

No degrees are offered in Physical Education.

INTERCOLLEGIATE ATHLETICS

In keeping with American university tradition, Stanford offers a broad intercollegiate athletic program. The objectives are to provide the opportunity to compete at the highest possible level without jeopardizing the integrity of the individual or the institution; to adhere strictly to all University, association, and conference rules governing athletic participation; and to encourage effectively the achievement of academic goals by student athletes at the same rate as other University students. As a member of the National Collegiate Athletic Association (NCAA), Stanford fields both men's and women's varsity teams. Those for men are baseball, basketball, crew, cross country, fencing, football, golf, gymnastics, sailing, soccer, swimming and diving, tennis, track and field, volleyball, water polo, and wrestling. Those for women are basketball, crew, cross country, fencing, field hockey, golf, gymnastics, lacrosse, sailing, soccer, softball, squash, swimming and diving, synchronized swimming, tennis, track and field, volleyball, and water polo.

Both men's and women's teams are affiliated with the Pacific Ten Conference, one of the premier athletic conferences in the nation. Additional or alternative intercollegiate athletic competition is available for all teams.

CLUB SPORTS

The Stanford Club Sports program provides competition in sports not included in the intercollegiate varsity program and instruction in classes or activities not included in the Physical Education program. It also develops student leadership in organizing, administering, and funding activities. The club program is actively supervised by the Coordinator of Club Sports, but the emphasis is on student interest and leadership to initiate, organize, and conduct the respective clubs. Those students in clubs that meet the criteria for inclusion in the formal curriculum may apply for units of credit.

INTRAMURAL SPORTS (IM)

Students interested in participating in intramural sports should visit the intramural web site: http://www.stanford.edu/group/intramurals/ for more information. They may visit the IM Office in Ford/Burnham. The program includes formal competition in fifteen team and individual sports using both league and single elimination tournament play structure. Individuals are encouraged to check the web site at the beginning of each quarter to obtain registration and league information. Registration occurs on the second Monday and Tuesday of each quarter, with mandatory captain meetings held that Thursday evening. Intramural leagues are offered in Autumn, Winter, Spring, and Summer quarters.

RECREATION

The department provides facility use for faculty, staff, and students (and, for some activities, their immediate families) to participate in aquatics, conditioning, and sports for general recreation. Specific recreation hours for all the facilities are posted throughout the year at the respective facilities and at http://suwellness.stanford.edu.

The golf course and driving range are available for faculty, staff, and student use on a fee basis; information is available from the Golf Pro Shop.

Recreational classes are offered in areas such as rock climbing, indoor cycling, and golf.

FACILITIES

Athletic facilities are located throughout the campus. On the west side of campus are the Golf Course, the Golf Driving Range, the Red Barn Stables, Roble Field and Pool, the Sand Hill Intramural Fields, and the West Campus Tennis Courts. Centrally located is the Tresidder Fitness Center. On the east side of campus are the Arrillaga Center for Sports and Recreation, the Arrillaga Family Sports Center, Avery Aquatic Center, Burnham Pavilion, Cobb Track and Angell Field, the Ford Center for Sports and Recreation, the Manzanita Basketball Court and Field, Maples Pavilion, Taube South Tennis Courts, and Taube Tennis Stadium.

Off-campus facilities include the Morrison Boathouse, a sailing and rowing facility.

CURRICULUM AND SERVICES

The diverse instructional program strives to accommodate the sports interests of all undergraduate and graduate students. Only intercollegiate varsity men's and women's teams are limited to undergraduates. Skill groupings and limited class sizes enable the beginning student or the advanced performer to achieve success within the limits of individual motivation and potential. Skill level in, and knowledge about, a specific activity as well as available space are the only limitations to enrollment. Physically disabled students are encouraged to contact Eric Stein (elstein@stanford.edu) for enrollment advice.

Academic Credit—Activity classes carry 1 unit of credit for satisfactory completion of work. Although there is no limitation on the number of activity classes in which a student may enroll, no more than 8 units of these activity classes (and/or other University activity classes) may be applied toward undergraduate graduation requirements (see the "Undergraduate Degrees" section of this bulletin).

Auditing—No auditing is allowed in activity classes. Faculty and staff may take an activity class as space is available with instructor consent after student enrollment is completed.

Class Fees—Fees are charged for enrollment in all physical education classes and club sports.

Class fees are payable only by check or money order payable to Stanford University. Cash is not acceptable. Fees are payable at the first, and are required by the second, class meeting for a student to remain in class. Late enrollees must submit fees no later than the second time they attend the class.

Full refund is given to students who drop a class during the first two weeks of classes and request a refund at that time. No refund is given if a student either neglects to request a refund under the conditions listed previously or drops the class after the second week.

Class Sign-ups—Information on sign-up procedures can be found on http://suwellness.stanford.edu or under Athletics in the *Time Schedule*. Students must attend the first class meeting. If accepted into the class, they can register for that class through Axess.

Deadline for Adding a Class—Students who have never appeared in a class may not enroll in that class after the fourth class meeting has passed. Students may add the class after the fourth meeting if they have been in attendance and, for whatever reason, did not get registered until the beginning of the fourth week (the University deadline for adding courses).

Equipment—Information on equipment and recommended class attire is available from the department or instructor.

Lockers—Lockers are available for rent to faculty/staff and students at the Arrillaga Family Sports Center and Roble Gym. The fee for faculty/staff is $20 per quarter or $50 per year. The fee for students is $15 per quarter or $35 per year.

COURSES

(AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum). See http://www.stanford.edu/dept/pe for further information on courses and sign-up procedures.

PHYSICAL EDUCATION AND SPORTS THEORY

ATHLETIC 73. Mind, Body, Spirit—Spiritual features of everyday life primarily from a psychological perspective with a focus on health. Topics include cultivating gratitude, forgiveness, life purpose, and kindness; mind/body/spirit solutions to everday problems. Meditation and other stress management practices.

2 units, Aut, Win, Spr (Luskin, F)

ATHLETIC 75. Introduction to Nutrition—Optimize nutrition for health and performance. Macronutrients, fad diets, sugar addiction, low-calorie sweeteners, caloric restriction, disease prevention, and nutrition.

1-2 units, Aut, Spr, Sum (Wilson, C)

ATHLETIC 123. Sports Nutrition with Clinical Applications—Principles governing fluid and energy balance under conditions of exercise stress and recovery; how these principles correlate to health and disease. Prerequisites: 74. HUMBIO 120, 155; or consent of instructor.

1-3 units, Spr (Wilson, C)

ATHLETIC 190. Analysis of Human Movement—Overview of skeletal and muscular anatomy. The mechanical principles of movement as related to efficient performance in aquatics, dance, and sports.

2-4 units, Win (Wilson, C)

LEADERSHIP OPPORTUNITIES IN PHYSICAL EDUCATION

ATHLETIC 85. Manager: Athletic Team—For student managers of intercollegiate teams. Prerequisite: consent of respective varsity team head coach. (AU)

1 unit, Aut, Win, Spr (Staff)

ATHLETIC 87. Outdoor Leadership—Skills needed to lead basic multi-day backpacking trips. Classroom sessions and wilderness trips. Topics include group dynamics and leadership, technical skills, and wilderness first aid. Class may require work over several quarters. See http://www.stanford.edu/group/spot/training/.

1 unit, Aut, Win, Spr (Staff)

AQUATIC ACTIVITY

ATHLETIC 83. Lifeguard Training—Priority to those wanting to guard at Stanford during the year. Lifeguard characteristics and responsibilities, recognition of hazards and emergencies, patron and facility surveillance, interaction with the public, rescue skills. Community first aid and CPR for the professional rescuer. Fee. Prerequisite: pass swim test (swimmer/advanced swimmer level).

2 units, Spr (Provoznik, P)

ATHLETIC 99. Sailing, Beginning: Keelboat—Basic skills, theory, and techniques enable beginners to sail a 24'-30' fixed keelboat with confidence. Emphasis is on safety and seamanship skills. Fee. (AU)
1 unit, Spr (Gross-Kehoe, A)

ATHLETIC 100. Sailing, Beginning: Dinghy—Skills, theory, and techniques to enable beginners to sail with confidence in small centerboard boats. Fee. (AU)
1 unit, Aut, Spr (Gross-Kehoe, A)

ATHLETIC 101. Sailing, Intermediate: Dinghy—Refine skills. Introduction to racing. Prerequisite: consent of instructor. Fee. (AU)
1 unit, Aut, Spr (Gross-Kehoe, A)

ATHLETIC 103. Sailing: Beginning Dinghy Racing—Racing rules, strategy, tactics, and more advanced boat handling. Enrollment limited to 14. Fee. (AU)
1 unit, Spr (Kehoe, J)

ATHLETIC 104. Sailing: Assistant Instructor (Beginning Level)
2 units, Aut, Spr (Gross-Kehoe, A)

ATHLETIC 105. Sailing: Assistant Instructor (Intermediate/Advanced Level)
2 units, Aut, Spr (Gross-Kehoe, A)

ATHLETIC 131. Swimming: Beginning—For non-swimmers or those who can swim about 10 yards but are not comfortable in deep water. Safety skills, front crawl, and back stroke. Additional strokes introduced as ability warrants. Fee. (AU)
1 unit, Aut, Sum (Neuhold-Huber, Z), Spr (Vargas, J)

ATHLETIC 132. Swimming: Advanced Beginning—For those with limited swimming and safety skills. Safety skills, crawl, and elementary backstroke or back crawl. Introduction to sidestroke and breaststroke. Increase time and distance of swim. Prerequisite: ability to swim 25-50 yards on front and back. Fee. (AU)
1 unit, Aut (Whildin, S), Win, Spr, Sum (Neuhold-Huber, Z)

ATHLETIC 133. Swimming: Intermediate—Crawl, elementary backstroke, backstroke, and sidestroke. Safety skill work as needed. Introduction to or review of breaststroke. Open turns. Introduction to butterfly, flip turn, and conditioning. Prerequisites: crawl, elementary backstroke, backstroke; some sidestroke and breaststroke; ability to swim approximately 100-200 yards continuously by mixing strokes. Fee. (AU)
1 unit, Aut, Win (Neuhold-Huber, Z), Spr (Whildin, S), Sum (Neuhold-Huber, Z)

ATHLETIC 134. Swimming: Advanced—Review and refine all basic strokes and safety skills. Introduction to or review of butterfly and flip turn. Stroke drills and information on conditioning and designing individual workouts. Prerequisite: average to good strokes; ability to swim approximately 400-500 yards continuously. Fee. (AU)
1 unit, Aut (Tanner, J), Spr (Maurer, L)

ATHLETIC 135. Swim Conditioning—Improve cardio-respiratory endurance through directed swimming workouts. Technique corrections as needed. Prerequisite: advanced swimmer. Fee. (AU)
1 unit, Aut (Kenney, A), Win (Vargas, J), Spr (Knapp, T)

ATHLETIC 136. Synchronized Swimming, Beginning—Basic skills and techniques. Prerequisite: intermediate to advanced swimming skills. Fee. (AU)
1 unit, Aut (Olson, H)

ATHLETIC 168. Water Polo: Beginning—Introduction to basic skills and game play. For those who have never played or have had limited experience. Fee. (AU)
1 unit, Spr (Barnea, J)

ATHLETIC 169. Water Polo: Intermediate/Advanced—Further work on skills. Game strategies. Fee. (AU)
1 unit, Aut (Ortwein, S), Spr (Barnea, J)

FITNESS, INDIVIDUAL, AND TEAM SPORT ACTIVITIES

ATHLETIC 2. Abs and Glutes—Lower body workout to strengthen glutes and thighs, and abdominal training. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 6. Badminton, Beginning/Intermediate—Skills, knowledge, and etiquette including fundamentals such as serving, forehand and backhand shots, drops, and smashes. Score keeping. Strategies for play in singles and doubles. Fee. (AU)
1 unit, Win (Mack, K)

ATHLETIC 7. Band, Sports Activity—(AU)
1 unit, Aut, Win, Spr (Aquilanti, G)

ATHLETIC 14. Body Blast and Sculpt—Full body workout including weights, bands, steps, and body bars. Fee. (AU)
1 unit, Aut, Win, Spr (Mandell, M)

ATHLETIC 17. Core Training—Exercises to build muscular strength and body core endurance, focusing on balance and stability. Equipment includes stability and medicine balls. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 37. Fencing: Beginning—The sport of swordmanship develops quick hands, strong legs, and a strategic mind. Footwork, handwork, and bouting. Emphasis is on foil technique. All equipment provided. Fee. (AU)
1 unit, Aut, Win, Spr (Naulo, V)

ATHLETIC 38. Fencing, Advanced Beginning—Continuation of 37; learn advanced footwork and handwork. Strategy and bouting. Introduction to epee and saber. All equipment provided. Prerequisite: 37. Fee. (AU)
1 unit, Aut, Win, Spr (Naulo, V)

ATHLETIC 43. Fitness for Life—For students who want to improve their overall fitness level. Workouts include brief periods of high intensity exercise interspersed with lower intensity exercise or rest. Short duration agility runs, weight lifting, and cardiovascular improvement. Emphasis is on proper stretching techniques, warm-ups, cool-downs, and monitoring heart rate. Fee. (AU)
1 unit, Win, Spr (Irvine, L)

ATHLETIC 44. Field Hockey, Intermediate—For those with prior experience. Techniques, skills, and strategy. Scrimmages and game-like scenarios. Fee. (AU)
1 unit, Win (Irvine, L)

ATHLETIC 47. Flexibility Training—Increase functional performance and range of motion while decreasing risk of injury with flexibility training techniques for the entire body. Fee. (AU)
1 unit, Aut, Win, Spr (Gittens, D)

ATHLETIC 52. Golf: Beginning—Fundamentals of the golf swing; putting, chipping, and sand play. Golf etiquette and rules. Fee. (AU)
1 unit, Aut Win, Spr, Sum (Staff)

ATHLETIC 53. Golf: Advanced Beginning—Further development of the golf swing and short game. How to practice. Rules and etiquette. Prerequisite: 52 or golf experience. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 54. Golf: Intermediate—Drills and practice on all facets of golf. How to lower scores and manage the game on the course. Prerequisite: 53 or equivalent. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 55. Golf: Advanced—Understand and refine the golf swing and increase power, distance, and accuracy. Course management, mental preparation, visualization techniques. Prerequisites: 54 or experience playing and practicing, and the ability to hit shots with relative accuracy and distance. Fee. (AU)
1 unit, Aut, Win, Spr (Staff)

ATHLETIC 59. Gymnastics: Beginning—Fundamental gymnastics movement for men and women, including flexibility and strength exercises taught on the Olympic apparatus including floor, balance beam, bars, and rings. Fee. (AU)
1 unit, Aut (Swircek, C), Win (Lorenzen, M), Spr (Swircek, C)

ATHLETIC 60. Gymnastics: Intermediate—For students who have completed 59 or have a background in gymnastics. Emphasis is on tumbling and somersaulting. Group work and individualized instruction for men and women. Limited apparatus work. Fee. (AU)
1 unit, Aut, Win, Spr (Staff)

ATHLETIC 64. Hip Hop—Funky, jazzy, hip hop dance for fun and cardiovascular fitness. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 65. Horsemanship: Beginning Riding—No experience needed. Basic horsemanship and riding at the walk, trot and canter. Fee. (AU)
1 unit, Aut, Win, Spr (Bartsch, V)

ATHLETIC 66. Horsemanship: Advanced Beginning Riding—Horsemanship and horse care; the canter and basic jumping. Prerequisite: 65 or equivalent. Fee. (AU)
1 unit, Aut, Win, Spr (Bartsch, V)

ATHLETIC 67. Horsemanship: Intermediate Riding and Jumping—Basic veterinary skills and barn management. Riding at all gaits and jumping basic course up to two feet. Prerequisite: 66 or equivalent. Fee. (AU)
1 unit, Aut, Win, Spr (Bartsch, V)

ATHLETIC 68. Horsemanship: Student Assistant
1 unit, Aut, Win, Spr (Bartsch, V)

ATHLETIC 78. Kickboxing—High intensity cardio workout incorporating kicks, punches, and elbow/knee and other combinations inspired by martial arts and boxing. Fee. (AU)
1 unit, Aut, Win, Spr (Duarte, B; Mandell, M), Sum (Mandell, M)

ATHLETIC 82. Lungs and Legs of Steel: Road Race and Marathon Training—Endurance training for road races and marathons. Dynamic warm-up, drills, interval training, hill training, functional strength training for runners, recover and recovery methods, core strength, nutrition and hydration, and static stretching routines to improve running performance. (AU)
1 unit, Win (Rembao, J)

ATHLETIC 86. Introduction to Martial Arts—Techniques, training methods, history, and culture of Asian martial arts. Three styles per quarter. Warm-ups, fundamental techniques, basic application, and conditioning.
1 unit, Aut, Win, Spr (Ghormley, T)

ATHLETIC 84. Lifestyle Fitness Challenge—Exploration and improvement of overall health. Wellness, physical fitness, nutrition, cardio endurance, muscular strength and endurance, flexibility, and stress management. Introductions to weight and cardio equipment, outdoor workouts, spinning, strength and tone workouts, and yoga. Before and after fitness assessment.
2 units, Aut, Win, Spr (Spanier, J)

ATHLETIC 88. Introduction to Personal Training—Two-part American Council on Exercise university personal training exam preparatory course. Foundational knowledge in health and fitness including human anatomy and exercise science. See http://suwellness.stanford.edu/fitness/certification_opportunities.html.
1-2 units, Aut, Win, Spr (Young, P.)

ATHLETIC 90. Pilates Mat—Balanced sequence of exercises emphasizing grace and balance. Breath work and precision separate Pilates from traditional conditioning methods. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Conniff, N)

ATHLETIC 92. Rock Body Bootcamp—High intensity intervals of cardiovascular and strength training to promote lean muscle and increased metabolism. Fee. (AU)
1 unit, Win, Spr (Staff)

ATHLETIC 95. Touch Rugby—Physical, technical, and tactical abilities relating to invasion games such as touch rugby. Fee.
1 unit, Spr (Staff)

ATHLETIC 112. Social Dance, Beginning—Introduction to the fundamentals of partner dancing. Learn basic steps, styling, and rhythms in several popular social dances such as Tango, Salsa, Waltz, Cha-Cha, and Foxtrot. No experience or partner necessary. Fee.
1 unit, Aut, Win, Spr (Kao, J.)

ATHLETIC 114. Soccer: Intermediate/Advanced—For the player with club or high school experience. Small group offensive and defensive tactics. Drills and small-sided games. Fee.
1 unit, Aut (Pascale, J; Noftsinger, S), Spr (Becerra II, R; Cooney Jr., J)

ATHLETIC 115. Soccer: Advanced for Men—Techniques under pressure; small group and team tactics. Fitness for the soccer player. Prerequisites: consent of instructor, tryouts. Fee. (AU)
1 unit, Win (Simon, B)

ATHLETIC 116. Soccer: Intermediate/Advanced for Women—Techniques under pressure; small group and team tactics. Fitness for the soccer player. Prerequisites: consent of instructor, tryouts. Fee. (AU)
1 unit, Win (Ratcliffe, P)

ATHLETIC 117. Soccer: Indoor, Beginning/Intermediate—For those with little or no playing experience. Skills, rules, small sided games. Fee. (AU)
1 unit, Win (Cooney Jr., J; Becerra II, R)

ATHLETIC 118. Soccer, Indoor: Intermediate/Advanced—Smaller ball and playing area. Emphasis is on individual ball skills through small sided games. Fee. (AU)
1 unit, Win (Pascale, J; Noftsinger, S)

ATHLETIC 124. Beginning Squash—Rules and practice matches. Racquets, balls, and eye guards provided. Limited enrollment. Fee.
1 unit, Aut, Win, Spr (Talbott, M)

ATHLETIC 125. Squash: Intermediate/Advanced—Continuation of 124. Fee. May be repeated for credit. (AU)
1 unit, Aut, Win, Spr (Talbott, M)

ATHLETIC 129. Step and Sculpt—Nonstop synergistic blend of cardiovascular and weight bearing exercises. Hand weights and tubes for strength. Equipment provided. Fee. (AU)
1 unit, Aut, Win, Spr (Gittens, D)

ATHLETIC 130. Synergy—Fusion of martial arts and yoga using linear and spherical movement. Modern approach to ancient practices to increase functional strength, range of motion, and clarity of mind. Fee. (AU)
1 unit, Aut, Win, Spr (McCracken, S)

ATHLETIC 150. Total Body Workout—For all fitness levels; tone and strengthen the entire body. Different equipment used to target all major muscle groups. Fee. (AU)
1 unit, Aut, Win, Spr (Sanders, B)

ATHLETIC 141. Tennis: Beginning—Forehand, backhand, serve, and net play; rules and scoring. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 142. Tennis: Low Intermediate—Fundamental strokes and their use in a game situation. Prerequisites: 141, or knowledge of rules and scoring and average ability in fundamental strokes but limited playing experience. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 143. Tennis: Intermediate—Fundamental stroke review. Singles and doubles tactics. Prerequisites:142 or average ability in fundamental strokes, and regular playing experience; NTRP rating of 3.0 or equivalent. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 144. Tennis: Advanced—Drills emphasize footwork, serve and return, approach shots, volleys, lobs, and overheads. Strategy for competition in singles and doubles. Prerequisites: above average stroking and game playing ability; NTRP rating above 4.0 or equivalent. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 146. Tennis: Analysis—Use of computer for analyzing tennis matches. Assist players and coaches by collecting data on player performance. Prerequisite: consent of instructor. Recommended: excellent knowledge of tennis, background in computers and statistics. (AU)
2 units, Aut, Win, Spr (Forood, L)

ATHLETIC 159. Volleyball: Introduction to Sand—Fundamental skills and rules. Strategy in two- and four-person sand volleyball. Fee. (AU)
1 unit, Aut (Shibuya, K)

ATHLETIC 160. Volleyball: Intermediate Sand—Further development of skills and rules. Strategy in two- and four-person sand volleyball. Fee. (AU)
1 unit, Aut, Spr (Shibuya, K)

ATHLETIC 161. Volleyball: Advanced Sand—Refine and improve skills and game playing strategy in two- and four-person sand volleyball. Must have strong skills and general knowledge of team concepts. Prerequisiste: 160 or consent of the instructor. Fee. (AU)
1 unit, Aut (Kosty, J), Spr (Shibuya, K)

ATHLETIC 163. Volleyball—Drills to improve skills and game playing strategy. As ability indicates, more emphasis on team play and strategy. Fee. (AU)
1 unit, Aut (Corlett, D)

ATHLETIC 174. Weight Training: Beginning—Improving fitness level through progressive resistance exercises using machines and free weights. Individualized weight training programs once basic exercises are learned. Stretching program. Basics of exercise physiology. Fee. (AU)
1 unit, Aut (Weir, R), Spr (Staff)

ATHLETIC 175. Weight Training: Intermediate—Review of exercises and techniques. Emphasis is on individualized programs and learning the use of all available machines and free weights. Exercise physiology. Prerequisite: 174 or equivalent. Fee. (AU)
1 unit, Aut (Staff)

ATHLETIC 176. Weight Training for Women—All levels welcome, but designed for the beginner. Techniques and equipment for weight training. Emphasis is on stretching, proper form and progressions, and injury prevention. The basics of the physiology of strength training and planning individual programs. Fee. (AU)
1 unit, Aut, Win (Allister, J)

ATHLETIC 177. Circuit Aerobic Weight Training—A full-body conditioning workout with weight lifting and aerobic components. Weight training equipment organized into a circuit to maximize workout intensity in a short amount of time. Fee. (AU)
1 unit, Aut, Spr (Nelson, D)

ATHLETIC 179. Wrestling: Beginning/Intermediate—Intercollegiate wrestling. Conditioning, cultivating the spirit of one-on-one competition. Basic skills and high-level sequences of upper- and lower-body technique. Fee. (AU)
1 unit, Spr (Staff)

ATHLETIC 186. Yoga—Mind, body, and spirit meet in yoga. Increase flexibility and restore health to the body. Fee. (AU)
1 unit, Aut, Win, Spr, Sum (Staff)

ATHLETIC 188. Yoga/Pilates Fusion—Combination of power and restorative yoga with strength building Pilates exercises. Fee.
1 unit, Aut, Win, Spr, Sum (Conniff, N; Merlo, A)

INTERCOLLEGIATE ATHLETIC TEAMS

ATHLETIC 9V. Baseball, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Marquess, M; Stotz, D)

ATHLETIC 11V. Basketball, Varsity Men—(AU)
1-2 units, Aut, Win (Johnson, T)

ATHLETIC 12V. Basketball, Varsity Women—(AU)
1-2 units, Aut, Win (VanDerveer, T)

ATHLETIC 19V. Crew, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Amerkhanian, C)

ATHLETIC 20V. Crew, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Farooq, Y)

ATHLETIC 22V. Cross Country, Varsity Men—(AU)
1-2 units, Aut (Tegen, P)

ATHLETIC 23V. Cross Country, Varsity Women—(AU)
1-2 units, Aut (Tegen, P)

ATHLETIC 31V. Diving, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Schavone, R)

ATHLETIC 32V. Diving, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Schavone, R)

ATHLETIC 41V. Fencing, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Posthumus, E)

ATHLETIC 42V. Fencing, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Posthumus, E)

ATHLETIC 45V. Field Hockey, Varsity Women—(AU)
1-2 units, Aut, Spr (Irvine, L)

ATHLETIC 48V. Football, Varsity—(AU)
1-2 units, Aut, Spr (Harbaugh, J)

ATHLETIC 57V. Golf, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Ray, C)

ATHLETIC 58V. Golf, Varsity Women—AU
1-2 units, Aut, Win, Spr (O'Connor, C)

ATHLETIC 61V. Gymnastics, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Glielmi, T)

ATHLETIC 62V. Gymnastics, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Smyth, K)

ATHLETIC 81V. Lacrosse, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Uhlfelder, M)

ATHLETIC 107V. Sailing, Varsity Men—(AU))
1-2 units, Aut, Win, Spr (Kehoe, J)

ATHLETIC 108V. Sailing, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Kehoe, J)

ATHLETIC 119V. Soccer, Varsity Men—(AU)
1-2 units, Aut, Spr (Simon, B)

ATHLETIC 120V. Soccer, Varsity Women—(AU)
1-2 units, Aut, Spr (Ratcliffe, P)

ATHLETIC 122V. Softball, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Rittman, J)

ATHLETIC 127V. Squash, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Talbott, M)

ATHLETIC 137V. Swimming, Synchronized: Varsity—(AU)
1-2 units, Aut, Win, Spr (Olson, H)

ATHLETIC 138V. Swimming, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Kenney, A)

ATHLETIC 139V. Swimming, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Maurer, L)

ATHLETIC 148V. Tennis, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Whitlinger, J)

ATHLETIC 149V. Tennis, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Forood, L)

ATHLETIC 153V. Track and Field, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Weir, R)

ATHLETIC 154V. Track and Field, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Floreal, E)

ATHLETIC 165V. Volleyball, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Kosty, J)

ATHLETIC 166V. Volleyball, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Dunning, J)

ATHLETIC 171V. Water Polo, Varsity Men—(AU)
1-2 units, Aut, Win, Spr (Vargas, J)

ATHLETIC 172V. Water Polo, Varsity Women—(AU)
1-2 units, Aut, Win, Spr (Tanner, J; Ortwein, S)

ATHLETIC 182V. Wrestling, Varsity—(AU)
1-2 units, Aut, Win, Spr (McCoy, K)

CLUB SPORTS

The Stanford Club Sports Program is affiliated with the department but is initiated, organized, and conducted by students. All clubs are coeducational except as specified. Clubs whose instructional classes meet the criteria for academic credit are scheduled for meeting times as published each quarter in the *Time Schedule*. For additional information, contact the Club Sports Coordinator.

ATHLETIC 4C. Archery Club Team—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 5C. Badminton Club Team—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 15C. Canoe and Kayak Club—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 28C. Cycling Club Team—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 34C. Equestrian Club Team—(AU)
1 unit, Aut, Win, Spr (Bartsch, V)

ATHLETIC 69C. Horse Polo Club Team—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 71C. Ice Hockey Club Team—Men (AU)
1 unit, Aut, Win (Gross-Kehoe, A)

ATHLETIC 76C. Judo Club Team—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 79C. Lacrosse Club Team (Men)—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 93C. Rugby Club Team (Men)—(AU)
1 unit, Aut, Win, Spr (Griffin, P)

ATHLETIC 94C. Rugby Club Team (Women)—(AU)
1 unit, Aut, Win, Spr (Griffin, P)

ATHLETIC 98C. Running Club—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 110C. Ski Club Team—(AU)
1 unit, Win (Gross-Kehoe, A)

ATHLETIC 126C. Squash Club Team (Men)—(AU)
1 unit, Aut, Win, Spr (Talbott, M)

ATHLETIC 140C. Tae Kwon Do Club—(AU)
1 unit, Aut, Win, Spr (Ghormley, T)

ATHLETIC 151C. Triathlon Club Team—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 156C. Ultimate Frisbee Club Team (Men)—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

ATHLETIC 157C. Ultimate Frisbee Club Team (Women)—(AU)
1 unit, Aut, Win, Spr (Gross-Kehoe, A)

BIOLOGICAL SCIENCES

Emeriti: (Professors) Winslow R. Briggs, Donald Kennedy, Peter Ray, Robert Schimke, Norman K. Wessells, Dow O. Woodward, Charles Yanofsky;* *(Professor, Research)* R. Paul Levine*
Chair: Robert D. Simoni
Professors: Bruce S. Baker, Barbara A. Block, Steven M. Block, Allan M. Campbell, Martha S. Cyert, Gretchen Daily, Mark W. Denny, Rodolfo Dirzo, Paul R. Ehrlich, David Epel, Marcus W. Feldman, Russell Fernald, Christopher B. Field, William F. Gilly, Deborah M. Gordon, Philip C. Hanawalt, H. Craig Heller, Patricia P. Jones, Richard G. Klein, Ron R. Kopito, Sharon R. Long, Liqun Luo, Susan K. McConnell, Harold A. Mooney, W. James Nelson, Stephen R. Palumbi, Joan Roughgarden, Robert M. Sapolsky, Stephen H. Schneider, Carla J. Shatz, Michael A. Simon, Robert D. Simoni, George N. Somero, Chris R. Somerville, Stuart H. Thompson, Shripad Tuljapurkar, Peter Vitousek, Virginia Walbot, Ward B. Watt
Professor (Teaching): Carol L. Boggs
Associate Professors: Judith Frydman, Elizabeth A. Hadly, Dmitri Petrov, Tim Stearns
Assistant Professors: Dominique Bergmann, William F. Burkholder, Guowei Fang, Or Gozani, Fiorenza Micheli, Mary Beth Mudgett, Mark J. Schnitzer, Kang Shen
Assistant Professor (Research): Anthony De Tomaso
Courtesy Professors: Joseph Berry, Wolf Frommer, Arthur R. Grossman, Terry Root, Shauna Somerville, Irving Weissman, Wing Wong
Courtesy Associate Professors: Kathryn Barton, Alfred M. Spormann
Courtesy Assistant Professor: Zhiyong Wang
Lecturers: Waheeda Khalfan, Shyamala D. Malladi, Timothy J. Meier, James Watanabe
Consulting Professors: Terrence Gosliner, Nina Jablonski, J. Patrick Kociolek, Cathy Laurie, Catherine Squires, Marc Tessier-Lavigne
Librarian: Michael Newman

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* Recalled to active duty.

Department Offices: Gilbert, Room 109
Mail Code: 94305-5020
Phone: (650) 723-1826
Web Site: http://www.stanford.edu/dept/biology

Courses given in Biological Sciences have the subject code BIOSCI. For a complete list of subject codes, see Appendix.

The department provides: (1) a major program leading to the B.S. degree; (2) a minor program; (3) a coterminal program leading to the M.S. degree; (4) a terminal program leading to the M.S. degree; (5) a doctoral program leading to the Ph.D. degree; and (6) courses designed for the non-major. An undergraduate major in Biological Sciences serves as preparation for professional careers, including medicine, dentistry, veterinary sciences, teaching, consulting, research, and field studies. Additionally, the major provides a valuable focus of a liberal arts education for those not planning careers in science-related fields. For graduate-level students, the department offers resources and experience learning from and working with world-renowned faculty involved in research on ecology, neurobiology, population biology, plant and animal physiology, biochemistry, immunology, cell and developmental biology, genetics, and molecular biology.

The facilities and personnel of the Department of Biological Sciences are housed in the Gilbert Biological Sciences Building, Herrin Laboratories, Herrin Hall, the Jasper Ridge Biological Preserve, the James H. Clark Center, and the Lorry I. Lokey Laboratory Building on the main campus, and at the Hopkins Marine Station in Pacific Grove on Monterey Bay.

Jasper Ridge Biological Preserve (JRBP) is located near Stanford University's campus in the eastern foothills of the Santa Cruz Mountains. The preserve encompasses geologic, topographic, and biotic diversity within its 1,189 acres and provides a natural laboratory for researchers from around the world, educational experiences for students and docent-led visitors, and refuge for native plants and animals. See http://jrbp.stanford.edu.

The Hopkins Marine Station, located 90 miles from the main University campus in Pacific Grove, was founded in 1892 as the first marine laboratory on the west coast of North America. For more information, including courses taught at Hopkins Marine Station with the subject code BIOHOPK, see the "Division of Marine Biology Hopkins Marine Station" section of this bulletin, immediately following this section.

The department's large collections of plants (Dudley Herbarium), fish, reptiles, and amphibians, as well as smaller collections of birds, mammals, and invertebrates, are housed at the California Academy of Sciences in San Francisco, where they, and extensive collections of the academy, are available to those interested in the systematics of these groups. Entomological collections, restricted to those being used in particular research projects, are housed in the Herrin Laboratories. No general collections are maintained except for teaching purposes.

The Falconer Biology Library in Herrin Hall (http://library.stanford.edu/depts/falconer/) contains over 1,200 current subscriptions and an extensive collection of monographs and reference works. A specialized library is maintained at the Hopkins Marine Station.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

ADVISING

Members of the Biological Sciences faculty are available for advising on such academic matters as choice of courses and career plans. The student services office maintains a current list of faculty advisers, advising schedules, and research interests.

The student services office staff and BioBridge, the department's peer advising group, are prepared to answer questions on administrative matters, such as requirements for the major, approved out-of-department electives, transfer course evaluations, and petition procedures. This office also distributes the department's *Bachelor of Science Handbook,* which delineates policies and requirements, as well as other department forms and information handouts.

Each undergraduate interested in the Biological Sciences major is required to select a department adviser as part of the major declaration process. Students who plan to attend medical or graduate school, enroll in the honors or coterminal programs, take courses at Hopkins Marine Station, or attend one of the overseas campuses will find their faculty adviser particularly helpful.

REQUIREMENTS

Candidates for the B.S. degree must complete:

Core Courses and Electives—

Courses	*Units*
BIOSCI 41*	5
BIOSCI 42*	5
BIOSCI or BIOHOPK 43*	5
BIOSCI 44X	4
BIOSCI or BIOHOPK 44Y (may be replaced by 4 units of BIOHOPK 175H or 176H)	4
Total	23
Electives	24

* Letter grade only.

Required Foundational Breadth Courses—Students may take up to two foundational breadth courses credit/no credit (CR/NC).

1. Introductory, organic, and physical chemistry with lab: CHEM 31X (or 31A,B), 33, 35, 36, 130, 131, 135 (or 171). For those interested in ecology and evolutionary biology, an advanced Mathematics course of 100-level or above may be substituted for 130.
2. General Physics: PHYSICS 21, 22, 23, 24; or 41, 43, 45; or 28, 29.
3. Math through calculus: MATH 19, 20, 21; or 41, 42.
4. One foundational breadth course in Mathematics, Statistics, or Computer Science: MATH 51 or beyond; BIOSCI 141*; BIOHOPK 174H*; STATS 60 or beyond; or CS 106A or X.

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* If taken to fulfill the foundational breadth requirement, these courses do not count toward the 24 elective unit requirement.

Electives—Electives must be 100-level or above and selected from the offerings in the Department of Biological Sciences, Hopkins Marine Station, or from the list of approved out-of-department electives in the student services office or by downloading http://biology.stanford.edu/student_resources/out_of_dept_electives.pdf. Stanford Introductory Seminars may not be used to fulfill this requirement.

The program for the junior and senior year should include a total of 24 elective units beyond the core. The courses making up these units must include at least one course from at least three of the following four central menu areas. The rest of the 24 units can include more courses from this central menu, other Biological Sciences or Hopkins Marine Station courses, courses listed on the approved out-of-department elective list, or advanced courses for which menu courses are prerequisites. A complete central menu course listing including inactive and alternate year courses is available in the student services office or by downloading http://biology.stanford.edu/student_resources/central_menu.pdf. Active central menu courses are:

1. *Molecular*
   BIOSCI 104. Advanced Molecular Biology
   BIOSCI 113. Fundamentals of Molecular Evolution[3]
   BIOSCI 118. Genetic Analysis of Biological Processes[1]
   BIOSCI 133. Genetics of Prokaryotes[1]
   BIOSCI 134. Replication of DNA[1]
   BIOSCI 188. Biochemistry I
   BIOSCI 189. Biochemistry II
   BIOSCI 230. Molecular and Cellular Immunology[1]
   CBIO 101. Cancer Biology[1]
   CEE 274A. Environmental Microbiology I[5]
2. *Cell/Developmental*
   BIOSCI 115. Signal Transduction and Development
   BIOSCI 118. Genetic Analysis of Biological Processes[1]
   BIOSCI 129A. Cellular Dynamics I: Cell Motility and Adhesion
   BIOSCI 129B. Cellular Dynamics II: Building a Cell
   BIOSCI 133. Genetics of Prokaryotes[1]
   BIOSCI 134. Replication of DNA[1]
   BIOSCI 154. Molecular and Cellular Neurobiology[2]
   BIOSCI 158. Developmental Neurobiology[2]
   BIOSCI 160. Developmental Biology
   BIOSCI 230. Molecular and Cellular Immunology[1]
   BIOHOPK 183H. Environmental Cell & Developmental Biology
   CBIO 101. Cancer Biology[1]
   CEE 274A. Environmental Microbiology I[5]
3. *Organismal*
   BIOSCI 112. Human Physiology
   BIOSCI 124. Plant Physiological Ecology[4]
   BIOSCI 138. Ecology and Evolution of Plants[4]
   BIOSCI 153. Cellular Neuroscience
   BIOSCI 154. Molecular and Cellular Neurobiology[2]
   BIOSCI 158. Developmental Neurobiology[2]
   BIOSCI 163. Neural Systems and Behavior
   BIOSCI 213. Biology of Viruses
   BIOHOPK 161H. Invertebrate Zoology
   BIOHOPK 162H. Comparative Animal Physiology
   BIOHOPK 167H. Nerve, Muscle, and Synapse
   BIOHOPK 169H. Neurobiology and Behavior
   BIOHOPK 171H. Ecological and Evolutionary Physiology
   HUMBIO 140. Vertebrate Biology
   MI 185. Topics in Microbiology
4. *Ecology and Evolution*
   BIOSCI 101. Ecology
   BIOSCI 113. Fundamentals of Molecular Evolution[3]
   BIOSCI 121. Biogeography
   BIOSCI 136. Evolutionary Paleobiology
   BIOSCI 142. Topics in Theoretical Ecology
   BIOSCI 143. Evolution
   BIOSCI 144. Conservation Biology
   BIOSCI 145. Behavioral Ecology
   BIOHOPK 163H. Oceanic Biology
   BIOHOPK 172H. Marine Ecology
   CEE 274A. Environmental Microbiology I[5]

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[1] May be used to satisfy either area I or area II requirement.
[2] May be used to satisfy either area II or area III requirement.
[3] May be used to satisfy either area I or area IV requirement.
[4] May be used to satisfy either area III or area IV requirement.
[5] May be used to satisfy either area I or area II or area IV requirement.

No more than 6 units from any combination of individual instruction courses (BIOHOPK 175H, 176H, 198H, 199H, 290H, 300H; BIOSCI 198, 198X, 199, 199X, 290, 290X, 291, 300, or 300X) may be applied toward the total number of elective units. No more than 6 units applied toward the elective unit requirement may be taken CR/NC.

Students intending to pursue research careers in biology, especially in ecology, population genetics, or theoretical biology, should be aware that MATH 19, 20, 21, or MATH 41, 42 are minimum mathematics requirements for the B.S. degree in Biological Sciences. Substantial additional training in mathematics, including differential equations, linear algebra, and probability theory, is often highly advisable. Students should consult the Biological Sciences faculty to discuss individual needs.

Additionally, even though only two or three quarters of physics are required, students should be aware that many graduate and professional schools (for example, Medicine and Education) require a year of general physics with lab. Biological Sciences majors are therefore advised to take the year-long physics sequence PHYSICS 21, 22, 23, 24, 25, 26 if they plan to attend graduate or medical school.

For students considering study at Hopkins Marine Station during the junior or senior year, or an overseas program, the department recommends fulfilling as many University General Education Requirements as possible in the first two years at Stanford.

TYPICAL SCHEDULE FOR A FOUR-YEAR PROGRAM

FIRST YEAR

Subject and Catalog Number	*Qtr. and Units*		
	A	*W*	*S*
CHEM 31X*, 33, 35, 36	4	4	7
MATH 19, 20, 21. Calculus and Analytic Geometry	3	3	4
Freshman requirements, seminars, or GERs	8	8	6
Totals	15	15	17

* This schedule varies slightly if the student takes CHEM 31A,B.

SECOND YEAR

BIOSCI 41. Principles of Biology*	5		
BIOSCI 42. Principles of Biology*		5	
BIOSCI or BIOHOPK 43. Principles of Biology*			5
BIOSCI 44X. Core Experimental Laboratory		4	
BIOSCI or BIOHOPK 44Y. Core Experimental Laboratory			4
CHEM 130, 131, 135 (or 171). Organic and Physical Chemistry	8	3	
General Education Requirements or electives	3	5	8
Totals	16	17	17

* Letter grade only.

THIRD YEAR

PHYSICS 21, 22, 23, 24. Introductory Physics	4	4	
General Education Requirements or electives	11	11	11
Totals	15	15	11

FOURTH YEAR

Electives	15	15	15

FIELDS OF STUDY (SPECIALIZATION TRACKS)

In addition to the undergraduate major program described above, the department offers these six specialized fields of study for students wishing to concentrate their studies in particular areas of biology:

1. Biochemistry and Biophysics
2. Ecology and Evolution
3. Marine Biology
4. Microbes and Immunity
5. Molecular and Cellular Biology
6. Neurobiology

These fields of study are declared on Axess; they appear on the transcript but not on the diploma. Candidates for the B.S. degree in Biological Sciences with a field of study are expected to complete the departmental honors program as well as the set of requirements outlined below. Students in a field of study must have their checklist signed by their advisers and submitted to the student services office by the end of junior year. Students may petition in advance for the substitution of either equivalent or more advanced courses using the General Petition, available in the student services office or by downloading http://biology.stanford.edu/student_resources/general_petition.pdf.

BIOCHEMISTRY AND BIOPHYSICS

Core Courses (must be taken for a letter grade):

Subject and Catalog Number	*Units*
BIOSCI 41	5
BIOSCI 42	5
BIOSCI or BIOHOPK 43	5

Writing in the Major (one of the following):

BIOSCI 44X	4
BIOSCI or BIOHOPK 44Y	4
BIOSCI 145*	4
BIOHOPK175H*	10
BIOHOPK 176H*	12

* These courses can also be used to count toward the elective requirement.

Required Foundational Breadth Courses (two courses may be taken credit/no credit):

CHEM 31A,B, or 31X	8 or 4
CHEM 33, 35, 36, 130	15
CHEM 135 or 171	3
PHYSICS 41, 43, 45	12
MATH 51, 52	10
STATS 60 or BIOSCI 141	5 or 4-5

Required Biology Courses (must be taken for a letter grade):

BIOSCI 104	3
BIOSCI 118	5
BIOSCI 129A or 129B	4
BIOSCI 188	3

Approved Biochemistry and Biophysics Courses (three of the following; must be taken for a letter grade):

APPPHYS 192	3
BIOMEDIN 210	3
BIOSCI 152/MCP 222	3
BIOSCI 154	4
BIOSCI 211	4
CHEM 232/CHEMENG 452	3
MCP 256	4

Electives—7 units required. Electives must be 100-level or above and chosen from the offerings in the Department of Biological Sciences, Hopkins Marine Station, or from the list of approved out-of-department electives. Up to 6 units of teaching and research are allowed. Only one course can be taken credit/no credit.

Research Requirement—Admission to the departmental honors program; 10 units of BIOSCI 199, 199X, or BIOHOPK 199H; poster or oral presentation; and honors thesis. Only research units from BIOSCI or BIOHOPK are permitted.

ECOLOGY AND EVOLUTION

Core Courses (must be taken for a letter grade):

Subject and Catalog Number	*Units*
BIOSCI 41	5
BIOSCI 42	5
BIOSCI or BIOHOPK 43	5
BIOSCI 101 or BIOHOPK 172H	3 or 5

Writing in the Major (one of the following):

BIOSCI 44X	4
BIOSCI or BIOHOPK 44Y	4
BIOSCI 145*	4
BIOHOPK175H	10
BIOHOPK 176H	12

* This course can also be used to count toward the elective requirement.

Required Foundational Breadth Courses (two courses may be taken credit/no credit):

CHEM 31A,B or 31X	8 or 4
CHEM 33, 35, 36	11
PHYSICS 21, 22, 23, 24 or 41, 43, 45 or 28, 29	8 or 12
MATH 41, 42	10

Required Evolutionary Biology Course (one of the following; must be taken for a letter grade):

BIOSCI 113/244	4
BIOSCI 136	4
BIOSCI 143	3
BIOHOPK 166H	5

Required Quantitative Methods Course (one of the following; must be taken for a letter grade):

BIOSCI 141	4-5
BIOSCI 142	3
BIOSCI 221	4
BIOHOPK 174H	3
CS 106A or 106X	3-5
STATS 60 or beyond	5

Electives—30 units required. Only one course can be taken credit/no credit. Electives must be from this approved list: ANTHSCI 187; BIOSCI 102, 109Z*, 110Z*, 111Z*, 117, 118, 121, 124, 125, 139, 144, 145, 146, 147, 175, 183, 184, 215, 216; BIOHOPK 163H, 171H; CHEM 130, 131; GEOPHYS 130/231; GES 144, 164, 168, 240.

* Only 2 units can count.

Research Requirement—Admission to the departmental honors program; 10 units of BIOSCI 199, 199X, or BIOHOPK 199H; poster or oral presentation; and honors thesis. Only research units from BIOSCI or BIOHOPK are permitted.

MARINE BIOLOGY

Core Courses (must be taken for a letter grade):

Subject and Catalog Number	*Units*
BIOSCI 41	5
BIOSCI 42	5
BIOSCI or BIOHOPK 43	5

Writing in the Major (one of the following):

BIOSCI 44X	4
BIOSCI or BIOHOPK 44Y	4
BIOSCI 145	4
BIOHOPK175H*	10
BIOHOPK 176H*	12

* These courses can also be used to count toward the approved courses.

Required Foundational Breadth Courses (two courses may be taken credit/no credit):

CHEM 31A,B or 31X	8 or 4
CHEM 33, 35, 36, 130, 131	18
PHYSICS 21, 22, 23, 24 or 41, 43, 45	8 or 12
MATH 41, 42 or 19, 20, 21	10
STATS 60 or BIOSCI 141 or BIOHOPK 174H	5 or 4-5 or 3

Required Biology Courses (must be taken for a letter grade):

BIOSCI 101	3
BIOSCI 118	5
BIOSCI 143	3

Approved courses (three of the following; must be taken for a letter grade):

BIOHOPK 161H	5
BIOHOPK 162H or 171H	5-8 or 4
BIOHOPK 163H	4
BIOHOPK 166H	5
BIOHOPK 172H	5

Approved courses (one of the following; must be taken for a letter grade):

BIOHOPK 175H	10
BIOHOPK 176H	12
BIOHOPK 182H	16

Research Requirement—Admission to the departmental honors program; 10 units of BIOSCI 199, 199X, or BIOHOPK 199H; poster or oral presentation; and honors thesis. Only research units from BIOSCI or BIOHOPK are permitted.

MICROBES AND IMMUNITY

Core Courses (must be taken for a letter grade):

Subject and Catalog Number	*Units*
BIOSCI 41	5
BIOSCI 42	5
BIOSCI or BIOHOPK 43	5

Writing in the Major and Introduction to Laboratory Science (one of the following):

BIOSCI 44X	4
BIOSCI or BIOHOPK 44Y	4
BIOHOPK 175H*	10
BIOHOPK 176H*	12

* This course can also be used to count toward the elective requirement.

Required Foundational Breadth Courses (two courses may be taken credit/no credit):

CHEM 31A,B or 31X	8 or 4
CHEM 33, 35, 36, 130, 131	18
PHYSICS 21, 22, 23, 24 or 41, 43, 45	8 or 12
MATH 19, 20, 21 or 41, 42	10
BIOSCI 141* or BIOHOPK 174H*	4-5 or 3

* This course cannot also be used to count toward the elective requirement.

Required Courses in Microbiology, Immunology, Molecular Evolution (four of the following; must be taken for a letter grade):

BIOSCI 113	4
BIOSCI 133	4
BIOSCI 213	3
BIOSCI 230	4-5
BIOHOPK 274	9-12
CEE 177	4
CEE 274A	3
CEE 274B	3
CEE 274D	3
MI 104	3
MI 211	3
MI 212	3

Required Course in Reading Scientific Literature (must be taken for a letter grade):

MI 185	3

Electives—12 units required. Electives must be 100-level or above and selected from the offerings in the Department of Biological Sciences, Hopkins Marine Station, or from the list of approved out-of-department electives. Up to 6 units of teaching and research are allowed. Only one course can be taken credit/no credit.

Research Requirement—Admission to the departmental honors program; 10 units of BIOSCI 199, 199X, or BIOHOPK 199H; poster or oral presentation; and honors thesis. Only research units from BIOSCI or BIOHOPK are permitted.

MOLECULAR AND CELL BIOLOGY

Core Courses (must be taken for a letter grade):

Subject and Catalog Number	*Units*
BIOSCI 41	5
BIOSCI 42	5
BIOSCI or BIOHOPK 43	5

Writing in the Major (one of the following):

BIOSCI 44X	4
BIOSCI *or* BIOHOPK 44Y	4
BIOSCI 145*	4
BIOHOPK175H*	10
BIOHOPK 176H*	12

* These courses can also be used to count toward the elective requirement.

Required Foundational Breadth Courses (two courses may be taken credit/no credit):

CHEM 31A,B *or* 31X	8 or 4
CHEM 33, 35, 36, 130, 131	18
CHEM 135 or 171	3
PHYSICS 21, 22, 23, 24 *or* 41, 43, 45	8 or 12
MATH 41, 42 *or* 19, 20, 21	10
STATS 60 or BIOSCI 141*	5 or 4-5

* This course cannot also be used to count toward the elective requirement.

Required Biology Courses (must be taken for a letter grade):

BIOSCI 104	3
BIOSCI 118	5
BIOSCI 129A	4
BIOSCI 129B	4

Electives—15 units required. Electives must be 100-level or above and selected from the offerings in the Department of Biological Sciences, Hopkins Marine Station, or from the list of approved out-of-department electives. Up to 6 units of teaching and research are allowed. Only one course can be taken credit/no credit.

Research Requirement—Admission to the departmental honors program; 10 units of BIOSCI 199, 199X, or BIOHOPK 199H; poster or oral presentation; and honors thesis. Only research units from BIOSCI or BIOHOPK are permitted.

NEUROBIOLOGY

Core Courses (must be taken for a letter grade):

Subject and Catalog Number	*Units*
BIOSCI 41	5
BIOSCI 42	5
BIOSCI or BIOHOPK 43	5

Writing in the Major (one of the following):

BIOSCI 44X	4
BIOSCI or BIOHOPK 44Y	4
BIOSCI 145*	4
BIOHOPK175H*	10
BIOHOPK 176H*	12

* These courses can also be used to count toward the elective requirement.

Required Foundational Breadth Courses (two courses may be taken credit/no credit):

CHEM 31A,B or 31X	8 or 4
CHEM 33, 35, 36, 130, 131	18
PHYSICS 21, 22, 23, 24 or 41, 43, 45	8 or 12
MATH 41, 42 or 19, 20, 21	10
STATS 60 or BIOSCI 141*	5 or 4-5

* This course cannot also be used to count toward the elective requirement.

Required Biology Courses (must be taken for a letter grade):

BIOSCI 118 or 104	5 or 3
BIOSCI 129A or 129B	4
BIOSCI 150 or 163	5 or 4
BIOSCI 154	4
BIOSCI 158	4

Electives—15 units required. Electives must be at the 100-level or above and selected from the offerings in the Department of Biological Sciences, Hopkins Marine Station, or from the list of approved out-of-department electives. Up to 6 units of teaching and/or research are allowed. Only one course can be taken credit/no credit.

Research Requirement—Admission to the departmental honors program; 10 units of BIOSCI 199, 199X, or BIOHOPK 199H; poster or oral presentation; and honors thesis. Only research units from BIOSCI or BIOHOPK are permitted.

For further information on the fields of study (specialization tracks), including detailed descriptions of their requirements and deadlines, see http://biology.stanford.edu/programs.html.

HONORS PROGRAM

To graduate with departmental honors, a student must:

1. Submit an honors petition proposal to the department's undergraduate research coordinator by the fifth Friday of the quarter, two quarters prior to graduation. For instance, students graduating Spring Quarter must submit petitions no later than mid-Autumn Quarter.
2. Complete at least 10 units of an approved research project in BIOSCI 199, 199X, or BIOHOPK 199H. Only research units from BIOSCI or BIOHOPK are permitted.
3. Obtain at least a 3.0 (B) grade point average (GPA) in all Biological Sciences major requirements taken at Stanford (foundational breadth, core, and elective courses). Grades earned from teaching (BIOSCI or BIOHOPK 290 and BIOSCI 291) and research (BIOHOPK 175H, 176H, 199H; BIOSCI 199, 199X) are not computed into this GPA.

4. If graduating in June, participate in the Biological Sciences Honors Symposium by presenting a poster or giving an oral presentation. The symposium is usually at the end of May. If graduating Autumn, Winter, or Summer Quarter, produce a poster.
5. Complete and submit, by the end of the quarter of graduation, two signed and bound copies of an honors thesis approved by at least two readers (one of whom must be from the faculty of the Department of Biological Sciences and both must be Academic Council members). In addition, students must submit two copies of the honors thesis abstract (one paper copy and one electronic copy), which include student name, thesis title, research sponsor, and sponsor's department.

Further information on the honors program is available in the office of the undergraduate research coordinator in Gilbert 118, as well as on the web at http://biohonors.stanford.edu. Questions should be directed to the undergraduate research coordinator, Dr. Timothy Meier (gastrula@stanford.edu, 650-723-3767, Gilbert 118).

TRANSFER STUDENTS

Because of differences between Stanford undergraduate courses and prerequisites and those of many other institutions, transfer students may face problems not encountered by entering freshmen. Transfer students are urged to visit the student services office in Gilbert 108 during transfer orientation to obtain information on course credit evaluations. Course catalogs, syllabi, and/or lecture notes from the former institution are necessary in the evaluation and accreditation process. Transfer students are encouraged to find a faculty adviser soon after arrival.

All transfer courses intended to fulfill department requirements must be evaluated on Evaluation of Course Content forms available in the student services office or downloadable at http://biology.stanford.edu/student_resources/eval_course_content.pdf; these forms are kept in the student's file. This department procedure is in addition to the Registrar's process of having units earned at other institutions transferred for Stanford credit that appear on the Stanford transcript.

The department authorizes transfer credit only for courses whose content parallels the Stanford courses and that have comparable prerequisites (not merely a comparable course title). To substitute a course taken elsewhere for an upper-division Stanford course, course content must be approved by a department faculty member teaching in the area of the course. Submit as complete a course description as practical (including prerequisites and their descriptions) using the Evaluation of Course Content form available in the student services office before taking an off-campus course. Students must provide exams, reading lists, term papers, and other materials for the evaluation. Credit is not allowed for projects for which the student was paid, nor is credit allowed for work of a purely technical or clinical nature. Credit for natural history, culture biology, and similar courses is rarely appropriate and can be obtained only by meeting the same criteria outlined above. Academic performance is verified upon receipt of the official transcript. Semester units are not converted to quarter units; units awarded for transfer credit are determined by faculty evaluation.

MINOR

Students interested in the minor in Biological Sciences must declare the minor and submit their course plan online via Axess no later than two quarters prior to the student's intended quarter of degree conferral. The Biological Sciences minor requires a minimum of six courses meeting the following criteria:

1. all courses must be taken for a letter grade.
2. all courses must be worth 3 or more units.
3. all courses, other than the Biological Sciences Core (41, 42, 43), must be at or above the 100-level. Stanford Introductory Seminars may not be used to fulfill this requirement.
4. Courses used to fulfill the minor may not be used to fulfill any other department degree requirements (minor or major).
5. At least one course from the Biological Sciences Core (41, 42 or 43) must be taken.
6. The Biological Sciences Core Laboratory (44X and 44Y) does not count towards the minor degree.
7. Courses must be selected from the offerings of the Department of Biological Sciences or the Hopkins Marine Station, or from the list of approved out-of-department electives (available in the student services office or downloadable at http://biology.stanford.edu/student_resources/out_of_dept_electives.pdf).
8. Elective credit for research (BIOSCI 199 or BIOHOPK 199H) is limited to a maximum of 3 units.

REQUIREMENTS FOR PREHEALTH PROFESSIONS

Students who are not biology majors should take at least the following courses in Biological Sciences: 41, 42, 43, 44X, 44Y, and such upper-division electives as may be recommended by Undergraduate Advising and Research, Sweet Hall.

COTERMINAL B.S. AND M.S. DEGREES

The Department of Biological Sciences admits a limited number of undergraduates to the coterminal B.S. and M.S. degree program in Biological Sciences. Students may apply to the program after they have earned a minimum of 120 units toward graduation (UTG) and at least one quarter prior to conferring the undergraduate degree; for example, if a student expects to have the B.S. conferred in Spring Quarter, the student must apply no later than during Winter Quarter. The application includes a statement of purpose, an unofficial Stanford transcript, official GRE score print-out, two letters of recommendation from faculty members in this department (if two such letters are not available, a letter from someone outside the department can be used in lieu of one of those), a program proposal listing the courses in which they intend to enroll to fulfill degree requirements, a course transfer form, and an application fee of $50. Students must meet all requirements except the electives for the B.S. degree, and all requirements for the M.S. degree in Biological Sciences. Unit requirements for a coterminal program are 180 units for the bachelor's degree and 45 units for the master's degree.

Coterminal students are permitted to use course work taken up to two quarters immediately prior to their first graduate quarter toward their graduate degree.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

MASTER OF SCIENCE

For information on the University's basic requirements for the M.S. degree, see the "Graduate Degrees" section of this bulletin.

The M.S. degree program offers general or specialized study to individuals seeking biologically oriented course work, and to undergraduate science majors wishing to increase or update their science background or obtain advanced research experience. Students who have majored in related fields are eligible to apply. However, course work equivalent to the Stanford B.S. in Biological Sciences is recommended. The M.S. program does not have an M.S. with thesis option.

ADMISSIONS

Students submit an application for admission to the M.S. program, three letters of recommendation, official transcripts, official Graduate Record Examination (GRE) scores, and TOEFL scores, if applicable. The application is available at http://gradadmissions.stanford.edu. Applicants should plan on taking the GRE at least six weeks prior to the application deadline to ensure that official scores are available when applications are evaluated. Applications are accepted for matriculation to Autumn Quarter only. Financial support for students in this program is not available from either the department or the University.

GENERAL REQUIREMENTS

The M.S. program consists of Department of Biological Sciences and/or Hopkins Marine Station course work, approved out-of-department electives, and foundational breadth courses totaling at least 45 units at or above the 100-level, distributed as follows:

1. A minimum of 23 of the 45 units must be courses designated primarily for graduate students (typically at the 200-level or higher).
2. A minimum of 36 units must be chosen from the offerings in the Department of Biological Sciences (BIOSCI), Hopkins Marine Station (BIOHOPK), the list of approved out-of-department electives, foundational breadth courses, and/or research and teaching.
   a) a maximum of 18 of the 36 units may be a combination of Biological Sciences research, directed reading, and/or teaching (BIOHOPK 175H, 176H, 198H, 290H, 300H; BIOSCI 198, 198X, 290, 290X, 291, 300, or 300X).
   b) a maximum of 9 units may be foundational breadth courses in chemistry, mathematics, statistics, computer science, and/or physics beyond the level required for the undergraduate degree in Biological Sciences and at least at the 100-level.
3. The remaining 9 units may be other Stanford course work relevant to a student's professional development. Students are required to petition for courses that fall into this category using the General Petition form, available in the student services office or downloadable at http://biology.stanford.edu/student_resources/general_petition.pdf.

Each candidate designs a coherent program of study in consultation with her or his department adviser. Although there are no specific courses required, program proposals must adhere to department parameters.

A program proposal, signed by the student's adviser and approved by the chair of the M.S. committee, must be filed by the third week of the first quarter of enrollment. Students may take only 6 units CR/NC and must receive a grade of 'B-' or better in all courses taken for the degree.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, consult the "School of Education" section of this bulletin or address an inquiry to the Credential Administrator, School of Education.

DOCTOR OF PHILOSOPHY

For information on the University's basic requirements for the Ph.D. degree, see the "Graduate Degrees" section of this bulletin. Training for a Ph.D. in Biological Sciences is focused on learning skills required for being a successful research scientist and teacher, including how to ask important questions and then devise and carry out experiments to answer these questions. Students work closely with an established adviser and meet regularly with a committee of other faculty members to ensure that they understand the importance of diverse perspectives on experimental questions and approaches. Students learn how to evaluate critically pertinent original literature to stay abreast of scientific progress in their areas of interest. They also learn how to make professional presentations, write manuscripts for publication, and become effective teachers.

ADMISSIONS

Preparation for Graduate Study—Students seeking entrance to graduate study in Biological Sciences ordinarily should have the equivalent of an undergraduate major in Biological Sciences at Stanford. However, students from other disciplines, particularly the physical sciences, are also encouraged to apply. Such students are advised at the time of initial registration on how they should complete background training during the first year of graduate study. In addition to the usual basic undergraduate courses in biology, it is recommended that preparation for graduate work include courses in chemistry through organic chemistry, general physics, and mathematics through calculus.

Application, Admission, and Financial Aid—Prospective graduate students should apply online at http://gradadmissions.stanford.edu. The department's program is divided into three separate tracks: ecology/evolution/population biology; integrative/organismal; and molecular/cellular/developmental/genetic/plant. Included in these tracks is the option to conduct research at Hopkins Marine Station. These concentrations are reported to the department; they are not declared on Axess.

Applicants are required to take the Graduate Record Examination (GRE) general test. The GRE subject test is not required. Applicants should plan on taking the GRE at least one month prior to the application deadline to ensure that official scores are available when applications are evaluated.

Admission to the Ph.D. program is competitive, and in recent years it has been possible to offer admission to only 10 percent of the applicants.

Qualified applicants should apply for nationally competitive predoctoral fellowships, especially those from the National Science Foundation.

Admitted students are typically offered financial support in the form of Stanford Graduate Fellowships, research assistantships, NIH traineeships, or Biological Sciences fellowships.

GENERAL REQUIREMENTS

The following requirements must be completed by all students:

1. Course work is planned in consultation with an advising committee assigned for a student's track. In addition, students must take a course on the ethical conduct of research: BIOSCI 312 for the ecology/evolution/population biology track; MED 255 for the integrative/organismal and molecular/cellular/developmental/genetic/plant tracks.
2. Teaching experience and training are part of the graduate curriculum. Each student assists in teaching one course in the department's core lecture (41, 42, or 43) or lab (44X, 44Y) series, and a second course that can be either a core course or other Biological Sciences or Hopkins Marine Station course. Three quarters of teaching are required for ecology, evolution, and population biology students.
3. Graduate seminars devoted to current literature and research in particular fields of biology are an important means of attaining professional perspective and competence. Seminars are presented under individual course listings or are announced by the various research groups. Topics of current biological interest are presented by speakers from Stanford and other institutions. During the first year of study, graduate students are required to attend seminars and make one formal seminar presentation which must be evaluated by a minimum of two faculty members.
4. By June 1, each first-year student is expected to have selected a lab in which to perform dissertation research and to have been accepted by the faculty member in charge. Students and faculty must wait until April 1 to discuss the choice of a dissertation lab.
5. During second year, students are required to write a dissertation proposal which is evaluated by a committee of three faculty (the dissertation advising committee) in an oral presentation. Advancement to candidacy depends on satisfactory completion of the dissertation proposal.
6. Third year and beyond: each student must meet with the advising committee beginning the third year, and each year thereafter prior to the end of the Spring Quarter. Advanced students are required to meet with their committee at least twice a year.
7. Residency requirement: a minimum of 135 units of graduate registration is required of each candidate.
8. The doctoral dissertation must be presented to an oral examination committee comprised of at least five faculty members. In addition, the final dissertation must be approved by the student's reading committee, comprised of at least three faculty members and by a graduate degree progress officer in the Registrar's Office. Upon completion of this final requirement, a student is eligible for conferral of the degree.

TRACK SPECIFIC REQUIREMENTS

In addition to the general requirements listed above, students must also complete requirements within their track.

Molecular, Cellular, Developmental, Genetic, and Plant Track—

1. *First year:*
   a) *advising committee:* shortly after arrival, each entering student meets with the first-year advising committee. The committee reviews the student's previous academic work and current goals and advises the student on a program of Stanford courses, some of which may be required and others recommended. Completion of the core curriculum (below) is required of all students.
   b) *core curriculum:** students are required to take the following courses for a letter grade, unless previous course work has fulfilled these requirements:
      BIOSCI 203. Advanced Genetics
      BIOSCI 214. Cell Biology of Physiological Process
      BIOSCI 301. Frontiers in Biology: satisfies first-year talk requirement; must be taken Autumn and Winter quarters.

One of the following:
- BIOC/SBIO 241. Biological Macromolecules
- MCP 256. Molecular Physiology of Cells
- MPHA 210. Signal Transduction

Three additional courses in the student's area of interest, or as advised by committee.

c) *Lab rotations:** first-year students are required to complete rotations in three different laboratories. The first rotation must be in a lab in the Department of Biological Sciences.

2. *Second year:* each student must pass a qualifying exam.
   a) *dissertation proposal:* during Winter and Spring quarters of the second year, the student must prepare a dissertation proposal that outlines the student's projected dissertation research, including an expert assessment of the current literature. An oral examination is held after submission of the proposal to the dissertation advising committee. The student's adviser is a silent member of the examination committee; the other members of the dissertation advising committee can provide feedback. Advancement to candidacy is contingent upon completion of the dissertation proposal and oral exam. The written proposal is due by March 31 and the oral defense must take place no later than May 1. Failure to complete these requirements on schedule results in the withholding of the graduate stipend.
3. *Third year and beyond:*
   a) *dissertation and dissertation defense:* a completed draft of the dissertation must be turned in to the student's oral examination committee at least one month before the oral exam is scheduled to take place. See University guidelines for the composition of this committee in the "Graduate Degrees" section of this bulletin.

Integrative/Organismal Track—

1. *First year:*
   a) *advising committee:* shortly after arrival, each entering student meets with the first-year advising committee. The committee reviews the student's previous academic work and current goals and advises the student on a program of Stanford courses, some of which may be required and others recommended.
   b) *core curriculum*: Students are required to take BIOSCI 306, Current Topics in Integrative and Organismal Biology. Students specializing in integrative biology may also be asked to take appropriate graduate-level courses such as DBIO 210; MCP 215; NBIO 206, 216; or PSYCH 228.
   c) *first-year paper:* students must submit a paper that is evaluated by the advising committee before the end of Spring Quarter of the first year. This paper should be a step toward the development of a dissertation proposal and may consist of an analysis of new data or a literature review and synthesis. The first-year paper must be evaluated by a minimum of two faculty members.
2. *Second year:*
   a) *dissertation proposal:* the dissertation proposal is evaluated by a committee of three faculty (the dissertation advising committee) in an oral presentation. This is to be completed by the end of Spring Quarter of the second year. Advancement to candidacy depends on completion of the dissertation proposal and oral exam.
3. *Third year and beyond:*
   a) *dissertation and dissertation defense:* a completed draft of the dissertation must be turned in to the student's oral examination committee at least one month before the oral exam is scheduled to take place. See University guidelines for the composition of this committee in the "Graduate Degrees" section of this bulletin.

Ecology, Evolution, and Population Biology Track—

1. *First year:*
   a) *advising committee:* each entering student is assigned a first-year advising committee whose function is to develop a schedule of required and recommended courses and to meet once each quarter with the student during the first year.
   b) *core curriculum:* Students are required to take BIOSCI 302, 303, 304, Current Topics and Concepts in Population Biology, Ecology, and Evolution.
   c) *first-year paper:* each student must submit a paper that is evaluated by the advising committee before the end of Spring Quarter of the first year. This paper should be a step toward the development of a dissertation proposal and may consist of an analysis of new data or a literature review and synthesis. The first-year paper must be evaluated by a minimum of two faculty members.
2. *Second year:*
   a) *dissertation proposal:* the dissertation proposal is evaluated by a committee of three faculty (the dissertation advising committee) in an oral presentation. This is to be completed by the end of Spring Quarter of the second year. Advancement to candidacy depends on completion of the dissertation proposal and oral exam.
3. *Third year and beyond:*
   a) *dissertation and dissertation defense:* a completed draft of the dissertation must be turned in to the student's oral examination committee at least one month before the oral exam is scheduled to take place. See University guidelines for the composition of this committee in the "Graduate Degrees" section of this bulletin.

COURSES

Course and laboratory instruction in the Department of Biological Sciences conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

INTRODUCTORY

BIOSCI 1. Human Evolution and Environment—Human genetic and cultural evolution and how people interact with their environments, from the ancestors of Australopithecus to current events. Issues include race, gender, and intelligence; pesticide and antibiotic resistance; abortion and contraception; ecosystem services; environmental economics and ethics; the evolution of religion; climate change; population growth and overconsumption; origins and spread of ideas and technologies; and the distribution of political and economic power. GER:DB-NatSci

3 units, not given this year (Ehrlich, P)

BIOSCI 2. Current Research Topics in Biological Sciences—Primarily for sophomores interested in majoring in Biological Sciences. Weekly seminars by faculty: molecular biology and genetics; theory and mathematics in biology; ecology, physiology, and the environment; molecular and cellular aspects of neurobiology, immunology, and developmental biology; biological chemistry; behavioral biology; and evolution. May be repeated for credit.

1 unit, Aut, Win (Meier, T)

BIOSCI 3. Frontiers in Marine Biology—An introduction to contemporary research in marine biology, including ecology, conservation biology, environmental toxicology, behavior, biomechanics, evolution, neurobiology, and molecular biology. Emphasis is on new discoveries and the technologies used to make them. Weekly lectures by faculty from the Hopkins Marine Station.

1 unit, Aut (Somero, G)

BIOSCI 8. Frontiers in Organismal Biology—Preference to freshmen and sophomores. How animals work. Research frontiers in organismal biology including integrative physiology, biomechanics, neurobiology, and environmental physiology and ecology.

1 unit, not given this year (Block, B)

BIOSCI 20. Introduction to Brain and Behavior—(Same as HUMBIO 21.) Evolutionary principles to understand how the brain regulates behavior, described in physiological terms, and is influenced by behavioral interactions. Topics include neuron structure and function, transmission of neural information, anatomy and physiology of sensory and motor systems, regulation of body states, the biological basis of learning and memory, and behavioral abnormalities. GER:DB-NatSci

3 units, alternate years, not given this year (Fernald, R)

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* Written petitions for exemptions to core curriculum and lab rotation requirements are considered by the advising committee and the chair of the graduate studies committee. Approval is contingent upon special circumstances and is not routinely granted.

BIOSCI 96A,B. Jasper Ridge Docent Training—Two quarter preparation for Stanford and community students to join the Jasper Ridge education program. Multidisciplinary environmental education; hands-on field research. Field ecology and the natural history of plants and animals, archaeology, geology, hydrology, land management, and research projects of the preserve presented by faculty, local experts, and staff. Participants lead research-focused educational tours, assist with classes, and attend continuing education classes available to members of the JRBP community after the course.

2 units, **A:** *Win,* **B:** *Spr (Wilber, C; Vitousek, P)*

STANFORD INTRODUCTORY SEMINARS

BIOSCI 6N. Climate Change: Drivers, Impacts, and Solutions—Stanford Introductory Seminar. Preference to freshmen. The scientific understanding of climate change, and the evidence, driving forces, and options for managing its impacts. GER:DB-NatSci

3 units, Win (Field, C)

BIOSCI 14N. Plants and Civilization—Stanford Introductory Seminar. Preference to freshmen. The role of plants in the development of civilization. Topics: the use of forests, woodlands, and grazing lands; centers of origins and spread of crops; viticulture, and wine and beer making; the spice route and the age of exploration; the use of plants as medicine; the global spread of weeds; engineering plants for the future; the importance of tea, coffee, chocolate, sugar, potatoes, natural dyes, and rubber in societal affairs and change. GER:DB-NatSci

3 units, Win (Mooney, H)

BIOSCI 16N. Island Ecology—Stanford Introductory Seminar. Preference to freshmen. How ecologists think about the world. Focus is on the Hawaiian Islands: origin, geology, climate, evolution and ecology of flora and fauna, and ecosystems. The reasons for the concentration of threatened and endangered species in Hawaii, the scientific basis for their protection and recovery. How knowledge of island ecosystems can contribute to ecology and conservation biology on continents. GER:DB-NatSci

3 units, Spr (Vitousek, P)

BIOSCI 21N. Evolutionary Basis of Animal Sexual Behaviors—Stanford Introductory Seminar. Preference to freshmen. The genetic and evolutionary basis for innate sexual behavioral patterns in animals. Readings from primary scientific literature, and Olivia Judson's *Dr. Tatiana's Sex Advice for All Creation*. GER:DB-NatSci

3 units, Spr (Baker, B)

BIOSCI 24N. From Bread to Genomics: Using Yeast to Study Biology—Stanford Introductory Seminar. Preference to freshmen. The single-celled organism, Saccharomyces cerevisiae or baker's yeast, as a tool in experiments including winemaking, evolution, and cancer. Yeast biology; how yeast genetics is used to examine the properties of cells. Modern genomic techniques in yeast research such as DNA microarrays, high-throughput genetic analysis, protein-interaction studies, and proteomic analyses. Readings from primary scientific literature. Final paper. GER:DB-NatSci

3 units, Aut (Cyert, M)

BIOSCI 25Q. The Molecular Basis of Genetic Disease—Stanford Introductory Seminar. Preference to sophomores. Focus is on two genetic diseases resulting from the production of protein molecules that are unable to fold into their native conformations, called conformational diseases: cystic fibrosis and amyotrophic lateral sclerosis or Lou Gehrig's disease. Hypotheses and controversies surrounding the molecular basis of these disorders, and implications for novel therapeutics. Readings from research literature. GER:DB-NatSci

3 units, Spr (Kopito, R)

BIOSCI 26N. Maintenance of the Genome—Stanford Introductory Seminar. Preference to freshmen. Focus is on DNA repair systems which scan the genome to ensure genomic stability in the face of natural endogenous threats to DNA and those due to radiation and chemicals in the external environment. Redundancy of the genetic message ensured by complementary DNA strands facilitates recovery of information when one of the strands is altered. Predisposition to cancer often implicates a defective DNA repair gene. Relevance for oncology, aging, developmental biology, environmental health, and neurobiology. GER:DB-NatSci

3 units, Spr (Hanawalt, P)

BIOSCI 28N. Molecular Basis of Cancer—Stanford Introductory Seminar. Preference to freshmen. Current knowledge on the molecular basis of cancer. Topics: cell cycle regulation, oncogenes, tumor suppressor genes, telomere biology, angiogenesis, and apoptosis. Current cancer biology literature. GER:DB-NatSci

3 units, Spr (Fang, G)

BIOSCI 31Q. Ants: Behavior, Ecology, and Evolution—Stanford Introductory Seminar. Preference to sophomores. Behavior: the organization of colonies, how they operate without central control, how they resemble other complex systems like brains. Ecology: how populations of colonies change, comparing the ecology of a species in SW American desert and invasive Argentine ants. Evolution: why are there so many species of ants; how are they alike, how do they differ, and why? Ants as the theme for exploring how to do research in animal behavior, ecology, and evolution. Research project will be on the invasive Argentine ant: its distribution on campus, foraging trails, and nest structure.

3 units, Spr (Gordon, D)

BIOSCI 33N. Conservation Science and Practice—Stanford Introductory Seminar. Preference to freshmen. Interdisciplinary. The science and art of conservation today. The power of the human race to change ecological and evolutionary playing fields of macroscopic species. Which elements of ecosystems, including their plants, animals, and microorganisms, most merit protection; what is the scientific basis for deciding? The prospects for aligning economic forces with conservation. Field trip; project. GER:DB-NatSci

3 units, Spr (Daily, G)

BIOSCI 34N. Hunger—Stanford Introductory Seminar. Preference to freshmen. The biology of hunger and satiety, disease states that disrupt normal responses to hunger and satiety, starvation responses and adaptations to starvation in a variety of organisms, food production and distribution mechanisms, historic famines and their causes, the challenges of providing adequate food and energy for the Earth's growing population, local and global efforts to alleviate hunger, and hunger in fiction.

3 units, Aut (Barton, K)

BIOSCI 36N. Physiology of Human Performance—Stanford Introductory Seminar. Preference to freshmen. Laboratory-oriented. Students conduct studies on each other, and possibly on volunteers, involving physical activity and measurement of physiological variables before, during, and after physical activity. Focus is on the physiological systems underlying the capacity for physical activity and on the limits to increasing strength, power output, and endurance. Strenuous physical activity required.

3 units, Aut (Heller, C; Grahn, D; Sims, S)

BIOSCI 106Q. The Heart of the Matter—(Same as GENE 106Q.) Stanford Introductory Seminar. Preference to sophomores. The molecular and biochemical basis of life. Emphasis is on the methods and scientific logic that lead to advances in knowledge. The human heart and circulatory system is the unifying theme for topics such as the constituents and activities of cells, tissues, and organs; the chemicals and proteins that carry on life processes; the biotechnology revolution; the role of genes in human disease and normal functions; and the Human Genome Project. How scientific knowledge is built up through research; how biology initiates advances in medicine; and how science, engineering, and economics interact in biotechnology. Student presentations, demonstrations, and field trips.

3 units, Win (Myers, R; Simoni, R)

CORE

BIOSCI 41, 42, 43. Principles of Biology—The principles of modern biological sciences, taken in sequence, preferably in the sophomore year. Biological Sciences majors must take for a letter grade. Prerequisites: CHEM 31X (or 31A and B), 33, 35; MATH 19, 20, 21, or 41, 42.

BIOSCI 41. Genetics, Biochemistry, and Molecular Biology—Emphasis is on macromolecules (proteins, lipids, carbohydrates, and nucleic acids) and how their structure relates to function and higher order assembly; molecular biology, genome structure and dynamics, gene expression from transcription to translation. GER:DB-NatSci

5 units, Aut (Simoni, R; Bergmann, D)

BIOSCI 42. Cell Biology and Animal Physiology—Cell structure and function; principles of animal physiology (immunology, renal, cardiovascular, sensory, motor physiology, and endocrinology); neurobiology from cellular and developmental to neural regulation of physiology. GER:DB-NatSci

5 units, Win (Sapolsky, R; Jones, P; Cyert, M; Heller, C; Luo, L)

BIOSCI 43. Plant Biology, Evolution, and Ecology—Principles of evolution: macro- and microevolution and population genetics. Ecology: the principles underlying the exchanges of mass and energy between organisms and their environments; population, community, and ecosystem ecology; populations, evolution, and global change. Equivalent to BIOHOPK 43. GER:DB-NatSci

5 units, Spr (Gordon, D; Petrov, D; Mudgett, M)

BIOSCI 44X,Y. Core Experimental Laboratory—Two quarters of lab projects provide a working familiarity with the concepts, organisms, and techniques of modern biological research. Emphasis is on experimental design, analysis of data, and written and oral presentation of the experiments. Lab fee. Prerequisites: CHEM 31X, or 31A,B, and 33. Recommended: Biological Sciences or Human Biology core, and statistics; 44X,Y should be taken sequentially in same year. 44Y equivalent to BIOHOPK 44Y. WIM

4 units, **X:** *Win,* **Y:** *Spr (Malladi, S)*

HOPKINS MARINE STATION

For full descriptions of courses offered at the Hopkins Marine Station, see the "Hopkins Marine Station" section of this bulletin which follows immediately after this section. The following Hopkins Marine Station courses may be used toward the Biological Sciences degree requirements:

Core—

BIOHOPK 43. Plant Biology, Evolution, and Ecology (equivalent to BIOSCI 43)
BIOHOPK 44Y. Core Experimental Laboratory, equivalent to BIOSCI 44Y
BIOHOPK 175H. Problems in Marine Ecology and Ecophysiology (can be used in place of BIOSCI 44Y)*
BIOHOPK 176H. Experimental Neurobiology (can be used in place of BIOSCI 44Y)*

*4 units count toward the BIOSCI 44Y requirement, with the remaining units counting as research/teaching under the upper-division elective requirement

Electives—

BIOHOPK 161H. Invertebrate Zoology (central menu area 3)
BIOHOPK 162H. Comparative Animal Physiology (central menu area 3)
BIOHOPK 163H. Oceanic Biology (central menu area 4)
BIOHOPK 164H. Marine Botany
BIOHOPK 166H. Molecular Biology
BIOHOPK 167H. Nerve, Muscle, and Synapse (central menu area 3)
BIOHOPK 169H. Neurobiology and Behavior (central menu area 3)
BIOHOPK 170H. Topics in Marine Biology
BIOHOPK 171H. Ecological and Evolutionary Physiology (central menu area 3)
BIOHOPK 172H. Marine Ecology (central menu area 4)
BIOHOPK 173H. Marine Conservation Biology
BIOHOPK 174H. Experimental Design and Probability
BIOHOPK 178H. Polar Biology
BIOHOPK 179H. Subtidal Communities
BIOHOPK 182H. Stanford at Sea (6 units maximum)
BIOHOPK 180H. Problems in Subtidal Ecology
BIOHOPK 183H. Environmental Cell & Developmental Biology (central menu area 2)
BIOHOPK 184H. Holistic Biology: Monterey Bay and the Sea of Cortez (6 units maximum)
BIOHOPK 186H. Ocean Pollution: Land, Air and Sea Interactions
BIOHOPK 274. Hopkins Microbiology Course (6 units maximum)
BIOHOPK 277H. Biomechanics, Ecological Physiology, and Genetics of Intertidal Communities

Research and/or Teaching (maximum 6 units combined)—

BIOHOPK 175H. Problems in Marine Ecology and Ecophysiology
BIOHOPK 176H. Experimental Neurobiology
BIOHOPK 198H. Directed Instruction or Teaching
BIOHOPK 199H. Undergraduate Research
BIOHOPK 290H. Teaching of Biological Science
BIOHOPK 300H. Research

See Biological Science degree requirements above for further information. Many of the Hopkins Marine Station courses may be used to fulfill department major requirements.

INTERMEDIATE UNDERGRADUATE AND GRADUATE

BIOSCI 101. Ecology—The principles of ecology. Topics: interactions of organisms with their environment, dynamics of populations, species interactions, structure and dynamics of ecological communities, biodiversity. Prerequisites: 43, or consent of instructor. Recommended: statistics. GER:DB-NatSci

3 units, Aut (Vitousek, P; Dirzo, R)

BIOSCI 102. Demography: Health, Development, Environment—(Same as HUMBIO 119.) Demographic methods and their application to understanding and projecting changes in human infant, child, and adult mortality and health, fertility, population, sex ratios, and demographic transitions. Progress in human development, capabilities, and freedoms. Relationships between population and environment. Prerequisites: numeracy and basic statistics; Biological Sciences or Human Biology core; or consent of instructor. GER:DB-SocSci

3 units, not given this year (Tuljapurkar, S)

BIOSCI 104/200. Advanced Molecular Biology—Molecular mechanisms that govern the replication, recombination, and expression of eukaryotic genomes. Topics: DNA replication, DNA recombination, gene transcription, RNA splicing, regulation of gene expression, protein synthesis, and protein folding. Prerequisite: Biological Sciences core. GER:DB-NatSci

5 units, Win (Fang, G; Frydman, J)

BIOSCI 106. Human Origins—(Same as ANTHSCI 6/206, HUMBIO 6.) The human fossil record from the first non-human primates in the late Cretaceous or early Paleocene, 80-65 million years ago, to the anatomically modern people in the late Pleistocene, between 100,000 to 50,000 B.C.E. Emphasis is on broad evolutionary trends and the natural selective forces behind them. GER:DB-NatSci

5 units, Win (Klein, R)

BIOSCI 109A/209A. The Human Genome and Disease—(Same as HUMBIO 158.) The variability of the human genome and the role of genomic information in research, drug discovery, and human health. Concepts and interpretations of genomic markers in medical research and real life applications. Human genomes in diverse populations. Original contributions from thought leaders in academia and industry and interaction between students and guest lecturers. GER:DB-NatSci

3 units, Win (Heller, R)

BIOSCI 109B/209B. The Human Genome and Disease: Genetic Diversity and Personalized Medicine—Continuation of 109A/209A. Genetic drift: the path of human predecessors out of Africa to Europe and then either through Asia to Australia or through northern Russia to Alaska down to the W. Coast of the Americas. Support for this idea through the histocompatibility genes and genetic sequences that predispose people to diseases. Guest lectures from academia and pharmaceutical companies. Prerequisite: Biological Sciences or Human Biology core. GER:DB-NatSci

3 units, Spr (Heller, R)

BIOSCI 112/212. Human Physiology—(Same as HUMBIO 133.) The functioning of organ systems emphasizing mechanisms of control and regulation. Topics: structure and function of endocrine and central nervous systems, cardiovascular physiology, respiration, salt and water balance, exercise, and gastrointestinal physiology. Prerequisite: Biological Sciences or Human Biology core. GER:DB-NatSci

4 units, Win (Garza, D)

BIOSCI 113/244. Fundamentals of Molecular Evolution—The inference of key molecular evolutionary processes from DNA and protein sequences. Topics include random genetic drift, coalescent models, effects and tests of natural selection, combined effects of linkage and natural selection, codon bias and genome evolution. Prerequisites: Biological Sciences core or graduate standing in any department, and consent of instructor. GER:DB-NatSci

4 units, Spr (Petrov, D)

BIOSCI 114. Field Course on Tropical Biogeochemistry: Amazon as Case Study—(Same as EARTHSYS 114.) Post-field seminar for students who went on the two-week field trip to the Amazon in September with Brazilian students under Professor Martinelli of the University of São Paulo and Stanford Latin American Studies. Land use changes over the last 30 years including the conversion of natural forest for cattle ranching and soy beans in the Amazon, the largest continuous area of tropical forests on Earth with the greatest number of plant and animal species. In English.

3 units, Aut (Vitousek, P)

BIOSCI 115. Signal Transduction and Development—The molecular basis of cell-cell communication during development. The cell biology and biochemistry of signaling by hormones and growth factors; focus is on the set of evolutionarily conserved signaling pathways that underlie crucial developmental processes such as cell fate specification, cellular differentiation, tissue organization, and cellular polarization. Current research literature. Prerequisites: BIOSCI 41, 42. Recommended: BIOSCI 129A, 129B, or 160.

4 units, Spr (Simon, M; Bergmann, D)

BIOSCI 117. Biology and Global Change—(Same as EARTHSYS 111, GEOPHYS 117.) The biological causes and consequences of anthropogenic and natural changes in the atmosphere, oceans, and terrestrial and freshwater ecosystems. Topics: glacial cycles and marine circulation, greenhouse gases and climate change, tropical deforestation and species extinctions, and human population growth and resource use. Prerequisite: Biological Sciences or Human Biology core or graduate standing. GER:DB-NatSci

4 units, Win (Vitousek, P; Arrigo, K)

BIOSCI 118/218. Genetic Analysis of Biological Processes—Genetic principles and their experimental applications. Emphasis is on the identification and use of mutations to study cellular function. Prerequisite: Biological Sciences core. GER:DB-NatSci

5 units, Spr (Baker, B)

BIOSCI 121. Biogeography—Global distributions of organisms through the Phanerozoic, with emphasis on historical causes. Topics: plate tectonics, island biogeography, climatic change, dispersal, vicariance, ecology of invasions, extinction, gradients, diversity. GER:DB-NatSci

3 units, not given this year (Hadly, E)

BIOSCI 125. Ecosystems of California—The diversity and functioning of California ecosystems through time and how human beings have impacted and managed them. Prerequisite: 43, HUMBIO 2A, or EARTHSYS 10. GER:DB-NatSci

3 units, Spr (Mooney, H)

BIOSCI 129A. Cellular Dynamics I: Cell Motility and Adhesion—Cell motility emphasizing role of actin assembly and dynamics coupling actin organization to cell movement. Interaction of cells with extracellular matrix, and remodelling of extracellular matrix in development and disease. Directed cell migration by chemotaxis (neuronal path-finding, immune cells). Cell-cell adhesion, formation of intercellular junctions and mechanisms regulating cell-cell interactions in development and diseases. Emphasis is on experimental logic, methods, problem solving, and interpretation of results. Students present research papers. Prerequisite: Biological Sciences core. GER:DB-NatSci

4 units, Win (Nelson, W)

BIOSCI 129B. Cellular Dynamics II: Building a Cell—Principles of cell organization; how common biochemical pathways are modified to generate diversity in cell structure and function. Roles of actin and microtubule cytoskeletons in cellular architecture. Mechanisms of protein sorting and trafficking, and protein modules and switches in regulating cell polarity. Yeast to polarized epithelial cells and neurons. Emphasis is on experimental logic, methods, problem solving, and interpretation of results. Students present research papers. Prerequisite: Biological Sciences core. Recommended: 129A. GER:DB-NatSci

4 units, Spr (Nelson, W)

BIOSCI 130. Current Issues in Paleoanthropology—(Same as ANTHSCI 130C/230C.) Current issues in fossil, archaeological, and genetic evidence for human evolution. Topics chosen by participants. May be repeated for credit.

1 unit, Aut, Win, Spr (DeGusta, D; Klein, R)

BIOSCI 132/232. Advanced Imaging Lab in Biophysics—(Same as BIOPHYS 232, MCP 232.) Laboratory and lectures. Advanced microscopy and imaging, emphasizing hands-on experience with state-of-the-art techniques. Students construct and operate working apparatus. Topics include microscope optics, Koehler illumination, contrast-generating mechanisms (bright/dark field, fluorescence, phase contrast, differential interference contrast), and resolution limits. Laboratory topics vary by year, but include single-molecule fluorescence, fluorescence resonance energy transfer, confocal microscopy, two-photon microscopy, and optical trapping. Limited enrollment. Recommended: basic physics, Biological Sciences core or equivalent, and consent of instructor. GER:DB-NatSci

4 units, Spr (Block, S; Schnitzer, M; Smith, S; Stearns, T)

BIOSCI 133. Genetics of Prokaryotes—Genetic approaches for understanding cellular processes in bacteria, including metabolism, adaptive and stress responses, signal transduction, gene expression, genetic exchange and recombination, chromosome dynamics and evolution, cell division, motility, surface attachment, and developmental responses. Emphasis is on the power of effectively combining genetics with biochemistry, microscopy, and genomics. Prerequisite: Biological Sciences core. GER:DB-NatSci

4 units, alternate years, not given this year (Burkholder, W)

BIOSCI 134. Replication of DNA—Seminar. Modes of DNA replication and their control in prokaryotes and eukaryotes. Structures, properties, and functions of DNA polymerases and associated factors. Emphasis is on experimental approaches and their limitations. Current research literature. Students prepare journal club style report and lead class discussions. Enrollment limited to 20 advanced undergraduates. Prerequisite: Biological Sciences core. Recommended: 118. GER:DB-NatSci

3 units, not given this year (Burhkholder, W)

BIOSCI 135. Biological Clocks—(Same as HUMBIO 186.) The biological basis for endogenous timekeeping in organisms from flies to human beings. How biological clocks are constructed at the molecular, tissue, and behavioral levels; how these clocks interact with other physiological systems and allow animals to anticipate changes in their environment. Applications of circadian rhythm principles to treating human disorders and diseases such as cancer. Prerequisite: Biological Sciences or Human Biology core, or consent of instructor. GER:DB-NatSci

3 units, Spr (Heller, C; Ruby, N)

BIOSCI 136. Evolutionary Paleobiology—A paleontological approach to evolutionary theory. Topics: history of life, speciation, heterochrony, evolutionary constraint, coevolution, macroevolution, the Cambrian Explosion, mass extinctions, taphonomy, life on land, life in the sea, life in the air. GER:DB-NatSci
4 units, not given this year (Hadly, E)

BIOSCI 137/237. Plant Genetics—Gene analysis, mutagenesis, transposable elements; developmental genetics of flowering and embryo development; biochemical genetics of plant metabolism; scientific and societal lessons from transgenic plants. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci
3 units, Spr (Walbot, V), alternate years, not given next year

BIOSCI 139. Biology of Birds—How birds interact with their environments and each other, emphasizing studies that had impact in the fields of population biology, community ecology, and evolution. Local bird communities. Emphasis is on field research. Enrollment limited to 20. Prerequisites: 43 or equivalent, and consent of instructor. Recommended: birding experience. GER:DB-NatSci
3 units, Spr (Root, T)

BIOSCI 140. Population Biology of Butterflies—Field work on Euphydryas populations under study on campus and elsewhere in California. Course offered as participation in research when conditions permit; decisions not made until Winter Quarter. Prerequisites: 43 and consent of instructor.
2-5 units, not given this year (Ehrlich, P)

BIOSCI 141. Biostatistics—(Same as STATS 141.) Introductory statistical methods for biological data: describing data (numerical and graphical summaries); introduction to probability; and statistical inference (hypothesis tests and confidence intervals). Intermediate statistical methods: comparing groups (analysis of variance); analyzing associations (linear and logistic regression); and methods for categorical data (contingency tables and odds ratio). Course content integrated with statistical computing in R. See http://www-stat.stanford.edu/~rag/stat141/. GER:DB-Math
4-5 units, Aut (Rogosa, D)

BIOSCI 142/242. Topics in Theoretical Ecology—Issues include foraging theory, demography and life history theory, population dynamics and species interactions including ecosystem stability, ecological economics and marine reserve design, evolutionary theory, evolutionary ecology, and evolution of gender sexuality and family structure. Prerequisites: 43 or 101, calculus, and computer programming. Recommended: linear algebra and differential equations. GER:DB-NatSci
3 units, alternate years, not given this year (Roughgarden, J)

BIOSCI 143/243. Evolution—The basic facts and principles of the evolution of all life. The logic of and evidence for the correctness of Darwin's argument for evolution by natural selection. How Mendelian genetics was integrated into evolutionary thinking. The integration of physiological and ecological perspectives into the study of evolutionary adaptation within species. Species formation and evolutionary divergence among species. Patterns of evolution over long time scales. GER:DB-NatSci
3 units, Aut (Watt, W)

BIOSCI 144. Conservation Biology—(Same as HUMBIO 112.) Principles and application of the science of preserving biological diversity. Topics: sources of endangerment of diversity; the Endangered Species Act; conservation concepts and techniques at the population, community, and landscape levels; reserve design and management; conflict mediation. 4 units if taken with a service learning component. Prerequisite: BIOSCI 101, or BIOSCI 43 or HUMBIO 2A with consent of instructor. GER:DB-NatSci
3-4 units, Win (Boggs, C; Launer, A)

BIOSCI 145/245. Behavioral Ecology—Animal behavior from an evolutionary and ecological perspective. Topics: foraging, territoriality, reproductive behavior, social groups. Lecture/seminar format; seminars include discussion of journal articles. Independent research projects. Prerequisites: Biological Sciences or Human Biology core, or consent of instructor. Recommended: statistics. GER:DB-NatSci, WIM
4 units, Spr (Gordon, D)

BIOSCI 146. Population Studies—Series of talks by distinguished speakers introducing approaches to population and resource studies.
1 unit, Win (Feldman, M)

BIOSCI 147/247. Controlling Climate Change in the 21st Century—(Same as EARTHSYS 147/247, HUMBIO 116.) The science, economics, and environmental diplomacy of global climate change. Topics: the science of climate change, climate change and global environmental law; global economic approaches to carbon abatement, taxes, and tradable permits; joint implementation, consensus, and division in the EU; gaining the support of China, other developing countries, and U.S. corporations; alternative energy and energy efficiencies for less carbon-intensive electric power and transport. GER:DB-NatSci
3 units, alternate years, not given this year (Schneider, S)

BIOSCI 149/249. The Neurobiology of Sleep—(Same as HUMBIO 161.) Preference to seniors and graduate students. The neurochemistry and neurophysiology of changes in brain activity and conscious awareness associated with changes in the sleep/wake state. Behavioral and neurobiological phenomena including sleep regulation, sleep homeostasis, circadian rhythms, sleep disorders, sleep function, and the molecular biology of sleep. Enrollment limited to 16. GER:DB-NatSci
4 units, not given this year (Heller, C)

BIOSCI 150/250. Human Behavioral Biology—(Same as HUMBIO 160.) Multidisciplinary. How to approach complex normal and abnormal behaviors through biology. How to integrate disciplines including sociobiology, ethology, neuroscience, and endocrinology to examine behaviors such as aggression, sexual behavior, language use, and mental illness. GER:DB-NatSci
5 units, Spr (Sapolsky, R), alternate years, not given next year

BIOSCI 151. Mechanisms of Neuron Death—For Biology majors with background in neuroscience. Cell and molecular biology of neuron death during neurological disease. Topics: the amyloid diseases (Alzheimer's), prion diseases (kuru and Creutzfeldt-Jakob), oxygen radical diseases (Parkinson's and ALS), triplet repeat diseases (Huntington's), and AIDS-related dementia. Student presentations. Enrollment limited to 15; application required.
3 units, Aut (Sapolsky, R)

BIOSCI 152. Imaging: Biological Light Microscopy—(Same as MCP 222, NBIO 222.) Survey of instruments which use light and other radiation for analysis of cells in biological and medical research. Topics: basic light microscopy through confocal fluorescence and video/digital image processing. Lectures on physical principles; involves partial assembly and extensive use of lab instruments. Lab. Prerequisites: some college physics, Biological Sciences core. GER:DB-NatSci
3 units, Spr (Smith, S)

BIOSCI 153. Cellular Neuroscience: Cell Signaling and Behavior—(Same as PSYCH 120.) Neural interactions underlying behavior. Prerequisites: PSYCH 1 or basic biology. GER:DB-NatSci
4 units, Aut (Wine, J)

BIOSCI 154/254. Molecular and Cellular Neurobiology—(Same as NBIO 254.) For advanced undergraduates and graduate students. Cellular and molecular mechanisms in the organization and functions of the nervous system. Topics: wiring of the neuronal circuit, synapse structure and synaptic transmission, signal transduction in the nervous system, sensory systems, molecular basis of behavior including learning and memory, molecular pathogenesis of neurological diseases. Prerequisite for undergraduates: Biological Sciences core or equivalent, or consent of instructors. GER:DB-NatSci
4-5 units, alternate years, not given this year (Luo, L; Shen, K; Clandinin, T)

BIOSCI 157/257. Plant Biochemistry—The biochemistry of plants relevant to their physiology and cell biology. Topics include: the biosynthesis, assembly, function, and regulation of cell walls; lipids; pigments; photoreceptors; transporters; and the response of plants to pathogens and stresses. Prerequisite: Biological Sciences core or equivalent, or consent of instructors. GER:DB-NatSci

3-4 units, Spr (Mudgett, M)

BIOSCI 158. Developmental Neurobiology—For advanced undergraduates and coterminal students. The principles of nervous system development from the molecular control of patterning, cell-cell interactions, and trophic factors to the level of neural systems and the role of experience in influencing brain structure and function. Topics: neural induction and patterning cell lineage, neurogenesis, neuronal migration, axonal pathfinding, synapse elimination, the role of activity, critical periods, and the development of behavior. Prerequisite: 42 or equivalent. GER:DB-NatSci

4 units, alternate years, not given this year (McConnell, S; Shen, K; Garner, C)

BIOSCI 159/259. Chromatin Biology in Health and Disease—Molecular principles of chromatin dynamics, such as modification and remodeling, in the regulation of nuclear functions, and the relationship of these activities to human diseases. Topics include the role of chromatin biology in gene expression, gene silencing, DNA damage responses and repair, DNA recombination, and epigenetics. The molecular mechanisms behind chromatin signaling networks, and their perturbations in disease processes. Students identify open questions in the field and design experimental strategies to address these issues. Prerequisite: Biological Sciences core. GER:DB-NatSci

4 units, Spr (Gozani, O; Chua, K)

BIOSCI 160. Developmental Biology—Focus is on the strategies and molecular mechanisms used to generate diverse cell types and tissues during embryonic and post-embryonic development in animals. Prerequisite: Biological Sciences core. GER:DB-NatSci

4 units, Aut (Simon, M)

BIOSCI 163/263. Neural Systems and Behavior—(Same as HUMBIO 163.) The field of neuroethology and its vertebrate and invertebrate model systems. Research-oriented. Readings include reviews and original papers. How animal brains compare; how neural circuits are adapted to species-typical behavior; and how the sensory worlds of different species represent the world. Prerequisites: BIOSCI 42, HUMBIO 4A, or equivalents. GER:DB-NatSci

4 units, Aut (Fernald, R), alternate years, not given next year

BIOSCI 164/264. Biosphere-Atmosphere Interactions—Physiological, ecological, and physical aspects of ecosystem function, emphasizing how ecosystems influence and are influenced by the atmosphere. Prerequisites: 42, 43; or consent of instructor. GER:DB-NatSci

4 units, alternate years, not given this year (Field, C; Berry, J)

BIOSCI 165/265. Cellular and Molecular Therapeutic Approaches to Neurological Disorders—Current therapeutic research for neurological conditions, including stroke, epilepsy, neurodegenerative disorders, depression, anxiety, and aging. Sources include primary literature. Guest lecturers.

1 unit, Win (Sapolsky, R)

BIOSCI 175. Tropical Ecology and Conservation—Field trip to a field station at Los Tuxtlas, Mexico; lectures at Stanford. How to address scientific questions concerning ecology and conservation. Field trip includes natural history observations and group research projects. Symposium based on project results. Recommended: 43, 101, and 141 or STATS 60.

5 units, Spr (Dirzo, R)

BIOSCI 180/280. Fundamentals of Sustainable Agriculture—(Same as EARTHSYS 180/280.) Ecological, economic, and social dimensions of sustainable agriculture in the context of a growing world population. Focus is on management and technological approaches, and historical content of agricultural growth and change, organic agriculture, soil and water resource management, nutrient and pest management, biotechnology, ecosystem services, and climate change. GER:DB-NatSci

3 units, alternate years, not given this year (Naylor, R; Daily, G)

BIOSCI 183/283. Theoretical Population Genetics—Models in population genetics and evolution. Selection, random drift, gene linkage, migration, and inbreeding, and their influence on the evolution of gene frequencies and chromosome structure. Models are related to DNA sequence evolution. Prerequisites: calculus and linear algebra, or consent of instructor.

3 units, Win (Feldman, M)

BIOSCI 188/288. Biochemistry I—(Same as CHEMENG 181/281, CHEM 181; CHEMENG and CHEM offerings formerly listed as 188/288.) Chemistry of major families of biomolecules including proteins, nucleic acids, carbohydrates, lipids, and cofactors. Structural and mechanistic analysis of properties of proteins including molecular recognition, catalysis, signal transduction, membrane transport, and harvesting of energy from light. Molecular evolution. Pre- or corequisites: CHEM 131; and CHEM 135 or 171. GER:DB-NatSci

3 units, Aut (Staff)

BIOSCI 189/289. Biochemistry II—(Same as CHEMENG 183/283, CHEM 183; CHEMENG and CHEM offerings formerly listed as 189/289.) Metabolism. Glycolysis, gluconeogenesis, citric acid cycle, oxidative phosphorylation, pentose phosphate pathway, glycogen metabolism, fatty acid metabolism, protein degradation and amino acid catabolism, protein translation and amino acid biosynthesis, nucleotide biosynthesis, DNA replication, recombination and repair, lipid and steroid biosynthesis. Medical consequences of impaired metabolism. Therapeutic intervention of metabolism. Prerequisite: BIOSCI 188/288 or CHEM 181 or CHEMENG 181/281 (formerly 188/288). GER:DB-NatSci

3 units, Win (Khosla, C)

UNDERGRADUATE, INVOLVING INDIVIDUAL WORK

Students majoring in Biological Sciences are encouraged to pursue directed reading and research opportunities. An introduction to research is provided by BIOSCI 2.

BIOSCI 191. Research in Bird Biology—Semi-independent field research in ornithology emphasizing ecological relationships. Projects involve research, planned and carried out by the student in consultation with the instructor. Results are written in publication format. Enrollment limited. Prerequisites: 43, concurrent or subsequent enrollment in 139, and consent of instructor.

1-4 units, Win, Spr (Root, T)

BIOSCI 193. Undergraduate Journal Club—Weekly discussion, led by students and facilitated by faculty, for reading scientific literature and presenting papers. Contact Tim Meier (gastrula@stanford.edu) by the fifth week of the previous quarter if requesting a particular research topic. Minimum enrollment required. Prerequisites: Biological Sciences core and consent of instructor. Recommended: 199 or 199X.

1 unit, Aut, Win, Spr (Meier, T)

BIOSCI 198. Directed Reading in Biological Sciences—Individually arranged under the supervision of members of the faculty.

1-15 units, Aut, Win, Spr, Sum (Staff)

BIOSCI 198X. Out-of-Department Directed Reading—Individually arranged under the supervision of members of the faculty. Credit for work arranged with out-of-department faculty is restricted to Biological Sciences majors and requires department approval. See http://biohonors.stanford.edu for information and petitions, or email gastrula@stanford.edu for more information.

1-15 units, Aut, Win, Spr, Sum (Staff)

BIOSCI 199. Advanced Research Laboratory in Experimental Biology—Individual research taken by arrangement with in-department instructors. See http://biohonors.stanford.edu for information on research sponsors, units, and credit for summer research, or email gastrula@stanford.edu.

1-15 units, Aut, Win, Spr, Sum (Staff)

BIOSCI 199X. Out-of-Department Advanced Research Laboratory in Experimental Biology—Individual research by arrangement with out-of-department instructors. Credit for 199X is restricted to declared Biological Sciences majors and requires department approval. See http://biohonors.stanford.edu for information on research sponsors, units, petitions, deadlines, credit for summer research, and out-of-Stanford research, or email gastrula@stanford.edu.

1-15 units, Aut, Win, Spr, Sum (Staff)

ADVANCED UNDERGRADUATE AND GRADUATE

BIOSCI 203. Advanced Genetics—(Same as DBIO 203, GENE 203.) For graduate students in Bioscience programs; may be appropriate for other graduate students. The genetic toolbox. Examples of analytic methods, genetic manipulation, genome analysis, and human genetics. Emphasis is on use of genetic tools in dissecting complex biological pathways, developmental processes, and regulatory systems. Faculty-led discussion sections with evaluation of papers. Students with minimal experience in genetics should prepare by working out problems in college level textbooks.

4 units, Aut (Stearns, T; Barsh, G; Sidow, A; Kim, S)

BIOSCI 205. DNA Repair and Genomic Stability—Interactions of endogenous and environmental mutagens with cellular DNA. Cellular responses to damaged DNA including molecular mechanisms for DNA repair, translesion DNA synthesis, and genetic recombination. Inducible repair responses and error-prone mechanisms. Human hereditary diseases that predispose to cancer. Relationships of DNA repair to mutagenesis, carcinogenesis, aging, and human genetic disease. Current research literature. Prerequisites: 41 and 118, or consent of instructor.

3 units, Spr (Hanawalt, P; Ford, J)

BIOSCI 206. Field Studies in Earth Systems—(Same as EARTHSYS 189.) For advanced upper-division undergraduates and graduate students. Field-based, focusing on the components and processes by which terrestrial ecosystems function. Topics from biology, chemistry, ecology, geology, and soil science. Lecture, field, and lab studies emphasize standard field techniques, experimental design, analysis of data, and written and oral presentation. Small team projects test the original questions in the functioning of natural ecosystems. Admission by application; see Time Schedule. Prerequisites: BIOSCI 141 or GES 160, or equivalent.

5 units, alternate years, not given this year

BIOSCI 213. Biology of Viruses—Principles of virus growth, genetics, architecture, and assembly. The relation of temperate viruses and other episomes to the host cell. Prerequisite: Biological Sciences core. Recommended: 118.

3 units, Win (Campbell, A)

BIOSCI 214. Cell Biology of Physiological Processes—(Same as BIOC 224.) For Ph.D. students. Current research on cell structure, function, and dynamics. Topics include complex cell phenomena such as cell division, apoptosis, compartmentalization, transport and trafficking, motility and adhesion, differentiation, and multicellularity. Current papers from the primary literature. Prerequisite for advanced undergraduates: BIOSCI 129A,B, and consent of instructor.

2-5 units, Win (Theriot, J; Kopito, R; Nelson, W; Straight, A)

BIOSCI 215. Biochemical Evolution—Biochemical viewpoints on the evolutionary process. Topics: prebiotic biochemistry and the origins of life; adaptive organization of metabolism; enzyme polymorphisms and other biochemical aspects of population genetics; macromolecular phylogeny and protein clocks. Prerequisites: Biological Sciences core or substantial equivalent.

3 units, Win (Watt, W)

BIOSCI 216. Terrestrial Biogeochemistry—Nutrient cycling and the regulation of primary and secondary production in terrestrial, freshwater, and marine ecosystems; land-water and biosphere-atmosphere interactions; global element cycles and their regulation; human effects on biogeochemical cycles. Prerequisite: graduate standing in science or engineering; consent of instructor for undergraduates or coterminal students.

3 units, Spr (Vitousek, P), alternate years, not given next year

BIOSCI 217. Neuronal Biophysics—Biophysical descriptions and mechanisms of passive and excitable membranes, ion channels and pumps, action potential propagation, and synaptic transmission. Introduction to dynamics of single neurons and neuronal networks. Emphasis is on the experimental basis for modern research applications. Interdisciplinary aspects of biology and physics. Literature, problem sets, and student presentations. Prerequisites: undergraduate physics, calculus, and biology.

4 units, Spr (Schnitzer, M)

BIOSCI 221. Methods of Theoretical Population Biology—Formulation and analysis of problems in population biology using theoretical and computational numerical methods. Topics include deterministic and stochastic models, structured populations, stability and bifurcations, and data-driven models with applications in ecology and genetics. Prerequisites: recent courses in advanced calculus and linear algebra.

4 units, not given this year (Tuljapurkar, S)

BIOSCI 222. Exploring Neural Circuits—Seminar. The logic of how neural circuits control behavior; how neural circuits are assembled during development and modified by experience. Emphasis is on primary literature. Topics include: neurons as information processing units; simple and complex circuits underlying sensory information processing and motor control; and development and plasticity of neural circuits. Advanced undergraduates with background in physical science, engineering, and biological science may apply to enroll. Recommended: background in neuroscience.

3 units, not given this year (Luo, L)

BIOSCI 223. Stochastic and Nonlinear Dynamics—(Same as APPPHYS 223.) Theoretical analysis of dynamical processes: dynamical systems, stochastic processes, and spatiotemporal dynamics. Motivations and applications from biology and physics. Emphasis is on methods including qualitative approaches, asymptotics, and multiple scale analysis. Prerequisites: ordinary and partial differential equations, complex analysis, and probability or statistical physics.

3 units, Spr (Fisher, D)

BIOSCI 230. Molecular and Cellular Immunology—For graduate students and advanced undergraduates. Components of the immune system: structure and functions of antibody molecules; cellular basis of immunity and its regulation; molecular biology and biochemistry of antigen receptors and signaling pathways; genetic control of immunity and disease susceptibility. Emphasis is on key experimental approaches. Prerequisite for undergraduates: Biological Sciences or Human Biology core, or consent of instructor.

4 units, Aut (Jones, P)

BIOSCI 230A. Molecular and Cellular Immunology Literature Review—Supplement to 230. Corequisite: 230.

1 unit, Aut (Staff)

BIOSCI 258. Neural Development—For Ph.D. students. Seminar; students also attend BIOSCI 158 lectures. Topics: neural induction and patterning, cell lineage, neurogenesis, neuronal migration, axonal pathfinding, synapse elimination, the role of activity, critical periods, and the development of behavior.

4 units, not given this year (McConnell, S; Shen, K; Garner, C)

BIOSCI 261A. Advanced Topics in Behavioral Biology—Seminar. The biological roots of aggression, competition, cooperation, and altruism. Prerequisite: 150/250, and consent of instructor.

3 units, alternate years, not given this year (Sapolsky, R)

BIOSCI 261B. Advanced Topics in Behavioral Biology—Seminar. The biological roots of aggression, competition, cooperation, and altruism. Prerequisite: 150/250, and consent of instructor.
3 units, alternate years, not given this year (Sapolsky, R)

BIOSCI 267. Molecular Mechanisms of Neurodegenerative Disease—(Same as NENS 267.) The epidemic of neurodegenerative disorders such as Alzheimer's and Parkinson's disease occasioned by an aging human population. Genetic, molecular, and cellular mechanisms. Clinical aspects through case presentations.
4 units, Win (Kopito, R; Reimer, R; Wyss-Coray, A), alternate years, not given next year

BIOSCI 290. Teaching of Biological Sciences—Open to upper-division undergraduates and graduate students. Practical experience in teaching lab biology or serving as an assistant in a lecture course. May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Staff)

BIOSCI 290X. Out-of-Department Teaching of Biological Science—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Staff)

BIOSCI 291. Development and Teaching of Core Experimental Laboratories—Preparation for teaching the core experimental courses (44X and 44Y). Emphasis is on lab, speaking, and writing skills. Focus is on updating the lab to meet the changing technical needs of the students. Must be taken prior to teaching either of the above courses. May be repeated for credit. Prerequisite: selection by instructor.
1-2 units, Aut, Win (Malladi, S)

BIOSCI 294. Cellular Biophysics—(Same as APPPHYS 294.) Physical biology of dynamical and mechanical processes in cells. Emphasis is on qualitative understanding of biological functions through quantitative analysis and simple mathematical models. Sensory transduction, signaling, adaptation, switches, molecular motors, actin and microtubules, motility, and circadian clocks. Prerequisites: differential equations and introductory statistical mechanics.
3 units, Aut (Fisher, D)

PRIMARILY FOR GRADUATE STUDENTS

BIOSCI 300. Graduate Research—For graduate students only. Individual research by arrangement with in-department instructors.
1-15 units, Aut, Win, Spr, Sum (Staff)

BIOSCI 300X. Out-of-Department Graduate Research—Individual research by arrangement with out-of-department instructors. Master's students: credit for work arranged with out-of-department instructors is restricted to Biological Sciences students and requires approved department petition. See http://biohonors.stanford.edu for information on research sponsors, units, petitions, deadlines, credit for summer research, and out-of-Stanford research, or email gastrula@stanford.edu. May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

BIOSCI 301. Frontiers in Biology—Limited to and required of first-year Ph.D. students in molecular, cellular, and developmental biology. Current research in molecular, cellular, and developmental biology emphasizing primary research literature. Held in conjunction with the department's Monday seminar series. Students and faculty meet weekly before the seminar for a student presentation and discussion of upcoming papers
1-3 units, Aut, Win (Gozani, O; Bergmann, D)

BIOSCI 302. Current Topics and Concepts in Population Biology, Ecology, and Evolution—Required of first-year graduate students in population biology, and ecology and evolution; open to all graduate students. Major conceptual issues and developing topics.
1 unit, not given this year

BIOSCI 303. Current Topics and Concepts in Population Biology, Ecology, and Evolution—Required of first-year graduate students in population biology, and ecology and evolution; open to all graduate students. Major conceptual issues and developing topics.
1 unit, not given this year

BIOSCI 304. Current Topics and Concepts in Population Biology, Ecology, and Evolution—Required of first-year graduate students in population biology, and ecology and evolution; open to all graduate students. Major conceptual issues and developing topics.
1 unit, Spr (Staff)

BIOSCI 306. Current Topics in Integrative Organismal Biology—Limited to and required of graduate students doing research in this field. At Hopkins Marine Station.
1 unit, Aut (Somero, G)

BIOSCI 312. Ethical Issues in Ecology and Evolutionary Biology—Focus is on ethical issues addressed in Donald Kennedy's *Academic Duty* and others of importance to academics and scientists in the fields of ecology, behavior, and evolutionary biology. Discussions led by faculty and outside guests. Satisfies ethics course requirement for ecology and evolutionary biology. Prerequisite: graduate standing in the ecology and evolutionary biology or marine program, or consent of instructor.
1 unit, Aut (Ehrlich, P)

BIOSCI 315. Seminar in Biochemical Evolution—Literature review and discussion of current topics in biochemical evolution and molecular evolutionary genetics. Prerequisite: consent of instructor.
1-3 units, Spr (Watt, W)

BIOSCI 325. The Evolution of Body Size—(Same as GES 325.) The influence of organism size on evolutionary and ecological patterns and processes. Focus is on integration of theoretical principles, observations of living organisms, and data from the fossil record. What are the physiological and ecological correlates of body size? Is there an optimum size? Do organisms tend to evolve to larger size? Does productivity control the size distribution of consumers? Does size affect the likelihood of extinction or speciation? How does size scale from the genome to the phenotype? How is metabolic rate involved in evolution of body size? What is the influence of geographic area on maximum body size?
2 units, not given this year (Hadly, E; Payne, J)

BIOSCI 342. Plant Biology Seminar—Topics announced at the beginning of each quarter. Current literature. May be repeated for credit. See http://carnegiedpb.stanford.edu/seminars/seminars.php.
1-3 units, Aut, Win, Spr (Walbot, V)

BIOSCI 344. Advanced Seminar in Cellular Biology—Enrollment limited to graduate students directly associated with departmental research groups working in cell biology.
1 unit, Aut, Win, Spr (Burkholder, W; Fang, G; Frydman, J; Kopito, R; Stearns, T; Cyert, M)

BIOSCI 346. Advanced Seminar on Prokaryotic Molecular Biology—Enrollment limited to graduate students associated with departmental research groups in genetics or molecular biology.
1 unit, Aut, Win, Spr (Long, S; Campbell, A; Burkholder, W; Spormann, A; Grossman, A; Yanofsky, C)

BIOSCI 358. Advanced Topics in Biological Sciences—Restricted to doctoral and medical students in neurobiology labs. May be repeated for credit.
1 unit, Aut, Win, Spr (Baker, B; Fernald, R; Luo, L; McConnell, S; Shen, K), Sum (Staff)

BIOSCI 383. Seminar in Population Genetics—Literature review, research, and current problems in the theory and practice of population genetics and molecular evolution. Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Feldman, M)

BIOSCI 384. Theoretical Ecology—Recent and classical research papers in ecology, and presentation of work in progress by participants. Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Roughgarden, J)

BIOSCI 385. Speaking About Science—Communication about science occurs in settings such as presenting scientific work to an audience of peers, communicating difficult concepts in a classroom, or describing a new finding to a reporter. Focus is on practice in speaking about science, emphasizing strategies for making difficult ideas easy to understand and integrating visual aids into oral presentations. Limited to Ph.D. students.

2 units, Spr (McConnell, S), alternate years, not given next year

BIOSCI 459. Frontiers in Interdisciplinary Biosciences—(Same as BIOC 459, BIOE 459, CHEMENG 459, CHEM 459, PSYCH 459.) (Crosslisted in departments in the schools of H&S, Engineering, and Medicine; students register through their affiliated department; otherwise register for CHEMENG 459.) For specialists and non-specialists. Sponsored by the Stanford BioX Program. Three seminars per quarter address scientific and technical themes related to interdisciplinary approaches in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and the world present breakthroughs and endeavors that cut across core disciplines. Pre-seminars introduce basic concepts and background for non-experts. Registered students attend all pre-seminars; others welcome. See http://www.stanford.edu/group/biox/courses/459.html. Recommended: basic mathematics, biology, chemistry, and physics.

1 unit, Aut, Win, Spr (Robertson, C)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the department's student services office for applicability of these courses to a major or minor program.

CEE 274A. Environmental Microbiology I—(Same as CHEMENG 174/274.)

3 units, Aut (Spormann, A), Sum (Sepulveda-Torres, L)

CEE 274B. Metabolic Biochemistry of Microorganisms—(Same as CHEMENG 456.)

3 units, Win (Spormann, A), alternate years, not given next year

DBIO 210. Developmental Biology

5 units, Spr (Villeneuve, A; Fuller, M)

SBIO 241. Biological Macromolecules—(Same as BIOC 241, BIOPHYS 241.)

3-5 units, Aut (Herschlag, D; Puglisi, J; McKay, D; Garcia, K; Ferrell, J; Block, S; Pande, V; Weis, W)

OVERSEAS STUDIES

These courses are approved for the Biological Sciences major and taught overseas at the campus indicated. Students should discuss with their major advisers which courses would best meet individual needs. Descriptions are in the "Overseas Studies" section of this bulletin, or at the Overseas Studies Office, 126 Sweet Hall.

AUSTRALIA

OSPAUSTL 10. Coral Reef Ecosystems

3 units, Aut (Hoegh-Guldberg, O; Ward, S; Arrigo, K; Anthony, K)

OSPAUSTL 20. Coastal Resource Management

3 units, Aut (Johnstone, R; Chiffings, T)

OSPAUSTL 30. Coastal Forest Ecosystems

3 units, Aut (Hall, J; Duke, N)

SANTIAGO

OSPSANTG 25. The Evolution and Ecology of the South American Biota

3 units, Aut (Hadly, E)

OSPSANTG 85. Marine Ecology of Chile and the South Pacific

5 units, Win (Palma, A)

DIVISION OF MARINE BIOLOGY HOPKINS MARINE STATION

Emeriti: (Professor) John H. Phillips, Jr.
Director: George N. Somero
Professors: Barbara A. Block, Mark W. Denny, David Epel, William F. Gilly, Stephen R. Palumbi, George N. Somero, Stuart H. Thompson
Assistant Professor: Fiorenza Micheli
Assistant Professor (Research): Anthony DeTomaso
Lecturer: James Watanabe

Station Offices: Oceanview Blvd., Pacific Grove, CA 93950
Phone: (831) 655-6200
Email: information@marine.stanford.edu
Web Site: http://hopkins.stanford.edu

Courses given in Marine Biology at the Hopkins Marine Station have the subject code BIOHOPK. For a complete list of subject codes, see Appendix.

The Hopkins Marine Station, located 90 miles from the main University campus in Pacific Grove, was founded in 1892 as the first marine laboratory on the west coast of North America. The modern laboratory facilities on the 11-acre campus on Cabrillo Point house ten faculty, all members of the Department of Biological Sciences. The Miller Library has a collection of literature in marine science. The Hopkins faculty offers undergraduate and graduate courses in biology which focus on the marine realm and involve topics including oceanography, environmental and comparative physiology, molecular evolution, biomechanics, cellular biology, conservation biology, and neurobiology and behavior. Most courses have laboratory sections that exploit the potential of working with readily available marine plants and animals. Small class sizes encourage close student-faculty interactions. Undergraduates have opportunities to carry out research projects with Hopkins faculty during the academic year or summer months. Courses are offered in Winter, Spring, and Summer quarters.

COURSES

BIOHOPK 43. Plant Biology, Evolution, and Ecology—Introduction to biology in a marine context. Principles of plant biology: physiology, structure, diversity. Principles of evolution: macro and microevolution, population genetics. Ecology: the principles governing the distribution and abundance of organisms; population, community, and ecosystem ecology. Equivalent to BIOSCI 43. GER:DB-NatSci

5 units, Spr (Denny, M; Palumbi, S; Watanabe, J)

BIOHOPK 44Y. Core Experimental Laboratory—Laboratory and field projects provide working familiarity with the concepts, organisms, and techniques of plant and evolutionary biology, and ecology. Emphasis is on hands-on experimentation in the marine environment, analysis of data, and written and oral presentation of the experiments. Lab fee. Equivalent to BIOSCI 44Y. Corequisite: BIOHOPK 43. GER:DB-NatSci, WIM

5 units, Spr (Denny, M; Palumbi, S; Watanabe, J)

BIOHOPK 56H. History and Philosophy of Science—The nature of scientific inquiry, its logic, historical patterns, and sociology. Emphasis is on the unique aspects of the biological sciences.

2 units, alternate years, not given this year (Somero, G)

BIOHOPK 161H/261H. Invertebrate Zoology—(Graduate students register for 261H.) Survey of invertebrate diversity emphasizing form and function in a phylogenetic framework. Morphological diversity, life histories, physiology, and ecology of the major invertebrate groups, concentrating on local marine forms as examples. Current views on the phylogenetic relationships and evolution of the invertebrates. Lectures, lab, plus field trips. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci

5 units, Win (Watanabe, J)

BIOHOPK 162H/262H. Comparative Animal Physiology—(Graduate students register for 262H.) How animals work. Topics: physiology of respiration, circulation, energy metabolism, thermal regulation, osmotic regulation, muscle physiology, and locomotion. Evolutionary and ecological physiology. Lectures, lab, and field research. An option to combine the course work with a more intensive research focus, with more units, is available. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci

5-8 units, not given this year (Block, B)

BIOHOPK 163H/263H. Oceanic Biology—(Graduate students register for 263H.) How the physics and chemistry of the oceanic environment affect marine plants and animals. Topics: seawater and ocean circulation, separation of light and nutrients in the two-layered ocean, oceanic food webs and trophic interactions, oceanic environments, biogeography, and global change. Lectures, discussion, and field trips. Recommended: PHYSICS 21 or 51, CHEM 31, Biological Sciences core, or consent of instructor. GER:DB-NatSci

4 units, not given this year (Denny, M; Somero, G)

BIOHOPK 164H/264H. Marine Botany—(Graduate students register for 264H.) Introduction to plants in the sea. Phytoplankton and oceanic productivity; macrophytes and nearshore ecology; marine angiosperms from taxonomical, physiological, and ecological perspectives. Lectures, lab. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci

5 units, alternate years, not given this year

BIOHOPK 166H/266H. Molecular Ecology—(Graduate students register for 266H.) How modern technologies in gene sequencing, detection of nuclear nucleotide polymorphisms, and other approaches are used to gather data on genetic variation that allow measurement of population structure, infer demographic histories, inform conservation efforts, and advance understanding of the ecology of diverse types of organisms. GER:DB-NatSci

5 units, Win (Palumbi, S)

BIOHOPK 167H/267H. Nerve, Muscle, and Synapse—(Graduate students register for 267H.) Fundamental aspects of membrane excitability, nerve conduction, synaptic transmission, and excitation-contraction coupling. Emphasis is on biophysical, molecular, and cellular level analyses of these processes in vertebrate and invertebrate systems. Labs on intra- and extracellular recording and patch clamp techniques. Lectures, discussions, and labs. Prerequisites: PHYSICS 23, 28, 43, or equivalent; CHEM 31, 135; calculus; or consent of instructor. GER:DB-NatSci

5 units, alternate years, not given this year (Gilly, W)

BIOHOPK 169H/269H. Neurobiology and Behavior—(Graduate students register for 269H.) The neural mechanism responsible for generating animal behavior. Topics: sensory ecology, neuronal excitability, synaptic plasticity, and neural circuits. Lectures, discussions, demonstrations, and lab. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci

5 units, Win (Thompson, S)

BIOHOPK 170H/270H. Topics in Marine Biology—(Graduate students register for 270H.) A topic of current interest to marine science explored through primary literature. Prerequisite: Biological Sciences core or consent of instructor. May be repeated for credit.

1 unit, Win (Epel, D; De Tomaso, A)

BIOHOPK 171H/271H. Ecological and Evolutionary Physiology—(Graduate students register for 271H.) The interplay between environmental factors, such as temperature, light, nutrient supply, salinity, and oxygen availability, and adaptive change at the physiological level. Emphasis is on marine species and the roles played by physiological adaptations in establishing their distribution and performance. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci

4 units, not given this year (Somero, G)

BIOHOPK 172H/272H. Marine Ecology—(Graduate students register for 272H.) Focus is on quantitative approaches to questions in marine ecology and ecophysiology. Statistical methods, including multivariate statistical approaches and meta-analysis. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci

5 units, Win (Micheli, F)

BIOHOPK 173H/273H. Marine Conservation Biology—(Graduate students register for 273H.) The science of preserving marine diversity. Goal is to introduce students to major conservation issues associated with marine ecosystems. Topics include decline of open ocean fisheries, salmon conservation, bycatch issues in fisheries, use of marine reserves, marine invasions, marine pollution, and global warming. Includes five lecturers from other universities who specialize in marine conservation.

1-3 units, Spr (Micheli, F; Palumbi, S)

BIOHOPK 174H/274H. Experimental Design and Probability—(Graduate students register for 274H.) Variability is an integral part of biology. Introduction to probability and its use in designing experiments to address biological problems. Focus is on analysis of variance, when and how to use it, why it works, and how to interpret the results. Design of complex, but practical, asymmetrical experiments and environmental impact studies, and regression and analysis of covariance. Computer-based data analysis. Prerequisite: Biological Sciences core or consent of instructor. GER:DB-NatSci

3 units, Spr (Watanabe, J)

BIOHOPK 175H. Problems in Marine Ecology and Ecophysiology—Field-based, emphasizing individual and small group research for advanced undergraduates. Students learn field and laboratory techniques to address ecological, ecophysiological, and biomechanical problems faced by marine organisms. Original research projects may be integrated with ongoing research programs in the Hopkins Marine Life refuge. Prerequisites: Biological Sciences core, consent of instructor. GER:DB-NatSci, WIM

10 units, Spr (Epel, D; Somero, G)

BIOHOPK 176H. Experimental Neurobiology—Lab, emphasizing methods in the neurosciences, including electrophysiological, biochemical, molecular, behavioral, and histological techniques. Students work on individual original research projects under guidance of the faculty. Prerequisites: strong interest in neurobiology and previous relevant course work, consent of instructors. GER:DB-NatSci, WIM

6-12 units, Spr (Thompson, S)

BIOHOPK 178H/278H. Polar Biology—(Graduate students register for 278H.) Seminar. Adaptation to extreme environments by Arctic and Antarctic organisms, from microbes to diving mammals. The effects of global change on polar environments. Prerequisites: Biological Sciences core or consent of instructor.

2 units, alternate years, not given this year (Somero, G)

BIOHOPK 182H/323H. Stanford at Sea—(Graduate students register for 323H; same as EARTHSYS 323.) Five weeks of marine science including oceanography, marine physiology, policy, maritime studies, conservation, and nautical science at Hopkins Marine Station, followed by five weeks at sea aboard a sailing research vessel in the Pacific Ocean. Shore component comprised of three multidisciplinary courses meeting daily and continuing aboard ship. Students develop an independent research project plan while ashore, and carry out the research at sea. In collaboration with the Sea Education Association of Woods Hole, MA. Only 6 units may count towards the BioSci major. GER:DB-NatSci

16 units, alternate years, not given this year (Block, B; Dunbar, R; Micheli, F)

BIOHOPK 183H/283H. Environmental Cell and Developmental Biology—(Graduate students register for 283H.) How external signals alter cell activity and developmental trajectory. Survey of cell and developmental phenomena. GER:DB-NatSci

4 units, Spr (Epel, D)

BIOHOPK 184H/284H. Holistic Biology: Monterey Bay and the Sea of Cortez—(Graduate students register for 284H.) For majors and non-majors. Complexity in natural systems from complementary points of view, including scientific, historical, philosophical, and literary. The work and writings of Ed Ricketts and John Steinbeck and historical and contemporary works concerning marine ecology and fisheries. Field work, laboratory studies with living invertebrates, and an individual research project. Course includes a component in Baja California, Mexico. Only 6 units may count towards the BioSci major. GER:DB-NatSci

16 units, Spr (Gilly, W) alternate years, not given next year

BIOHOPK 186H/286H. Ocean Pollution: Land, Air, and Sea Interactions—(Graduate students register for 286H.) The scientific basis of environmental pollution; how organisms protect themselves against toxicants; how protection can be overcome; policy issues in government regulation of pollution.

3 units, Win (Epel, D)

BIOHOPK 198H. Directed Instruction or Reading—May be taken as a prelude to research and may also involve participation in a lab or research group seminar and/or library research. Credit for work arranged with out-of-department instructors restricted to Biological Sciences majors and requires department approval.

1-15 units, Aut, Win, Spr, Sum (Staff)

BIOHOPK 199H. Undergraduate Research—Qualified undergraduates undertake individual work in the fields listed under 300H. Arrangements must be made by consultation or correspondence.

1-15 units, Aut, Win, Spr, Sum (Staff)

BIOHOPK 290H. Teaching of Biological Science—Open to upper-division undergraduates and graduate students. Practical experience in teaching lab biology or serving as an assistant in a lecture course. Prerequisite: consent of instructor.

1-15 units, Win, Spr, Sum (Staff)

BIOHOPK 300H. Research—Graduate study involving original work undertaken with staff in the fields indicated:

B. Block: Comparative Vertebrate Physiology—biomechanics, metabolic physiology and phylogeny of pelagic fishes, evolution of endothermy.

M. Denny: Biomechanics—the mechanical properties of biological materials and their consequences for animal size, shape, and performance.

A. De Tomaso: Developmental and Comparative Immunology, Stem Cell Biology—evolution of self/non-self recognition systems.

D. Epel: Developmental Biology—physiology and regulation of early embryonic development. Embryonic adaptation to environmental stress.

W. Gilly: Neurobiology—analysis of giant axon systems in marine invertebrates from molecular to behavioral levels.

F. Micheli: Marine Ecology—species interactions and community ecology, scale-dependent aspects of community organization, marine conservation and design of multi-species marine protected areas, behavioral ecology.

S. Palumbi: Molecular Evolution—mechanisms of speciation, genetic differentiations of populations, use of molecular tools in conservation biology, design of marine protected areas.

G. Somero: Ecological and Evolutionary Physiology—adaptations of marine organisms to the environment: temperature, pressure, desiccation, and oxygen availability.

S. Thompson: Neurobiology—neuronal control of behavior and mechanisms of ion permeation, signal transduction, calcium homeostasis, and neurotransmission.

J. Watanabe: Marine Ecology—kelp forest ecology and invertebrate zoology.

SUMMER PROGRAM

The summer program is open to advanced undergraduate, graduate students, and postdoctoral students, and to teachers whose biological backgrounds, teaching, or research activities can benefit from a summer's study of marine life. Applications and further information may be obtained by writing to Hopkins Marine Station, Pacific Grove, CA 93950. Completed applications should be submitted by April 15. Applications received later are considered if space is still available.

Summer Quarter is divided into two terms. It is possible to register for either term, or for the full quarter. Registration is possible for only one course during each term.

FIRST TERM

BIOHOPK 179H/279H. Subtidal Communities—(Graduate students register for 279H.) Lectures, lab, and field trips treating shallow water marine communities. Emphasis is on local habitats and the introduction of physical environmental parameters, community composition, aspects of the biology of constituent species, and methods for subtidal studies. Prerequisites: scuba certification, scuba equipment, ocean diving experience, and some background in biology. GER:DB-NatSci

6 units, Sum (Watanabe, J)

BIOHOPK 274. Hopkins Microbiology Course—(Same as BIOSCI 274S, CEE 274S, GES 274S.) Four-week, intensive. The interplay between molecular, physiological, ecological, evolutionary and geochemical processes that constitute, cause, and maintain microbial diversity. How to isolate key microorganisms driving marine biological and geochemical diversity, interpret culture-independent molecular characterization of microbial species, and predict causes and consequences. Laboratory component: what constitutes physiological and metabolic microbial diversity; how evolutionary and ecological processes diversify individual cells into physiologically heterogeneous populations; and the principles of interactions between individuals, their population, and other biological entities in a dynamically changing microbial ecosystem. Prerequisites: CEE 274A,B, or equivalents.

9-12 units, Sum (Spormann, A; Francis, C)

BIOHOPK 277H. Biomechanics, Ecological Physiology, and Genetics of Intertidal Communities—Introduction to the mechanical and physiological design of wave-swept organisms. How different abiotic stresses (wave exposure, wind speed, temperature, light) influence marine animals and plants, and adaptive responses to these stresses. Lab introduces methods for measuring environmental stress and organismal responses. Recommended: background in algology, intertidal ecology, or invertebrate zoology; basic physics and calculus.

4 units, alternate years, not given this year
(Denny, M; Palumbi, S; Somero, G)

SECOND TERM

BIOHOPK 180H/280H. Problems in Subtidal Ecology—(Graduate students register for 280H.) Group and individual research projects focus on shallow water marine communities. Daily lectures, SCUBA dives, labs. Prerequisites: SCUBA certification; advanced or comparable experience, or 179H. GER:DB-NatSci

6 units, Sum (Watanabe, J)

BIOPHYSICS PROGRAM

Emeritus: Harden M. McConnell (Chemistry)

Director: William I. Weis

Professors: Russ Altman (Genetics, Medical Informatics), Steve Block (Applied Physics, Biological Sciences), Steven Boxer (Chemistry), Axel Brunger (Molecular and Cellular Physiology), Douglas Brutlag (Biochemistry), Gilbert Chu (Oncology), Mark Davis (Microbiology and Immunology), Sebastian Doniach (Physics, Applied Physics), James Ferrell (Chemical and Systems Biology), K. Christopher Garcia (Molecular and Cellular Physiology, Structural Biology), Gary Glover (Radiology), Philip C. Hanawalt (Biological Sciences), Daniel Herschlag (Biochemistry), Keith O. Hodgson (Chemistry), Chaitan Khosla (Chemical Engineering, Chemistry), Brian Kobilka (Molecular and Cellular Physiology), Eric Kool (Chemistry), Ron Kopito (Biological Sciences), Roger D. Kornberg (Structural Biology), Michael Levitt (Structural Biology), Richard Lewis (Molecular and Cellular Physiology), David B. McKay (Structural Biology), Uel J. McMahan (Neurobiology), Tobias Meyer (Chemical and Systems Biology), W. E. Moerner (Chemistry), Norbert Pelc (Bioengineering, Radiology), Joseph D. Puglisi (Structural Biology), Stephen Quake (Bioengineering), Stephen J. Smith (Molecular and Cellular Physiology), Edward I. Solomon (Chemistry), James A. Spudich (Biochemistry, Developmental Biology), William I. Weis (Structural Biology, Molecular and Cellular Physiology), Richard N. Zare (Chemistry)

Associate Professors: Judith Frydman (Biological Sciences), Pehr Harbury (Biochemistry), Craig Levin (Radiology), Vijay Pande (Chemistry), Julie Theriot (Biochemistry)

Assistant Professors: Zev Bryant (Bioengineering), Xiaoyuan Chen (Radiology), Jennifer Cochran (Bioengineering), Miriam Goodman (Molecular and Cellular Physiology), Merritt Maduke (Molecular and Cellular Physiology), Jianghong Rao (Radiology), Mark Schnitzer (Biological Sciences, Applied Physics)

Program Offices: Fairchild Building D118
Mail Code: 94305-5126
Phone: (650) 723-7576
Email: biophysics@med.stanford.edu
Web Site: http://med.stanford.edu/biophysics/

Courses given in Biophysics have the subject code BIOPHYS. For a complete list of subject codes, see Appendix.

The Biophysics Program offers instruction and research opportunities leading to the Ph.D. in Biophysics. Students admitted to the program may perform their graduate research in any appropriate department.

GRADUATE PROGRAM

For information on the University's basic requirements for the Ph.D. degree, see the "Graduate Degrees" section of this bulletin.

A small number of qualified applicants are admitted to the program each year. Applicants should present strong undergraduate backgrounds in the physical sciences and mathematics. The graduate course program, beyond the stated requirements, is worked out for each student individually with the help of appropriate advisers from the Committee on Biophysics. The requirements and recommendations for the Ph.D. degree include:

1. Training in physics or chemistry equivalent to that of an undergraduate physics or chemistry major at Stanford.
2. Completion of the following background courses or their equivalents at other institutions:
   a) CHEM 131, 171, 173, and 175
   b) BIOC 200, 201
3. Completion of the following courses or their equivalents:
   a) SBIO 241 and 242
   b) at least four additional graduate level courses in physical or biological science
   c) BIOPHYS 250
   d) MED 255
4. Opportunities for teaching are available during the first nine quarters, at the discretion of the advising committee.
5. The student must prepare a dissertation proposal defining the research to be undertaken, including methods of procedure. This proposal should be submitted by Winter Quarter of the third year, and it must be approved by a committee of at least three members including the principal research adviser and at least one member from the Biophysics Program. The candidate must defend the dissertation proposal in an oral examination. The dissertation reading committee normally evolves from the dissertation proposal review committee.
6. The student must present a Ph.D. dissertation as the result of independent investigation and expressing a contribution to knowledge in the field of biophysics.
7. The student must pass the University oral exam, taken only after the student has substantially completed the research. The examination is preceded by a public seminar in which the research is presented by the candidate.

COURSES

BIOPHYS 227. Functional MRI Methods—(Same as RAD 227.) Basics of functional magnetic resonance neuroimaging, including data acquisition, analysis, and experimental design. Journal club sections. Cognitive neuroscience and clinical applications. Prerequisites: basic physics, mathematics. Recommended: neuroscience.
3 units, alternate years, not given this year

BIOPHYS 228. Computational Structural Biology—(Same as SBIO 228.) Interatomic forces and interactions such as electrostatics and hydrophobicity, and protein structure in terms of amino acid properties, local chain conformation, secondary structure, domains, and families of folds. How protein motion can be simulated. Bioinformatics introduced in terms of methods that compare proteins via their amino acid sequences and their three-dimensional structures. Structure prediction via simple comparative modeling. How to detect and model remote homologues. Predicting the structure of a protein from knowledge of its amino acid sequence. Via Internet.
3 units, Aut, Spr (Levitt, M)

BIOPHYS 232. Advanced Imaging Lab in Biophysics—(Same as BIOSCI 132/232, MCP 232.) Laboratory and lectures. Advanced microscopy and imaging, emphasizing hands-on experience with state-of-the-art techniques. Students construct and operate working apparatus. Topics include microscope optics, Koehler illumination, contrast-generating mechanisms (bright/dark field, fluorescence, phase contrast, differential interference contrast), and resolution limits. Laboratory topics vary by year, but include single-molecule fluorescence, fluorescence resonance energy transfer, confocal microscopy, two-photon microscopy, and optical trapping. Limited enrollment. Recommended: basic physics, Biological Sciences core or equivalent, and consent of instructor.
4 units, Spr (Block, S; Schnitzer, M; Smith, S; Stearns, T)

BIOPHYS 241. Biological Macromolecules—(Same as BIOC 241, SBIO 241.) The physical and chemical basis of macromolecular function. Forces that stabilize biopolymers with three-dimensional structures and their functional implications. Thermodynamics, molecular forces, and kinetics of enzymatic and diffusional processes, and relationship to their practical application in experimental design and interpretation. Biological function and the level of individual molecular interactions and at the level of complex processes. Case studies. Prerequisites: introductory biochemistry and physical chemistry or consent of instructor.
3-5 units, Aut (Herschlag, D; Puglisi, J; Garcia, K; Ferrell, J; Block, S; Pande, V; Weis, W)

BIOPHYS 242. Methods in Molecular Biophysics—(Same as SBIO 242.) The potential utility of physical approaches to research, and how to evaluate literature that incorporates these methods. Experimental methods in molecular biophysics from theoretical and practical stand-points. Emphasis is on X-ray diffraction and nuclear magnetic resonance spectroscopy. Additional topics include fluorescence spectroscopy, circular dichroism, calorimetry, and separation methods. Prerequisite: physical chemistry or consent of instructor.

3 units, alternate years, not given this year

BIOPHYS 250. Seminar in Biophysics—Required of Biophysics graduate students. Presentation of current research projects and results by faculty in the Biophysics program. May be repeated for credit.

1 unit, Aut, Win (Weis, W)

BIOPHYS 297. Bio-Inorganic Chemistry—(Same as CHEM 297.) Overview of metal sites in biology. Metalloproteins as elaborated inorganic complexes, their basic coordination chemistry and bonding, unique features of the protein ligand, and the physical methods used to study active sites. Active site structures are correlated with function. Prerequisites: CHEM 153 and 173, or equivalents.

3 units, Win (Solomon, E)

BIOPHYS 300. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

BIOPHYS 399. Directed Reading in Biophysics—Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOC 210. Advanced Topics in Membrane Trafficking

3 units, Spr (Staff)

BIOSCI 205. DNA Repair and Genomic Stability

3 units, Spr (Hanawalt, P; Ford, J)

MCP 256. How Cells Work: Energetics, Compartments, and Coupling in Cell Biology

4 units, Spr (Maduke, M; Goodman, M)

CHEMISTRY*

Emeriti: (Professors) William A. Bonner, James P. Collman, Carl Djerassi, Harden M. McConnell, John Ross, Douglas A. Skoog, Eugene E. van Tamelen

Chair: Richard N. Zare

Vice Chair: Wray H. Huestis

Professors: Hans C. Andersen, Steven G. Boxer, John I. Brauman, Hongjie Dai, Michael D. Fayer, Keith O. Hodgson, Wray H. Huestis, Chaitan Khosla, Eric T. Kool, W. E. Moerner, Robert Pecora, Edward I. Solomon, Barry M. Trost, Robert M. Waymouth, Paul A. Wender, Richard N. Zare

Associate Professors: Christopher E. D. Chidsey, Justin Du Bois, Vijay S. Pande, T. Daniel P. Stack

Assistant Professors: Dmitry V. Yandulov

Courtesy Professors: Stacey F. Bent, Curtis W. Frank, Daniel Herschlag

Courtesy Associate Professor: Karlene A. Cimprich

Courtesy Assistant Professors: James K. Chen, Thomas J. Wandless

Lecturers: John A. Flygare, Hillary Hua, Christopher R. Moylan

Director of Undergraduate Laboratories: Christopher R. Moylan

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* The curriculum leading to the B.S. degree in Chemical Engineering is described in the "School of Engineering" section of this bulletin.

Department Offices: 121 S. G. Mudd

Mail Code: 94305-5080

Phone: (650) 723-2501

Web Site: http://www.stanford.edu/dept/chemistry/

Courses given in Chemistry have the subject code CHEM. For a complete list of subject codes, see Appendix.

Chemistry is central to many scientific disciplines and plays an important role in the emerging areas of biotechnology and material science. Fluorescent imaging of biological molecules, modeling of protein folding, manipulation of carbon nanotubes, development of new oxidation and polymerization catalysts, and synthesis of organic molecules for probing ion-channels are all research areas that are pursued actively in the Chemistry department. The overarching theme of these pursuits is a focus at the atomic and molecular levels, whether this concerns probing the reactivity of molecules as small as dihydrogen or synthesizing large polymer assemblies. The ability to synthesize new molecules and materials and to modify existing structures allows the exploration of properties of well-defined systems through systematic modification. The Chemistry department has a long-standing tradition of encouraging undergraduate majors to become involved in research during the academic year and through the 10-week Bing Summer Research Program.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

Entrance Preparation—Entrance credit in the preparatory subjects of chemistry, physics, and especially mathematics provides flexibility in creating a four-year schedule for students intending to major in Chemistry.

Requirements—

Chemistry option: University Writing and General Education Requirements; CHEM 31A and B or 31X, 33, 35, 36, 130, 131, 134, 136, 151, 153, 171, 173, 174, 175, 176; MATH 41, 42, 51, 53, or CME 100, 102, 104; PHYSICS 41, 43, 44, 45, 46.

Biological chemistry option: University Writing and General Education Requirements; CHEM 31A and B or 31X, 33, 35, 36, 130, 131, 134, 136, 151, 171, 173, 176, 181, 183, 184, 185; BIOSCI 41, 42, 44X; MATH 41, 42, 51, 53, or CME 100, 102, 104; PHYSICS 41, 43; an approved, elective, graduate-level class related to the student's biochemical interests.

In addition, CS 106A and B are recommended for students planning graduate study. All degree courses must be taken for a letter grade. For further information on the undergraduate program, see http://www.stanford.edu/dept/chemistry/academic/under.

TYPICAL SCHEDULE FOR A FOUR-YEAR PROGRAM: CHEMISTRY OPTION

FIRST YEAR

Subject and Catalog Number	*Qtr. and Units*		
	A	*W*	*S*
CHEM 31X. Chemical Principles	4		
CHEM 33. Structure and Reactivity		4	
CHEM 35. Organic Monofunctional Compounds			4
CHEM 36. Organic Chemistry Laboratory I			3
MATH 41, 42, 51. Calculus, Linear Equations	5	5	5

SECOND YEAR

CHEM 130. Organic Chemistry Laboratory II	4		
CHEM 131. Organic Polyfunctional Compounds	3		
CHEM 134. Analytical Chemistry Laboratory			5
CHEM 136. Synthesis Laboratory		3	
MATH 53. Differential Equations			5
PHYSICS 41, 43, 44. Mechanics, Electricity and Magnetism		4	5

THIRD AND FOURTH YEARS

CHEM 151, 153. Inorganic Chemistry		3	3
CHEM 171, 173, 175. Physical Chemistry	3	3	3
CHEM 174, 176. Physical Chemistry Laboratory		4	3
PHYSICS 45, 46. Light and Heat	5		

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* Elective courses must be used to complete the University Writing, General Education, and Language Requirements. They may also be used to broaden one's background in science and nonscience areas and to provide an opportunity for advanced study in Chemistry. Courses offered by other departments that may be of interest to Chemistry majors include BIOSCI 41, 42, 43; CHEMENG 20, 120A,B, 130; CS 106A,B; ECON 1; ENGR 50; MATH 52, 106, 109, 113, 131; MATSCI 50; PHYSICS 110; STATS 60, 110, 116.

MINORS

Courses required for a minor are CHEM 33, 35, 36, 130, 131, 134, 151, 171; MATH 51; and PHYSICS 21, 23, 25, or 28, 29, or 41, 43, 45 (no substitutions). All courses must be taken for a letter grade.

PRE-MEDICAL RECOMMENDATIONS

The department recommends that pre-med students take the following courses for a letter grade: 31A,B or 31X, 33, 35, 36, 130, 131, 135 or 171, and 181. Historically, these courses have fulfilled the chemistry requirements at most medical schools. For information on medical school advising and resources, download the Undergraduate Advising and Research publication at http://uar.stanford.edu/pdfs/MedSchool.pdf.

AMERICAN CHEMICAL SOCIETY CERTIFICATION

Students who wish to be certified as having met the minimum requirements of the American Chemical Society for professional training must complete, in addition to the above requirements, CHEM 181 and 183, and 6 units of CHEM 190.

HONORS PROGRAM

A B.S. degree in Chemistry with honors is available to those students interested in chemical research. Admission to the honors program requires a scientific grade point average (GPA) of 3.3 and an overall GPA of 3.0 in all University courses. Beyond the standard B.S. course requirements for each track, 9 units of CHEM 190 research credit, 9 units of course work need to be completed during the junior and senior academic years. A thesis, approved by a Chemistry research adviser, must be completed during the senior year. Theses must be completed by May 31 to be considered for the Firestone or Golden award. The use of a single course for multiple requirements for honors, major, minor, or coterminal requirements is not allowed. Students who wish to be admitted to the honors program should register in the department student services office in the Mudd Chemistry building in Spring Quarter of the junior year.

CHEM 190 research units towards honors may be completed, once accepted into the program, in any laboratory within Chemistry or with courtesy faculty in Chemistry. Other chemical research can be approved through a formal petitioning of the undergraduate studies committee. At least 3 units of CHEM 190 must be completed during the senior year. Participation in a summer research program in an academic setting between junior and senior years may be used in lieu of 3 units of CHEM 190. For each quarter, a progress report reflecting the units undertaken is required. This report must be signed by the Chemistry faculty adviser and filed in the department student services office in Mudd Chemistry before the last day of finals in the quarter during which the research is performed.

The 9 units of course work must be completed from courses approved by the undergraduate studies committee and taken for a letter grade. At least six of these units need to be taken from following CHEM courses: 153, 174, 175, 181, 183, 185, 221, 223, 225, 235, 251, 253, 255, 271, 273, 275, 297. Courses from Mathematics (MATH 114 or higher), Physics (PHYSICS 100 or higher), Engineering, and Structural Biology or Biochemistry in the School of Medicine can be used to fulfill this requirement.

TEACHING CREDENTIALS

The requirements for certification to teach chemistry in the secondary schools of California may be ascertained by consulting the section on credentials under the "School of Education" section of this bulletin and the Credential Administrator of the School of Education.

GRADUATE PROGRAMS

The University's basic requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

GENERAL REQUIREMENTS

Placement Examinations—Each new graduate student must take placement examinations upon entrance. These consist of three written examinations of two hours each in the fields of inorganic, organic, and physical chemistry, and cover such material as ordinarily is given in a rigorous one-year undergraduate course in each of these subjects. Students majoring in biophysical chemistry or chemical physics must take examinations in biophysical or chemical physics, physical chemistry, and organic or inorganic chemistry. All placement examinations are given the week before instruction begins in Autumn Quarter, and must be taken at that time. Each new graduate student meets with a member of the graduate study committee to define a program of courses based on results of the placement examinations.

Candidates for advanced degrees must have a minimum grade point average (GPA) of 3.0 for all Chemistry lecture courses as well as for all courses taken during graduate study. Required courses must be taken for a letter grade. Most course work ends in the second year of studies and students will then focus on full-time dissertation research. All prospective Ph.D. candidates, regardless of the source of financial support, are required to gain teaching experience as an integral part of graduate training. During the period in which a dissertation is being read by members of the faculty, candidates must be available for personal consultation until the dissertation has had final department approval.

MASTER OF SCIENCE

The Master of Science is available only to current Ph.D. students or as part of a coterminal program. Applicants for the M.S. degree in Chemistry are required to complete, in addition to the requirements for the bachelor's degree, a minimum of 45 units of work and a M.S. thesis. Of the 45 units, approximately two-thirds must be in the department and must include at least 12 units of graduate-level lecture courses exclusive of the thesis. Of the 12 units, at least 6 units must be from CHEM 221, 223, 225, 235, 251, 253, 255, 271, 273, 275, 276, 277, 280, or 297.

DOCTOR OF PHILOSOPHY

Graduate students are eligible to become formal candidates for the Ph.D. degree after taking the department placement examinations, satisfactorily completing most of the formal lecture course requirements, and beginning satisfactory progress on a dissertation research project. They then file for admission to candidacy for the Ph.D. degree. This filing must be done before June of the second year of graduate registration.

After taking the departmental placement examinations, students select research advisers by first interviewing members of the Chemistry faculty about their research. Students then file an Application to Start Research form with the Department of Chemistry graduate study committee and begin research on their Ph.D. dissertation under the supervision of the adviser. All students in good standing are required to start research by the end of the Winter Quarter of the first year of graduate registration.

There is no foreign language requirement for the Ph.D. degree.

Candidates for the Ph.D. degree are required to participate continually in the department colloquium (CHEM 300), and in the division seminar of the major subject. In addition, continuous enrollment in CHEM 301 is expected after the student has chosen a research supervisor. As part of graduate training, Ph.D. candidates are required to gain experience as teaching assistants.

Before candidates may request scheduling of the University oral examination, clearance must be obtained from the major professor and the chair of the department's Graduate Study Committee. Conditions that must be fulfilled before clearance is granted vary with the different divisions of the department and may be ascertained by consulting the chair of the committee.

It is the policy of the department to encourage and support in every possible way the pursuit of research and other advanced work by qualified students. Information about faculty members with lists of their recent research publications is found in *Chemistry at Stanford, the Directory of Graduate Research* published by the American Chemical Society, and at http://www.stanford.edu/dept/chemistry/faculty.html.

COURSE REQUIREMENTS

Students may major in biophysical, inorganic, organic, or physical chemistry. All graduate students are required to take six graduate-level lecture courses (course numbers greater than 199) of at least 3 units each in chemistry or related disciplines (for example, biochemistry, electrical engineering, mathematics, pharmacology, physics, and so on), to be selected in consultation with their research adviser and the Graduate Study Committee. At least four of these courses should be taken by the end of the first year. Required courses must be taken for a letter grade.

In addition, students majoring in organic chemistry must take 3 units of CHEM 231 in the second year and 3 units of 233 in the second and third year. Students in physical or biophysical chemistry or chemical physics must take CHEM 271, 273, and 275 in the first year, and 2 units of CHEM 278 in the second and third year. Students majoring in inorganic chemistry must take 3 units of CHEM 258 in the second, third, and fourth year.

CHEMICAL PHYSICS

Students with an exceptionally strong background in physics and mathematics may, upon special arrangement, pursue a program of studies in chemical physics.

PH.D. MINOR

Candidates for the Ph.D. degree in other departments who wish to obtain a minor in chemistry must complete, with a GPA of 3.0 or higher, 20 graduate-level units in Chemistry including four lecture courses of at least 3 units each.

FELLOWSHIPS AND SCHOLARSHIPS

In addition to school fellowships and scholarships open to properly qualified students, there are several department fellowships in chemistry. Undergraduate scholarships are administered through the Financial Aid Office. Teaching assistantships and research assistantships are open to graduate students. Graduate fellowships, scholarships, and teaching assistantships are administered through the Department of Chemistry.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

Note—Lab fees are a minimum of $75 per quarter and are not refundable.

UNDERGRADUATE

CHEM 22N. Naturally Dangerous—Stanford Introductory Seminar. Preference to freshmen. Topics from Collman's *Naturally Dangerous: Surprising Facts About Food, Health, and the Environment*. Designed for nonscientists, but also of interest to scientists and engineers.
2 units, Aut (Collman, J)

CHEM 24N. Nutrition and History—Stanford Introductory Seminar. Preference to freshmen. Intended to broaden the introductory chemistry experience. The biochemical basis of historically important nutritional deficiencies (vitamins, minerals, starvation, metabolic variants that predispose to disease) and environmental toxins is related to physiological action and the sociological, political, and economic consequences of its effect on human populations. Prerequisite: high school chemistry. Recommended: 31A,B, or 31X, or 33.
2 units, Spr (Huestis, W)

CHEM 25N. Science in the News—Stanford Introductory Seminar. Preference to freshmen. Possible topics include: diseases such as avian flu, HIV, SARS, and malaria; environmental issues such as climate change, and atmospheric pollution, and human population; evolution; stem cell research; nanotechnology; and drug development. The scientific basis for these topics to have an intelligent discussion of societal and political implications. Sources include the popular media and scientific media for the nonspecialist, especially those available on the web. GER:DB-NatSci
3 units, Aut (Andersen, H)

CHEM 27N. Lasers: The Light Fantastic—Stanford Introductory Seminar. Preference to freshmen. Introduction to lasers and their impact on everyday life. The operation of lasers using concepts of atomic and molecular energy levels, optics, and resonance. The use of lasers to produce guide stars for astronomy, sculpt the cornea, measure molecules in the ozone layer, transmit optical information over the web, measure the distance to the moon, and observe a single protein molecule in action. Prerequisites: CHEM 31A or X, or PHYSICS 23 and 25, or equivalents. GER:DB-NatSci
3 units, Win (Moerner, W)

CHEM 31A. Chemical Principles I—For students with moderate or no background in chemistry. Stoichiometry; periodicity; electronic structure and bonding; gases; enthalpy; phase behavior. Emphasis is on skills to address structural and quantitative chemical questions; lab provides practice. Recitation. GER:DB-NatSci
4 units, Aut (Chidsey, C)

CHEM 31B. Chemical Principles II—Chemical equilibria; acids and bases; oxidation and reduction reactions; chemical thermodynamics; kinetics. Lab provides practice. Recitation. Prerequisite: 31A. GER:DB-NatSci
4 units, Win (Andersen, H)

CHEM 31X. Chemical Principles—Accelerated; for students with substantial chemistry background. Chemical equilibria concepts, equilibrium constants, acids and bases, chemical thermodynamics, quantum concepts, models of ionic and covalent bonding, atomic and molecular orbital theory, periodicity, and bonding properties of matter. Recitation. Prerequisites: AP chemistry score of 5 or passing score on chemistry placement test. Recommended: high school physics. GER:DB-NatSci
4 units, Aut (Waymouth, R; Fayer, M), Sum (Staff)

CHEM 33. Structure and Reactivity—Organic chemistry, functional groups, hydrocarbons, stereochemistry, thermochemistry, kinetics, chemical equilibria. Recitation. Prerequisite: 31A,B, or 31X, or an AP Chemistry score of 5. GER:DB-NatSci
4 units, Win (Stack, T; Du Bois, J), Spr (Wender, P), Sum (Staff)

CHEM 35. Organic Monofunctional Compounds—Organic chemistry of oxygen and nitrogen aliphatic compounds. Recitation. Prerequisite: 33. GER:DB-NatSci
4 units, Aut, Spr (Huestis, W), Sum (Staff)

CHEM 36. Organic Chemistry Laboratory I—Techniques for separations of compounds; distillation, crystallization, extraction, and chromatographic procedures. Lecture treats theory; lab provides practice. Limited enrollment Spring Quarter; preference to students who have completed 33 or by consent of instructor. GER:DB-NatSci
3 units, Aut (Moylan, C), Spr (Hua, Y), Sum (Moylan, C)

CHEM 110. Directed Instruction/Reading—Undergraduates pursue a reading program under supervision of a faculty member in Chemistry; may also involve participation in lab. Prerequisites: superior work in 31A,B, 31X, or 33; and consent of instructor and the Chemistry undergraduate study committee.
1-2 units, Aut, Win, Spr, Sum (Staff)

CHEM 111. Exploring Chemical Research at Stanford—Preference to freshmen and sophomores. Department faculty describe their cutting-edge research and its applications.
1 unit, Win (Yandulov, D)

CHEM 130. Organic Chemistry Laboratory II—Diels-Alder, reduction, and Wittig reactions; qualitative analysis. Lab. Limited enrollment Autumn Quarter. Prerequisite: 36. Corequisite: 35. GER:DB-NatSci
4 units, Aut, Win (Hua, Y)

CHEM 131. Organic Polyfunctional Compounds—Aromatic compounds, polysaccharides, amino acids, proteins, natural products, dyes, purines, pyrimidines, nucleic acids, and polymers. Prerequisite: 35. GER:DB-NatSci
3 units, Aut (Kool, E), Win (Trost, B)

CHEM 134. Analytical Chemistry Laboratory—Methods include gravimetric, volumetric, spectrophotometric, and chromatographic. Writing instruction includes communications, full papers, research proposals, and referee papers. Lab. Prerequisite: 130. GER:DB-NatSci
5 units, Spr (Moylan, C)

CHEM 135. Physical Chemical Principles—Terminal physical chemistry for non-chemistry majors. Emphasis is on portions of physical chemistry most useful for students of the life sciences. Introduction to chemical thermodynamics: rate laws, integration of rate laws, reaction mechanisms, enzyme kinetics, first, second, and third laws, thermochemistry, entropy, free energy, chemical equilibrium, osmotic pressure, other colligative properties. Prerequisites: 31A,B, or 31X, calculus. GER:DB-NatSci
3 units, Win (Pecora, R)

CHEM 136. Synthesis Laboratory—Advanced synthetic methods in organic and inorganic laboratory chemistry. Prerequisites: 35, 130. GER:DB-NatSci
3 units, Win (Yandulov, D)

CHEM 137. Special Topics in Organic Chemistry—(Formerly 181.) Chemical view of the biological processes of life. Topics include: structure and function of proteins, peptides, and nucleic acids; and how to use chemistry to mediate biological processes. GER:DB-NatSci
3 units, Win (Flygare, J)

CHEM 151. Inorganic Chemistry I—Theories of electronic structure, stereochemistry, and symmetry properties of inorganic molecules. Topics: ionic and covalent interactions, electron-deficient bonding, and molecular orbital theories. Emphasis is on the chemistry of the metallic elements. Prerequisites: 35. Recommended: 171. GER:DB-NatSci
3 units, Win (Dey, A)

CHEM 153. Inorganic Chemistry II—The theoretical aspects of inorganic chemistry. Group theory; many-electron atomic theory; molecular orbital theory emphasizing general concepts and group theory; ligand field theory; application of physical methods to predict the geometry, magnetism, and electronic spectra of transition metal complexes. Prerequisites: 151, 173. GER:DB-NatSci
3 units, Spr (Solomon, E)

CHEM 155. Advanced Inorganic Chemistry—(Same as 255; graduate students register for 255.) Chemical reactions of organotransition metal complexes and their role in homogeneous catalysis. Analogous patterns among reactions of transition metal complexes in lower oxidation states. Physical methods of structure determination. Prerequisite: 151, one year of physical chemistry.
3 units, Spr (Waymouth, R)

CHEM 171. Physical Chemistry—Chemical thermodynamics; fundamental principles, Gibbsian equations, systematic deduction of equations, equilibrium conditions, phase rule, gases, solutions. Prerequisites: 31A,B, or 31X, 35; MATH 51. GER:DB-NatSci
3 units, Aut (Pande, V)

CHEM 173. Physical Chemistry—Introduction to quantum chemistry: the basic principles of wave mechanics, the harmonic oscillator, the rigid rotator, infrared and microwave spectroscopy, the hydrogen atom, atomic structure, molecular structure, valence theory. Prerequisites: MATH 51, 53; PHYSICS 41, 43. Recommended: PHYSICS 45. GER:DB-NatSci
3 units, Win (Boxer, S)

CHEM 174. Physical Chemistry Laboratory I—Experimental investigations in spectroscopy, thermodynamics, and electronics. Students take measurements on molecular systems, design and build scientific instruments, and computer-automate them with software that they write themselves. Prerequisites: 134, MATH 51, PHYSICS 44. Corequisite 173. GER:DB-NatSci
4 units, Win (Moylan, C)

CHEM 175. Physical Chemistry—Introduction to kinetic theory and statistical mechanics: molecular theory of matter and heat, transport phenomena in gases, Boltzmann distribution law, partition functions for ideal gases. Introduction to chemical kinetics: measurement of rates of reactions, relationship between rate and reaction mechanism, consideration of specific reactions, transition-state theory of reaction rates. Prerequisites: 171, 173. GER:DB-NatSci
3 units, Spr (Moerner, W)

CHEM 176. Physical Chemistry Laboratory II—Use of chemical instrumentation to study physical chemical time-dependent processes. Experiments include reaction kinetics, fluorimetry, and nuclear magnetic and electron spin resonance spectroscopy. Lab. Prerequisite: 173. GER:DB-NatSci
3 units, Spr (Dai, H)

CHEM 181. Biochemistry I—(Same as BIOSCI 188/288, CHEMENG 181/281; CHEMENG offerings formerly listed as 188/288.) Chemistry of major families of biomolecules including proteins, nucleic acids, carbohydrates, lipids, and cofactors. Structural and mechanistic analysis of properties of proteins including molecular recognition, catalysis, signal transduction, membrane transport, and harvesting of energy from light. Molecular evolution. Pre- or corequisites: CHEM 131; and CHEM 135 or 171. GER:DB-NatSci
3 units, Aut (Zare, R; Elrad, D; Altman, D)

CHEM 183. Biochemistry II—(Same as BIOSCI 189/289, CHEMENG 183/283; CHEMENG offerings formerly listed as 189/289.) Metabolism. Glycolysis, gluconeogenesis, citric acid cycle, oxidative phosphorylation, pentose phosphate pathway, glycogen metabolism, fatty acid metabolism, protein degradation and amino acid catabolism, protein translation and amino acid biosynthesis, nucleotide biosynthesis, DNA replication, recombination and repair, lipid and steroid biosynthesis. Medical consequences of impaired metabolism. Therapeutic intervention of metabolism. Prerequisite: BIOSCI 188/288 or CHEM 181 or CHEMENG 181/281 (formerly 188/288). GER:DB-NatSci
3 units, Win (Khosla, C)

CHEM 184. Biological Chemistry Laboratory—Modern techniques in biological chemistry including protein purification, characterization of enzyme kinetics, heterologous expression of His-tagged fluorescent proteins, site-directed mutagenesis, and single-molecule fluorescence microscopy. Prerequisite: 181. GER:DB-NatSci
4 units, Spr (Elrad, D; Kool, E; Zare, R; Altman, D)

CHEM 185. Biochemistry III—Advanced biophysical chemistry. Topics may include spectroscopy and other structure elucidation techniques, photochemistry, advanced quantum mechanics and statistical mechanics, and polymer structure and dynamics, emphasizing biological macromolecules and higher order systems. Prerequisites: 171, 173, 183. GER:DB-NatSci
3 units, Spr (Boxer, S)

GRADUATE

CHEM 221. Advanced Organic Chemistry—Molecular orbital theory and orbital symmetry. Thermochemistry and thermochemical kinetics. Unimolecular reaction rate theory. Methods of determining organic reaction mechanisms from a theoretical and experimental point of view. Prerequisites: 137, 175.
3 units, Aut (Du Bois, J)

CHEM 223. Advanced Organic Chemistry—Continuation of 221 with emphasis on physical methods. Prerequisite: 221 or consent of instructor.
3 units, Win (Trost, B)

CHEM 225. Advanced Organic Chemistry—Continuation of 223. Organic reactions, new synthetic methods, conformational analysis, and exercises in the syntheses of complex molecules. Prerequisite: 223 or consent of instructor.
3 units, Spr (Wender, P)

CHEM 227. Topics in Organic Chemistry—Possible topics: synthetic organic chemistry, photochemistry, inorganic-organic chemistry, bioorganic chemistry, reaction mechanisms, stereochemistry, structural chemistry of organic and biological molecules. May be repeated for credit.
3 units, Aut (Du Bois, J)

CHEM 229. Organic Chemistry Seminar—Required of graduate students majoring in organic chemistry. Students giving seminars register for 231.
1 unit, Aut, Win, Spr (Kool, E)

CHEM 231. Organic Chemistry Seminar Presentation—Required of graduate students majoring in organic chemistry for the year in which they present their organic seminar. Second-year students must enroll all quarters.
1 unit, Aut, Win, Spr (Waymouth, R)

CHEM 233A,B,C. Creativity in Organic Chemistry—Required of second- and third-year Ph.D. candidates in organic chemistry. The art of formulating, writing, and orally defending a research progress report (A) and two research proposals (B, C). Second-year students register for A and B; third-year students register for C.
1 unit, **A:** *Aut,* **B:** *Spr,* **C:** *Spr (Waymouth, R)*

CHEM 235. Applications of NMR Spectroscopy—The uses of NMR spectroscopy in chemical and biochemical sciences, emphasizing data acquisition for liquid samples and including selection, setup, and processing of standard and advanced experiments.
3 units, Win (Lynch, S)

CHEM 237. Electrochemistry—Principles of electrochemistry and their application to redox systems, electron transfer, electroanalysis, electrodeposition, electrocatalysis, batteries, and fuel cells. Prerequisite: 171 or equivalent.
3 units, not given this year

CHEM 251. Advanced Inorganic Chemistry—Chemical reactions of inorganic compounds with focus on mechanisms of reactions mediated by inorganic and organometallic complexes. The structural and electronic basis of reactivity including oxidation and reduction; kinetics and thermodynamics of inorganic reactions. Prerequisite: one year of physical chemistry.
3 units, Aut (Yandulov, D)

CHEM 253. Advanced Inorganic Chemistry—Electronic structure and physical properties of transition metal complexes. Ligand field and molecular orbital theories, magnetism and magnetic susceptibility, electron paramagnetic resonance including hyperfine interactions and zero field splitting and electronic absorption spectroscopy including vibrational interactions. Prerequisite: 153 or the equivalent.
3 units, not given this year

CHEM 255. Advanced Inorganic Chemistry—(Same as 155; see 155.)
3 units, Spr (Waymouth, R)

CHEM 258A,B,C. Research Progress in Inorganic Chemistry—Required of all second-, third-, and fourth-year Ph.D. candidates in inorganic chemistry. Students present their research progress in written and oral forms (A); present a seminar in the literature of the field of research (B); and formulate, write, and orally defend a research proposal (C). Second-year students register for A; third-year students register for B; fourth-year students register for C.
1 unit, **A:** *Win,* **B:** *Spr,* **C:** *Aut, Win (Yandulov, D)*

CHEM 259. Inorganic Chemistry Seminar—Required of graduate students majoring in inorganic chemistry.
1 unit, Aut, Win, Spr (Solomon, E)

CHEM 271. Advanced Physical Chemistry—The principles of quantum mechanics. General formulation, mathematical methods, and elementary applications of quantum theory to the structure of atoms and molecules, including variational procedures, perturbation theory, operator and matrix methods, theory of angular momentum, and elements of the electronic structure of atoms. Prerequisite: 175.
3 units, Aut (Fayer, M)

CHEM 273. Advanced Physical Chemistry—Topics in advanced quantum mechanics: vibrations and rotations of polyatomic molecules (normal modes, anharmonicity, wavefunctions and energy levels of rigid rotations, vibration-rotation interaction), ab initio electronic structure theory (Hartree-Fock, configuration interaction, multiconfiguration self-consistent-field, and many-body perturbation theory techniques), angular momentum theory (operators and wavefunctions, Clebsch-Gordan coefficients, rotation matrices), time-dependent quantum mechanics (time evolution operator, Feynman path integrals, scattering theory, Born approximation, Lipmann-Schwinger equation, correlation functions), interaction of radiation and matter (semiclassical and quantum theories of radiation, transition probabilities, selection rules). Prerequisite: 271 or PHYSICS 230.
3 units, Win (Dai, H)

CHEM 275. Advanced Physical Chemistry—The principles and methods of statistical mechanics from the ensemble point of view, statistical thermodynamics, heat capacities of solids and polyatomic gases, chemical equilibria, equations of state of fluids, and phase transitions. Prerequisite: 271.
3 units, Spr (Pande, V)

CHEM 276. Advanced Physical Chemistry—Time-dependent statistical mechanics: ensemble theory for equilibrium and nonequilibrium systems; static and dynamic correlation functions for fluctuating equilibrium systems; the relationship of correlation functions, spectroscopy, and transport; dynamical models used in chemistry, including classical mechanics, quantum mechanics, Brownian dynamics, Smoluchowski dynamics, and Markov processes. Applications to topics in physical chemistry. Prerequisite: 275.
3 units, Spr (Andersen, H)

CHEM 277. Topics in Physical Chemistry—Possible topics: structure elucidation using diffraction techniques, advanced statistical mechanics, crystal field theory, advanced quantum mechanics, magnetic relaxation, advanced thermodynamics, chemical applications of group theory. May be repeated for credit. Prerequisite: 275 or consent of instructor.
3 units, Aut (Pecora, R)

CHEM 278A,B. Research Progress in Physical Chemistry—Required of all second- and third-year Ph.D. candidates in physical and biophysical chemistry and chemical physics. Second-year students present their research progress and plans in brief written and oral summaries (A); third-year students prepare a written progress report (B).
1 unit, **A:** *Win,* **B:** *Win (Pecora, R)*

CHEM 279. Physical Chemistry Seminar—Required of graduate students majoring in physical chemistry. May be repeated for credit.
1 unit, Aut, Win, Spr (Chidsey, C)

CHEM 280. Single-Molecule Spectroscopy and Imaging—Theoretical and experimental techniques necessary to achieve single-molecule sensitivity in laser spectroscopy: interaction of radiation with spectroscopic transitions; systematics of signals, noise, and signal-to-noise; modulation and imaging methods; and analysis of fluctuations; applications to modern problems in biophysics, cellular imaging, physical chemistry, single-photon sources, and materials science. Prerequisites: 271, previous or concurrent enrollment in 273.

3 units, not given this year

CHEM 297. Bio-Inorganic Chemistry—(Same as BIOPHYS 297.) Overview of metal sites in biology. Metalloproteins as elaborated inorganic complexes, their basic coordination chemistry and bonding, unique features of the protein ligand, and the physical methods used to study active sites. Active site structures are correlated with function. Prerequisites: 153 and 173, or equivalents.

3 units, Win (Solomon, E)

CHEM 299. Teaching of Chemistry—Required of all teaching assistants in Chemistry. Techniques of teaching chemistry by means of lectures and labs.

1-3 units, Aut, Win, Spr (Moylan, C)

CHEM 300. Department Colloquium—Required of graduate students. May be repeated for credit.

1 unit, Aut, Win, Spr (Du Bois, J)

CHEM 301. Research in Chemistry—Required of graduate students who have passed the qualifying examination. Open to qualified graduate students with the consent of the major professor. Research seminars and directed reading deal with newly developing areas in chemistry and experimental techniques. May be repeated for credit. Search for adviser name on Axess.

2 units, Aut, Win, Spr, Sum (Staff)

CHEM 309. Navigating Career Options for Ph.D. Chemists—Planning a post-graduate career. Topics include career options, job search strategies, job application process, long-term career planning, and minority issues in science careers. Workshops focused on developing professional skills working with CDC and CTL, and panel discussions with chemistry Ph.D.s working in a range of fields.

1 unit, Sum (Zare, R)

CHEM 459. Frontiers in Interdisciplinary Biosciences—(Same as BIOC 459, BIOE 459, BIOSCI 459, CHEMENG 459, PSYCH 459.) (Crosslisted in departments in the schools of H&S, Engineering, and Medicine; students register through their affiliated department; otherwise register for CHEMENG 459.) For specialists and non-specialists. Sponsored by the Stanford BioX Program. Three seminars per quarter address scientific and technical themes related to interdisciplinary approaches in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and the world present breakthroughs and endeavors that cut across core disciplines. Pre-seminars introduce basic concepts and background for non-experts. Registered students attend all pre-seminars; others welcome. See http://www.stanford.edu/group/biox/courses/459.html. Recommended: basic mathematics, biology, chemistry, and physics.

1 unit, Aut, Win, Spr (Robertson, C)

RESEARCH AND SPECIAL ADVANCED WORK

CHEM 190. Introduction to Methods of Investigation—Limited to undergraduates admitted under the honors program or by special arrangement with a member of the teaching staff. For general character and scope, see 200. Prerequisite:130. Corequisite: 300.

1-5 units, Aut, Win, Spr, Sum (Staff)

CHEM 200. Research and Special Advanced Work—Qualified graduate students undertake research or advanced lab work not covered by listed courses under the direction of a member of the teaching staff. For research and special work, students register for 200.

1-15 units, Aut, Win, Spr, Sum (Staff)

CLASSICS

Emeriti: (Professors) Mark W. Edwards, Marsh H. McCall, Jr.,* Susan Treggiari, Michael Wigodsky; (*Professor, Teaching*) Edward Spofford
Chair: Richard P. Martin
Graduate Director: Joseph Manning
Undergraduate Director: Maud Gleason
Professors: Alessandro Barchiesi, Andrew M. Devine, Richard P. Martin, Ian Morris (Classics, History), Reviel Netz, Andrea Nightingale (Classics, Comparative Literature), Josiah Ober (Classics, Political Science), M. Rush Rehm (Classics, Drama), Richard Saller (Classics, History), Walter Scheidel, Michael Shanks, Susan A. Stephens
Associate Professors: Joseph Manning, Jody Maxmin (Art and Art History, Classics), Anastasia-Erasmia Peponi, Jennifer Trimble
Assistant Professors: Giovanna Ceserani, Grant Parker
Courtesy Professors: Ian Hodder, Chris Bobonich, Eva Prionas
Lecturers: Maud Gleason, Patrick Hunt, Norbert Lain

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* Recalled to active duty.

Department Offices: Building 110, Main Quad
Mail Code: 94305-2145
Phone: (650) 723-0479
Email: mgsm@stanford.edu
Web Site: http://classics.stanford.edu/

Courses given in Classics have the subject codes CLASSART, CLASSGEN, CLASSGRK, CLASSHIS, and CLASSLAT. For a complete list of subject codes, see Appendix.

The study of Classics has traditionally centered on the literature and material culture of ancient Greece and Rome, including Greek and Latin language, literature, philosophy, history, art, and archaeology. At Stanford, Classics also explores connections with ancient Egypt, ancient China, and the modern world; and specialized fields such as ancient economics, law, papyrology, and science. The department's faculty approaches Classics from an interdisciplinary perspective that crosses geographical, temporal, and thematic territories. Studying ancient epic poetry can lead to looking at modern cinema afresh; ancient Athenian politics opens new perspectives on modern politics; and Roman studies present cultural parallels just as Latin illuminates the history of English and the Romance languages. In short, Classics at Stanford is an interdisciplinary subject concerned not only with Greek and Roman civilization but also with the interaction of cultures and societies that influenced the ancient Mediterranean basin and continue to influence human society across the globe.

UNDERGRADUATE PROGRAMS

The department offers the following fields of study for degrees in Classics: Classical Studies; Ancient History; Greek; Latin; and Greek and Latin. The Classical Studies, Greek, and Latin fields of study may also be taken with a Philosophy and Literature focus. The Classics major can be completed in conjunction with a second major in the sciences or in other humanities departments. The department also offers minors in Classical Languages; History; and Literature and Philosophy.

BACHELOR OF ARTS

Those interested in majoring in Classics are encouraged to declare by the beginning of their junior year, but are urged to discuss their plans with the undergraduate director as early as possible. Students who choose the Greek and Latin field of study (option 8 below) should begin the curriculum as soon as possible because it is difficult to complete the language requirements without an early start; those with no previous knowledge of Latin or Greek should begin study in the freshman year or as early as possible in the sophomore year.

To declare the major, a student must fill out the Declaration of Major on Axess and meet with the undergraduate director in the Department of Classics. At that time, the undergraduate director assigns the student a department adviser; a student should meet with the adviser at least once a quarter. The student should then schedule an orientation with the student services officer. Each student's progress towards fulfillment of the major requirements is recorded in a file kept in the student services officer's office. It is the student's responsibility to work with the adviser to keep this file up to date.

A letter grade is required in all courses taken for the major. No course receiving a grade lower than 'C' is counted toward fulfilling major requirements.

The B.A. degree may be earned by fulfilling the requirements for one of the following fields of study or fields of study with a focus:

1. *Classical Studies:* This field of study is declared on Axess. Students are encouraged to meet with the undergraduate director to discuss options for pursuing a period of study in the Mediterranean region. This major is recommended for students who wish to study classical civilizations in depth but do not wish to study the languages to the extent required by options 4, 5, 6, 7, and 8. It is not suitable for students who wish to do graduate work in Classics or to teach Latin or Greek in high school, as the language work is insufficient for these purposes. Courses counted for the degree must be taken for a letter grade. Students must complete at least 60 units of approved courses including:
   a) CLASSGEN 176. Majors Seminar
   b) at least two courses in Latin or Greek at the 100 level or higher, *or* one course in one of the languages at the 100 level or higher, plus the series 1, 2, 3, or 51 and 52 in the other language (or an equivalent approved by the department)
   c) at least five courses with the prefix CLASSART, CLASSGEN, or CLASSHIS. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken.
2. *Classical Studies with a Philosophy and Literature Focus:* Students should declare the Classical Studies field of study on Axess, and meet with the undergraduate director concerning the Philosophy and Literature focus, and to discuss options for pursuing a period of study in the Mediterranean region. See http://philit.stanford.edu/programs.html. Courses counted for the degree must be taken for a letter grade. Students must complete at least 65 units of approved courses including:
   a) CLASSGEN 176. Majors Seminar
   b) at least five courses with the prefix CLASSART, CLASSGEN, or CLASSHIS. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken.
   c) two courses in Latin or Greek at the 100 level or higher, or one course in one of the languages at the 100 level or higher plus the series 1,2,3, or 51,52 in the other language
   d) Writing in the Major (WIM) in the Philosophy department (one introductory Philosophy course)
   e) one course in each of the following areas:
      1) aesthetics, ethics, and social and political philosophy (PHIL 170 series)
      2) philosophy of language, mind, metaphysics, and epistemology (PHIL 180 series)
      3) history of philosophy (above 100 level)
   f) PHIL 81. Philosophy and Literature
   g) two related courses in Classics or Philosophy. Students may double count a Classics course in philosophy or ancient science for one of the two related courses provided that this course fulfills the Philosophy and Literature requirements and is approved by a member of the committee in Philosophy and Literature.
   h) Philosophy and Literature capstone seminar. This year's capstone seminars are COMPLIT 154/GERLIT 154, Heidegger on Hölderlin, and PHIL 173A, Aesthetics: Metaphor across the Arts. One of these courses must be taken in the student's senior year.
3. *Ancient History:* This field of study is declared on Axess. Students are encouraged to meet with the undergraduate director to discuss options for pursuing a period of study in the Mediterranean region. Courses counted for the degree must be taken for a letter grade. Students complete at least 60 units of approved courses and must satisfy four requirements:
   a) CLASSGEN 176. Majors Seminar
   b) *core requirement:* majors must take at least three survey courses in ancient history
   c) *depth requirement:* majors must take at least 40 units of ancient history and civilization courses, drawn from courses with CLASSHIS and CLASSGEN prefixes. IHUM 31A,B, The Ancient Empires, may be counted toward this or the core requirement. Courses chosen must be approved in advance and in writing by the undergraduate director. Approval should be submitted to the student services officer for the student's academic file. With the written approval of the instructor and the undergraduate director, students may substitute graduate seminars in ancient history for some of these courses.
   d) *breadth requirement:* majors must take at least 4 units in each of the following areas: archaeology and art; comparative ancient civilizations; and historical and social theory. The courses chosen must be approved in advance by the undergraduate director, and are normally chosen from the list of areas below though courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken.
      1. archaeology and art: for example, any CLASSART course; ARTHIST 120A, 200, 200C; CASA 1/201, 90, 301
      2. comparative ancient civilizations: majors must take a course on the ancient world outside the Mediterranean and western Asia, such as ANTHSCI 3, 7, 103, 141; HISTORY 192
      3. historical and social theory: for example, CASA 1/201, 90; HISTORY 107, 206; SOC 1, 110, 113, 140, 142, 170
4. *Greek:* This field of study is declared on Axess. Beginning courses in Greek, if required, may be counted towards the total of 60 units. Relevant courses in other departments of the humanities may count towards the major with the consent of the undergraduate director. Students are encouraged to meet with the undergraduate director to discuss options for pursuing a period of study in the Mediterranean region. Courses counted for the degree must be taken for a letter grade. Students must complete at least 60 units of approved courses including:
   a) CLASSGEN 176. Majors Seminar
   b) a minimum of 31 units in Greek courses at the 100 level or higher. It is recommended that one of these courses be CLASSGRK 175A, although this course should not be taken until students have completed three years of Greek.
   c) at least three courses with the prefix CLASSART, CLASSGEN, or CLASSHIS. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken.
   d) the introductory Latin sequence CLASSLAT 1,2,3, *or* 51,52, *or* one 100-level course in Latin (recommended)
5. *Greek with a Philosophy and Literature Focus*: Students should declare the Greek field of study on Axess, and meet with the undergraduate director concerning the Philosophy and Literature focus, and to discuss options for pursuing a period of study in the Mediterranean region. See http://philit.stanford.edu/programs. Courses counted for the degree must be taken for a letter grade. Students must complete at least 65 units of approved courses including:
   a) CLASSGEN 176. Majors Seminar
   b) at least three courses with the prefix CLASSART, CLASSGEN, or CLASSHIS. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval

must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken.

c) 31 units in Greek courses at the 100 level or higher
d) Writing in the Major (WIM) in the Philosophy Department (one introductory Philosophy course)
e) one course in each of the following areas:
    1) aesthetics, ethics, and social and political philosophy (PHIL 170 series)
    2) philosophy of language, mind, metaphysics, and epistemology (PHIL 180 series)
    3) history of philosophy (above 100 level)
f) PHIL 81. Philosophy and Literature
g) two related courses in Classics or Philosophy. Students may double count a Classics course in philosophy or ancient science for one of the two related courses provided that this course fulfills the Philosophy and Literature requirements and is approved by a member of the committee in Philosophy and Literature.
h) Philosophy and Literature capstone seminar; this year's capstone seminars are COMPLIT 154/GERLIT 154, Heidegger on Hölderlin, and PHIL 173A, Aesthetics: Metaphor across the Arts. One of these courses must be taken in the student's senior year.

6. *Latin:* This field of study is declared on Axess. Beginning courses in Latin, if required, may be counted towards the total of 60 units. Relevant courses in other departments of the humanities may count towards the major with the consent of the undergraduate director. Students are encouraged to meet with the undergraduate director to discuss options for pursuing a period of study in the Mediterranean region. Courses counted for the degree must be taken for a letter grade. Students must complete at least 60 units of approved courses including:
    a) CLASSGEN 176. Majors Seminar
    b) a minimum of 31 units in Latin courses at the 100 level or higher. It is recommended that one of these courses be CLASSLAT 175A, although this course should not be taken until students have completed three years of Latin.
    c) at least three courses with the prefix CLASSART, CLASSGEN, or CLASSHIS. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken.
    d) the introductory sequence CLASSGRK 1,2,3, *or* 51,52, *or* one 100-level course in Greek (recommended)
7. *Latin with a Philosophy and Literature Focus:* Students should declare the Latin field of study on Axess, and meet with the undergraduate director concerning the Philosophy and Literature focus, and to discuss options for pursuing a period of study in the Mediterranean region. See http://philit.stanford.edu/programs. Courses counted for the degree must be taken for a letter grade. Students must complete at least 65 units of approved courses including:
    a) CLASSGEN 176. Majors Seminar
    b) at least three courses with the prefix CLASSART, CLASSGEN, or CLASSHIS. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken.
    c) 31 units in Latin courses at the 100 level or higher
    d) Writing in the Major (WIM) in the Philosophy Department (one introductory Philosophy course)
    e) one course in each of the following areas:
        1) aesthetics, ethics, and social and political philosophy (PHIL 170 series)
        2) philosophy of language, mind, metaphysics, and epistemology (PHIL 180 series)
        3) history of philosophy (above 100 level)
    f) PHIL 81. Philosophy and Literature
    g) two related courses in Classics or Philosophy. Students may double count a Classics course in philosophy or ancient science for one of the two related courses provided that this course fulfills the Philosophy and Literature requirements and is approved by a member of the committee in Philosophy and Literature.
    h) Philosophy and Literature capstone seminar. This year's capstone seminars are COMPLIT 154/GERLIT 154, Heidegger on Hölderlin, and PHIL 173A, Aesthetics: Metaphor across the Arts. One of these courses must be taken in the student's senior year.
8. *Greek and Latin:* This field of study is declared on Axess. Relevant courses in other departments of the humanities may count towards the major with the consent of the undergraduate director. Students are encouraged to meet with the undergraduate director to discuss options for pursuing a period of study in the Mediterranean region. Courses counted for the degree must be taken for a letter grade. Students must complete at least 60 units of approved courses including:
    a) CLASSGEN 176. Majors Seminar
    b) 30 units in Greek courses and the same number in Latin. It is recommended that students take either or both CLASSGRK or CLASSLAT 175A, although these courses should not be taken until students have completed three years of the respective language.
    c) it is recommended that students take a course in ancient history

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Note 1: University credit earned by placement tests or advanced placement work in secondary school is not counted towards any major program in the department; work done in other universities or colleges is subject to department evaluation.

MINORS

The undergraduate director meets with each student who opts for a minor to discuss curriculum choices and assigns the student an adviser in the relevant field. Students are required to work closely with their advisers to create a cohesive curriculum within each area. Students may organize their curriculum according to different principles: for example, they may wish to focus on a specific historical period (classical Athens, imperial Rome), or on a specific theme or topic (women in antiquity). After consulting with the adviser, each student must submit (in writing) a proposed curriculum to the undergraduate director. Students may proceed with the minor when the undergraduate director has approved the proposal. Courses offered in Greek and Latin above the 100 level may count toward the minor, provided the subject matter is suitable. Students who minor in Classics are required to take CLASSGEN 176, Majors Seminar, which is writing intensive.

Students may choose among three minors in Classics:

1. *Classical Languages*: students are required to take a minimum of five courses in Greek or in Latin. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken. In addition to the five required courses, students must take CLASSGEN 176, Majors Seminar. Students wishing to combine Greek and Latin may only do so if courses for one of the two languages are all above the 100 level; for example, CLASSGRK 1, 10, plus CLASSLAT 103, 111, 175.
2. *History:* students are required to take a minimum of five courses in history, art history, and archaeology. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken. In addition to the five required courses, students must take CLASSGEN 176, Majors Seminar. Courses offered in Latin and Greek that focus on historical topics or authors may count toward the minor.
3. *Literature and Philosophy:* students are required to take a minimum of five courses in classical literature or philosophy, including classical science. Courses listed in the department's cognate course list may be substituted for one or more of these courses with prior written approval

from the undergraduate director; written approval must be submitted to the student services officer for inclusion in the student's academic file prior to the end of the term in which the course is taken. In addition to the five required courses, students must take CLASSGEN 176, Majors Seminar. Courses offered in Latin and Greek that focus on philosophical or literary topics or authors may count toward the minor.

HONORS PROGRAMS

A minimum grade point average (GPA) of 3.3 in Classics courses is required for students to enroll in the honors program. To be considered for honors in Classics, the student must select a professor who can supervise his or her honors thesis. Together with the supervisor, the student writes a two- to three-page proposal at the beginning of the senior year. The proposal should outline the project in detail, list relevant courses that have been taken, and name the supervisor. The department gives approval only if it is satisfied that the student has a sufficient basis of knowledge derived from department course work in the general areas the thesis covers, such as art, Greek, Latin, history, literature, or philosophy. If the proposal is approved, the student may sign up for CLASSGEN 199, Undergraduate Thesis: Senior Research, during one or two quarters of the senior year for a maximum of 6 units a term, up to an overall total of 10 units. Honors are awarded only if the essay receives a grade of 'B+' or higher from the supervisor and a second reader.

HUMANITIES

The honors program in Humanities is available for Classics majors with appropriate interests; see the "Interdisciplinary Studies in Humanities" section of this bulletin.

DIGITAL HUMANITIES MODULE

The Classics department, in collaboration with the Humanities Lab, also offers a digital humanities module that can be combined with any of the department's major programs. Students who are interested in digital humanities should contact the department's undergraduate director who facilitates coordination with the Humanities Lab. Students planning to combine a Classics major and the digital humanities module must fulfill the following requirements in addition to the general Classics major requirements:

1. CS 105 or equivalent
2. Participate in the Humanities Lab gateway core seminar, HUMNTIES 198J/ENGLISH 153H, Digital Humanities: Literature and Technology (5 units)
3. Complete the HUMNTIES 201, Digital Humanities Practicum (2-5 units), in the junior year
4. Complete one digital project, in lieu of the course's main writing requirement, in a course offered in the department under the supervision of the course instructor and humanities lab adviser. This should usually be done in an upper-division course.

Students are encouraged to enroll in DLCL 99, Multimedia Course Lab, when working on the digital course project. For more information on the Digital Humanities Lab, see http://shl.stanford.edu.

STUDY ABROAD

Funding—Students whose record in Classics indicates that they are qualified may apply for funding from the Department of Classics. Students must submit a proposal to the undergraduate director as part of the Undergraduate Summer Research Grant Application; see the undergraduate page at http://classics.stanford.edu/ for the application. The proposal should include an itemized list of expenses based on the fees charged by the program, including room, board, tuition, and other expenses. Limited funding is available each year; preference is shown to students with strong records.

Programs—

1. *Rome:* Classics majors are encouraged to apply for the Intercollegiate Center for Classical Studies (http://studyabroad.duke.edu/iccs/index.php) in Rome which is managed by Duke University for about 50 constituent colleges and universities. It is open to Stanford majors in Classics, History, and Art History. All courses receive full credit at Stanford and may be applied to the respective major. Students interested in this program should consult the undergraduate director and the ICCS representative in the Department of Classics as early as possible in their career at Stanford to plan their course preparation and application. Competition is strong and applicants are expected to have taken one or more courses in Roman history and at least two years of Latin before they arrive in Rome. Brochures are available at the department office.

   Other programs offer a quarter, semester, or summer session in Rome. Interested students are urged to visit Bechtel International Center.
2. *Greece:* students are encouraged to apply for the summer session at the American School of Classical Studies in Athens (http://www.ascsa.edu.gr). The school is recommended principally for Classics majors with at least two years of ancient Greek. A student wishing to apply should prepare by taking courses in Greek history, archaeology, and art; beginning modern Greek is strongly recommended. Applicants should see the undergraduate director early in the academic year. Other programs such as College Year in Athens (http://www.cyathens.org) offer a quarter, semester, or summer session in Greece. Interested students should visit Bechtel International Center.

GRADUATE PROGRAMS

MASTER OF ARTS

University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin.

I and II. Language and Literature, and Philosophy Fields of Study—Students who have completed an undergraduate major in Classics (Greek, Latin, or Greek and Latin fields of study) or equivalent may be accepted as candidates for the M.A. degree in Classics and may expect to complete the program in twelve months (usually three quarters of course work plus three months study for the thesis or examination). Students with an undergraduate major in Classics (Ancient History or Classical Studies fields of study) or without an undergraduate major in Classics may also be accepted as candidates, though they may require a longer period of study before completing the requirements for the degree. These requirements are:

1. Attaining a standard of scholarship such as would be reached by three quarters of study in the department after fulfilling the requirements for an undergraduate major in the department. Normally, this means completing at least 25 units of graduate courses and 20 additional units of work at the 100 level or higher.
2. Completion of one Greek course at the 100 level (if the undergraduate major field of study was Latin) or one Latin course at the 100 level (if the undergraduate major major field of study was Greek). This requirement is waived for students with an undergraduate major in Classics (Greek and Latin field of study).
3. Passing an examination testing the candidate's ability to translate into English from a selected list of Greek and/or Latin authors.
4. Completion of the 275A,B sequence in at least one language (Latin or Greek).
5. Writing a thesis, or passing of an examination on a particular author or topic, or having written work accepted by the graduate committee as an equivalent. Three completed and satisfactory seminar papers are normally an acceptable equivalent.
6. A reading examination in French or German; these examinations are administered every quarter.
7. Completion and approval of a Program Proposal for a Master's Degree form before the end of the first quarter of enrollment.

Candidates for the Ph.D. degree may also, on the recommendation of the department, become candidates for the M.A. degree. In this case, requirement '5' above is waived provided that the student has completed some work beyond the course requirements listed under requirements '1' and '2' above.

III. Classical Archaeology—Students who have completed an undergraduate major in Classics with a Classical Archaeology field of study, or in a closely related field, may be accepted as candidates for the M.A. degree in Classics with a Classical Archaeology field of study, and may expect to complete the program in twelve months (usually three quarters of course work plus three months study for the thesis or examination). Students without an undergraduate major in Classics with a Classical Archaeology field of study may also be accepted as candidates, though they may require a longer period of study before completing the requirements for the degree. These requirements are:

1. Attaining a standard of scholarship such as would be reached by three quarters of study in the department after fulfilling the requirements for an undergraduate major in the department. Normally, this means completing at least 25 units of graduate courses and 20 additional units of work at the 100 level or higher.
2. Completion with a grade of 'B' or higher of at least 15 units of graduate-level courses in classical archaeology, not including CLASSART 302.
3. Passing an examination designed to test the candidate's ability to translate into English from either ancient Greek or Latin.
4. Completion with a grade of 'B' or higher of CLASSART 302, Classical Archaeology: Experiences of the Discipline, or an equivalent course on the history of thought in classical archaeology approved by the Classics department's graduate committee.
5. Writing a thesis, or passing an exam on a particular topic, or having written work accepted by the graduate committee as an equivalent. Three completed and satisfactory seminar papers are normally an acceptable equivalent.
6. Passing a reading examination in French, German, or Italian. These examinations are administered every quarter.
7. Completion and approval of a Program Proposal for a Master's Degree form before the end of the first quarter of enrollment.

Candidates for the Ph.D. degree may also, on the recommendation of the department, become candidates for the M.A. degree. In their case, requirement '5' above is waived provided that the student has completed some work beyond the course requirements listed under requirements '1' and '2' above.

IV. Ancient History—Students who have completed an undergraduate major in Classics with a Classical Archaeology field of study, or in a closely related field may be accepted as candidates for the M.A. degree in Classics with an Ancient History field of study, and may expect to complete the program in twelve months (usually three quarters of course work plus three months study for the thesis or examination). Students without an undergraduate major in Classics with a Classical Archaeology field of study may also be accepted as candidates, though they may require a longer period of study before completing the requirements for the degree. These requirements are:

1. Attaining a standard of scholarship such as would be reached by three quarters of study in the department after fulfilling the requirements for an undergraduate major in the department. Normally, this means completing 30 units of graduate courses and 15 additional units of work at the 100 level or higher.
2. Satisfactory completion of 20 units of graduate-level courses in Classics and of 10 units of graduate-level courses in other programs.
3. Satisfactory completion of 15 additional units of courses in either ancient Greek or Latin.
4. Writing a thesis, or passing an exam on a particular topic, or having written work accepted by the Graduate Committee as an equivalent. Three completed and satisfactory seminar papers are normally an acceptable equivalent.
5. Passing a reading examination in French, German, or Italian. These examinations are administered every quarter.
6. Completion and approval of a Program Proposal for a Master's Degree form before the end of the first quarter of enrollment.

Candidates for the Ph.D. degree may also (on the recommendation of the department) become candidates for the M.A. degree. In their case, requirement "4" above is waived provided that they have completed some work beyond the course requirements listed under requirements "1" and "2" above.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin. There are four specializations within the Classics Ph.D. program: language and literature; classical archaeology; ancient history; and ancient philosophy.

I. Language and Literature—Candidates for the Ph.D. degree in Classics with specialization in language and literature must fulfill the following requirements:

1. Complete 135 units of academic credit or equivalent in study beyond the bachelor's degree at the end of the fourth year.

   This includes:
   a) Greek and Latin survey sequence (CLASSGEN 207-208)
   b) Greek and Latin syntax sequence (CLASSGRK 275A,B *and* CLASSLAT 275A,B)
   c) semantics of grammar sequence (CLASSGEN 205A,B)
   d) twelve graduate seminars, nine of which must be Classics seminars, and one of the remaining three of which must be outside the department. The other two seminars may be in Classics, from other departments (with the graduate director's approval), and/or directed readings. However, no more than two directed readings can be taken. Classics seminars are generally offered for 4-5 units. In some cases, instructors allow a student to complete a seminar for 4 units without requiring a written paper but with completion of all other requirements.
2. Examinations:
   a) Students must take Greek and Latin translation exams at the end of each survey sequence (the end of the first and second years). These exams are based on the Greek and Latin reading lists available on the Classics Department web site at: http://www.stanford. edu/dept/classics. Greek and Latin survey courses cover less than half of the material on which the translation exams test, and students need to prepare much of the work on their own. It is possible to take both exams in the same year if the student chooses. However, students are obligated to take the exam in the language which the survey has covered that year. The exam consists of a choice of six of eight passages, and students are allowed three hours. A grade of 'B-' or higher, on every passage, is required to pass. If a student does not attain a 'B-', the exam must be retaken later in the summer before registering for the Autumn Quarter, in order to continue in the program. In order to retake an exam during Summer Quarter, a student must be registered at Stanford at their own expense; the department does not cover tuition in these instances. The exam can only be retaken once.
   b) Students must pass modern language translation exams in both German and French; Italian or modern Greek may be substituted in place of French, with consent of the graduate director. Students arrange with the student services officer to take the exam. One modern language exam must be passed by the end of the second year, the other by the end of the third year. These examinations are administered once each quarter.
   c) At the beginning of Autumn Quarter of the third year, students take general examinations in four of the following fields: Greek literature, Latin literature, ancient philosophy, Greek history, and Roman history. Students select the fields in consultation with the graduate director no later than June of the second year of graduate study. Candidates must have taken at least one course at Stanford in each of the chosen fields (in the case of ancient philosophy, a seminar or its equivalent); students need to confer with the professor overseeing the exam. General examinations must be taken by October of the third year.
   d) the University oral examination, which is a defense of the candidate's dissertation
3. The graduate director assigns a dissertation proposal director to each candidate who has passed the general examination. During the third year, the candidate, in consultation with the dissertation proposal director, prepares a dissertation proposal which is examined by the dissertation proposal defense committee (set up by the dissertation proposal director and consisting of the dissertation proposal director and two other faculty members, one of whom may be from outside the department), no later than the end of the first quarter of the fourth year.

If the proposal is deemed unsatisfactory, this proposal examination is repeated in the following quarter and must be passed. Subsequently, each candidate, in consultation with the graduate director and the dissertation proposal director, selects a dissertation director who must be a member of the Academic Council. The candidate, the dissertation director, and the graduate committee collaborate to select an appropriate dissertation reading committee. Two of the three members of the reading committee, including the chair, must be members of the Academic Council.

4. Students are required to undertake the equivalent of four, one quarter courses of teaching under department supervision. This teaching requirement is normally completed during the second and third years of study. Summer teaching does not satisfy this requirement.
5. A typical program for a graduate student in Classics is as follows. First year: CLASSLAT 275A,B (6 units), CLASSGRK 275A,B (6 units), CLASSGEN 205A,B, Semantics (3 units), either CLASSGEN 207A-C or 208A-C, Literature Survey (offered alternate years; 15 units), and three elective seminars (12-15 units). Second year: either CLASSGEN 207A-C or 208A-C, Literature Survey (offered alternate years) (15 units), five to nine elective seminars (20-45 units), and one to three teaching assistantships (9-27 units). Third year: three to eight elective seminars (12-40 units), one to three teaching assistantships (9-27 units). Fourth year: three quarters of predoctoral dissertation research assistantship (30 units).

II. Classical Archaeology—Candidates for the Ph.D. degree in Classics with a specialization in classical archaeology must fulfill the following requirements:

1. Complete 135 units of academic credit or equivalent in study beyond the bachelor's degree at the end of the candidate's fourth year.

   These must include:
   - a) at least three graduate (200) level courses in Latin and/or Greek literature
   - b) History of Classical Archaeology (CLASSART 201), to be taken as early as possible in the candidate's Stanford career
   - c) the interdepartmental graduate core sequence in archaeology. The Archaeology Center announces the courses which fulfill this requirement. The core sequence currently comprises a seminar in archaeology theory and a course on archaeological methods.
   - d) at least one further course outside the Classics department
   - e) at least five graduate seminars in classical archaeology
   - f) at least three graduate seminars in ancient history
   - g) Students may petition to count independent study courses in place of up to two required courses, but no more.
   - h) Students who enter the program with only one ancient language at the level needed for graduate study are strongly encouraged to take additional course work to reach graduate (200 and above) level in another language.
   - i) Students are urged to enroll in or audit other undergraduate courses that may fill gaps in their undergraduate training
   - j) All students are expected to take part in archaeological fieldwork in the classical world areas.
   - k) At least three consecutive quarters of course work must be taken at Stanford.
2. Examinations:
   - a) As soon as students arrive, they must take a diagnostic exam in either Greek or Latin. Depending on performance, students may be required to enroll in undergraduate language classes in that language to improve their skills to the level required for graduate work.
   - b) reading examinations in two of the following languages: French, German, Italian, and modern Greek. Candidates may petition to substitute a different modern language for one of these, if their area of specialization requires it. One modern language exam must be passed by the end of the second year, the other by the end of the third year. These examinations are administered once each quarter.
   - c) a translation examination from Latin or Greek into English. This examination must be taken either at the end of the first year or at the end of the second year. A grade of 'B-' or higher on every passage is required to pass. If a student does not attain a 'B-,' the exam must be retaken later in the summer before registering for Autumn Quarter, in order to continue in the program. In order to retake an exam during Summer Quarter, a student must be registered at Stanford at their own expense; the department does not cover tuition in these instances. The exam can only be retaken once.
   - d) general examinations in Greek archaeology and Roman archaeology, and two of the following fields: Greek literature, Latin literature, ancient philosophy, Greek history, Roman history. Candidates select the fields in consultation with the graduate director no later than the first week of Spring Quarter of the second year of graduate study. Candidates must have taken at least one course at Stanford in each of the chosen fields (in the case of ancient philosophy, a seminar or its equivalent). General examinations must be taken by October of the third year.
   - e) the University oral examination, which is a defense of the candidate's dissertation
3. The graduate director assigns a dissertation proposal director to each candidate who has passed the general examination. During the third year, the candidate, in consultation with the dissertation proposal director, prepares a dissertation proposal which is examined by the dissertation proposal defense committee (set up by the dissertation proposal director and consisting of the dissertation proposal director and two other faculty members, one of whom may be from outside the department), no later than the end of the first quarter of the fourth year. If the proposal is deemed unsatisfactory, this proposal examination is repeated in the following quarter and must be passed. Subsequently, each candidate, in consultation with the graduate director and the dissertation proposal director, selects a dissertation director who must be a member of the Academic Council. The candidate, the dissertation director, and the graduate committee collaborate to select an appropriate dissertation reading committee. Two of the three members of the reading committee, including the chair, must be members of the Academic Council.
4. Students are required to undertake the equivalent of four, one quarter courses of teaching under department supervision. This teaching requirement is normally completed during the second and third years of study. Summer teaching does not satisfy this requirement.

III. Ancient History—Candidates for the Ph.D. degree in Classics with specialization in ancient history must fulfill the following requirements:

1. Complete 135 units of academic credit or equivalent in study beyond the bachelor's degree at the end of the fourth year. This includes:
   - a) in the Autumn Quarter of the first year, Approaches to History (HISTORY 304), offered in the History department
   - b) two proseminars. These introduce students to primary sources of evidence for ancient history that require special training: papyrology, epigraphy, paleography, numismatics, and archaeology. The department should offer one each year, but students may also fulfill this requirement by doing a directed reading, or (with the approval of the ancient history track adviser) by taking a course at another university with which Stanford has an exchange agreement.
   - c) three skills courses relevant to the individual student's chosen research approach. For example, a student could take classes in economics, demography, legal history, or anthropology. The skills courses can also be used to learn other ancient or modern languages, either by course work or directed reading. Students need to consult with their advisers and the graduate director.
   - d) 10 graduate seminars: These normally have course numbers in the 200s, 300s, or 400s. Most of these are taken in the department, but students may also take seminars outside the department or at another university with which Stanford has an exchange agreement. Approval from the ancient history adviser and the graduate director must be obtained prior to exercising this option. While only two of the ten seminars can be replaced by directed readings, up to three additional seminars may be taken outside the department. This leaves five ancient history seminars that must be chosen from those in the department. Other Classics graduate seminars may be substituted for these ancient history seminars, with approval of the ancient history track adviser.

   e) The range and sequence of other courses to be taken depend on which of the following two options the student selects within the Ancient History track.
      1. *Option 1*: Students focus more on one language. This requires students to take: the three quarter survey course in either Greek or Latin (CLASSGEN 207A,B,C or CLASSGEN 208 A,B,C); the fifteen-week syntax course in the same language (CLASSGRK 275A,B or CLASSLAT 275A,B); one quarter of the survey course sequence in the other language; and the two quarter Semantics of Grammar sequence (CLASSGEN 205A,B).
      2. *Option 2:* Students emphasize broader linguistic skills. This requires students to take the three quarter survey sequence in both Greek and Latin (CLASSGEN 207A,B,C and 208A,B,C).
2. Examinations:
   a) As soon as students arrive, they take diagnostic exams in two areas of ancient history. Choices are: Egyptian, Greek, and Roman history. The test is mainly on narrative history, especially important names, dates, and events. Depending on performance, students may be asked to sit in on the undergraduate history courses and take directed reading or a graduate survey if offered. Reading lists are available upon request.
   b) Students must take the final offered at the end of each quarter of Greek or Latin survey (for Option 1 above) or both Greek and Latin surveys (for Option 2 above). Students must earn a 'B-' or higher on each final to pass.
   c) Students must pass modern language translation exams in both German and French; Italian or modern Greek may be substituted in place of French with consent of the graduate director. One modern language exam must be passed by the end of the second year, the other by the end of the third year. These examinations are administered once each quarter.
   d) Students must pass general exams in two areas in history (Egyptian, Greek, or Roman) and two of the following fields: Greek literature, Latin literature, Greek archaeology, Roman archaeology, or ancient philosophy. Students select the fields in consultation with the graduate director no later than June of their second year of graduate study. Candidates must have taken at least one course at Stanford in each of the chosen fields (in the case of ancient philosophy, a seminar or its equivalent). General examinations must be taken by October of the third year. In preparing for the general examinations, candidates are expected to make full use of relevant secondary material in modern languages. They should therefore plan to satisfy the requirements in French and German as soon as possible, preferably before the translation examinations.
   e) the University oral examination which is a defense of the candidate's dissertation.
3. The graduate director assigns a dissertation proposal director to each candidate who has passed the general examination. During the third year, the candidate, in consultation with the dissertation proposal director, prepares a dissertation proposal which is examined by the dissertation proposal defense committee (set up by the dissertation proposal director and consisting of the dissertation proposal director and two other faculty members, one of whom may be from outside the department), no later than the end of the first quarter of the fourth year. If the proposal is deemed unsatisfactory, this proposal examination is repeated in the following quarter and must be passed. Subsequently, each candidate, in consultation with the graduate director and the dissertation proposal director, selects a dissertation director who must be a member of the Academic Council. The candidate, the dissertation director, and the graduate committee collaborate to select an appropriate dissertation reading committee. Two of the three members of the reading committee, including the chair, must be members of the Academic Council.
4. Candidates are required to undertake the equivalent of four, one quarter courses of teaching under department supervision. This teaching requirement is normally completed during the second and third years of study. Summer teaching does not satisfy this requirement.

IV. Joint Program in Ancient Philosophy—This specialization is jointly administered by the departments of Classics and Philosophy and is overseen by a joint committee composed of members of both departments. It provides students with the training, specialist skills, and knowledge needed for research and teaching in ancient philosophy while producing scholars who are fully trained as either philosophers or classicists.

Graduate students admitted by the Classics department receive their Ph.D. from the Classics department. This specialization includes training in ancient and modern philosophy. Each student in the program is advised by a committee consisting of one professor from each department.

Candidates for the Ph.D. degree in Classics with specialization in ancient philosophy must fulfill the following requirements:

1. Complete 135 units of academic credit or equivalent in study beyond the bachelor's degree at the end of the fourth year. This includes:
   a) all the requirements listed for the language and literature specialization in the graduate program in Classics (see "I" above).
   b) three courses in the Philosophy department (including 100/200 and two courses at the 200 level or higher). These include:
      1. one course in logic which can be fulfilled at the 100 level or higher
      2. one course in aesthetics, ethics, or political philosophy
      3 one course in metaphysics, epistemology, philosophy of mind, or philosophy of science
   c) at least three courses in ancient philosophy at the 200 level or above, one of which must be in the Philosophy department
   d) all courses taken in the Philosophy department count for seminar credit (i.e., as contributing to the 12 seminar requirement in the Language and Literature track in the Classics department).
2. *Examinations:* The requirements are the same as those listed in the language and literature specialization, except that one of the four areas of general examination must be taken in ancient philosophy.
3. The graduate director assigns a dissertation proposal director to each candidate who has passed the general examination. During the third year, the candidate, in consultation with the dissertation proposal director, prepares a dissertation proposal which is examined by the dissertation proposal defense committee (set up by the dissertation proposal director and consisting of the dissertation proposal director and two other faculty members, one of whom may be from outside the department), no later than the end of the first quarter of the fourth year. If the proposal is deemed unsatisfactory, this proposal examination is repeated in the following quarter and must be passed. Subsequently, each candidate, in consultation with the graduate director and the dissertation proposal director, selects a dissertation director who must be a member of the Academic Council. The candidate, the dissertation director, and the graduate committee collaborate to select an appropriate dissertation reading committee. Two of the three members of the reading committee, including the chair, must be members of the Academic Council.
4. Students are required to undertake the equivalent of four, one quarter courses of teaching under department supervision. This teaching requirement is normally completed during the second and third years of study. Summer teaching does not satisfy this requirement.

PH.D. MINOR

For a graduate minor, the department recommends at least 20 units in Latin or Greek at the 100 level or above, and at least one course at the graduate (200) level.

CLASSICS AND A MINOR FIELD

The Ph.D. in Classics may be combined with a minor in another field, such as anthropology, history, humanities, or classical linguistics. Requirements for the minor field vary, but might be expected to involve about six graduate-level courses in the field and one written examination, plus a portion of the University oral exam (dissertation defense). Such a program is expected to take five years. The department encourages such programs for especially able and well prepared students. See the department *Graduate Handbook* for more information. The following timetable would be typical for a five-year program:

First Year: course work, almost entirely in Classics. One translation exam taken in June. One or both modern language exams taken.
Second Year: course work, both in Classics and the minor field. Second translation exam completed. French and German exams completed.
Third Year: course work, both in Classics and the minor field. General examinations in Classics.
Fourth Year: remaining course work, both in Classics and the minor field. General examination in the minor field. Preparation for dissertation.
Fifth Year: dissertation, University oral examination.

GRADUATE PROGRAM IN HUMANITIES

The Department of Classics participates in the Graduate Program in Humanities leading to the joint Ph.D. degree in Classics and Humanities. For a description of that program see the "Interdisciplinary Studies in Humanities" section of this bulletin.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Comparative Literature, English, French and Italian, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese, in the Program in Modern Thought and Literature, and in the Division of Literatures, Cultures, and Languages. For courses in modern Greek language with the subject code SPECLANG, see the "Language Center" section of this bulletin.

INTRODUCTION TO THE HUMANITIES (IHUM)

The following Introduction to the Humanities courses are taught by Classics department faculty members. IHUM courses are typically available only to freshmen seeking to fulfill IHUM requirements; see the "Introduction to the Humanities" section of this bulletin for further information. Prospective majors in Classics are advised to consider satisfying their IHUM requirements by registering for the following courses.

IHUM 39A,B. Inventing Classics: Greek and Roman Literature in Its Mediterranean Context—Two quarter sequence. The ancient Mediterranean world was as consumed with questions about the nature of human society and human existence as is present-day society. Sources include influential literary texts from Greece and Rome, and from other cultures in the Mediterranean and the Near East, organized by literary genre. The origins of such genres. GER:IHUM-2,3

IHUM 39A: *4 units, Win (McCall, M)*
IHUM 39B: *4 units, Spr (Martin, R)*

GREEK

UNDERGRADUATE

Courses in Greek have the subject code CLASSGRK. Classics majors and minors must take courses for letter grade.

Students whose major work is in another department and who wish to fulfill a departmental foreign language requirement by taking Greek should consult their department advisers to determine the precise nature of that department's requirements. Most departments are satisfied if part of the series 101, 102, 103 is completed.

CLASSGRK 1,2,3. Beginning Greek—No knowledge of Greek is assumed. Classics majors and minors must take course for letter grade. Vocabulary and syntax of the classical language. Separate section for Biblical Greek. CLASSGRK 3 fulfills University language requirement.

3-5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Porta, F)*

CLASSGRK 10. Intensive Beginning Greek—Equivalent to CLASSGRK 1, 2, and 3. Attic Greek morphology and syntax. Classics majors and minors must take course for letter grade. CLASSGRK 10 fulfills the University language requirement.

7-9 units, Sum (Staff)

INTERMEDIATE/ADVANCED

Students are admitted to these courses by completing CLASSGRK 3 or 10, or on the basis of previous work in secondary school or elsewhere. Usually two to three years of secondary school Greek qualifies a student for 101, three to four years for 111. Students with previous knowledge of Greek should consult the Undergraduate Director in Classics to determine the course for which they are best suited.

CLASSGRK 101. Intermediate Greek: Lucian—Selections from Lucian's satires including *True History*. Focus is on grammar, syntax, style, and comprehension of a literary text. Literary and cultural contexts. Classics majors and minors must take course for letter grade. May be repeated for credit.

3-5 units, Aut (Jones, E)

CLASSGRK 102. Intermediate Greek: Greek Tragedy—Close reading of Aeschylus' *Prometheus Bound*. Classics majors and minors must take course for letter grade. May be repeated for credit.

4-5 units, Win (McCall, M)

CLASSGRK 103. Intermediate Greek: Homer—Selections from the *Iliad*. Focus is on reading Homeric poetry with fluency and rapid comprehension. Style, meter, poetic techniques, and cultural background. Classics majors and minors must take course for letter grade. May be repeated for credit.

3-5 units, Spr (Haas, C)

CLASSGRK 112. Advanced Greek: Lyric Poetry—Invectives, love songs, drinking songs, elegies, and choral odes from 700-500 B.C.E. Readings include Sappho, Alcaeus, Archilochus, Mimnermus, Alcman, Solon, and Pindar. Classics majors and minors must take course for letter grade. May be repeated for credit.

3-5 units, Win (Peponi, A)

CLASSGRK 113/213. Advanced Greek: Palaeography—(Graduate students register for 213.) Reading Greek scientific texts; introduction to reading from parchment codices, emphasizing current digital practice. Classics majors and minors must take course for letter grade. May be repeated for credit.

3-5 units, Spr (Netz, R)

CLASSGRK 175A,B/275A,B. Greek Syntax: Prose Composition—(First-year graduate students register for 275A,B.) Review of Greek grammar and instruction in Greek prose composition skills. Begins sixth week of Winter Quarter and continues through Spring Quarter. Classics majors and minors must take course for letter grade. Prerequisite for undergraduates: three years of Greek.

2 units, **A:** *Win,* **B:** *Spr (Clayton, B)*

LATIN

UNDERGRADUATE

Courses in Latin have subject code CLASSLAT.

Students with previous knowledge of Latin should consult the undergraduate director in Classics to determine the course for which they are best suited. Students whose major work is in another department and who wish to fulfill a departmental foreign language requirement by taking Latin should consult their department's advisers to determine the precise nature of those requirements. Most departments are satisfied if part of the series 101, 102, 103 is completed.

CLASSLAT 1,2,3. Beginning Latin: Vocabulary and Syntax—Vocabulary and syntax of the classical language, preparing students for readings including Cicero, Caesar, and Catullus. No previous knowledge of Latin is assumed. Classics majors and minors must take course for letter grade. CLASSLAT 3 fulfills the University language requirement.

3-5 units, **1:** *Aut,* **2:** *Win (Lain, N),* **3:** *Spr (Janda, S; Lain, N)*

CLASSLAT 10. Intensive Beginning Latin—Equivalent to CLASSLAT 1, 2, 3; or 51 and 52. Goal is to read easy Latin prose and poetry by the end of the quarter. Classics majors and minors must take course for letter grade. CLASSLAT 10 fulfills the University language requirement.

7-9 units, Sum (Staff)

INTERMEDIATE/ADVANCED

Students are admitted to these courses by completing CLASSLAT 3 or 10, or on the basis of previous work in secondary school or elsewhere and the results of a placement exam offered at the beginning of the school year. Usually two to three years of secondary school Latin qualifies a student for 101, three to four years for 111.

CLASSLAT 101. Intermediate Latin: Introduction to Literature—Phonology, morphology, semantics, and syntax. Readings in prose and poetry. Analysis of literary language, including rhythm, meter, word order, narrative, and figures of speech.
3-5 units, Aut (Lain, N)

CLASSLAT 102. Intermediate Latin: Cicero—The life and work of Cicero. Close reading for grammar; questions of style and the genres of his written work including philosophy and courtroom drama. Classics majors and minors must take course for letter grade. May be repeated for credit.
3-5 units, Win (Roby, C)

CLASSLAT 103. Intermediate Latin: Horace—His epodes, satires, epistles, and odes; literary and historical analysis. Classics majors and minors must take course for a letter grade. May be repeated for credit.
3-5 units, Spr (Schiesaro, A)

CLASSLAT 111. Advanced Latin: Ovid—From Ovid's earliest love elegy to the *Metamorphoses*, emphasizing literary, historical, and cultural contexts. The development of Ovid's poetic style, his use of myth, and his role as an Augustan poet. Classic majors and minors must take course for a letter grade. May be repeated for credit.
3-5 units, Aut (Totten, D)

CLASSLAT 112. Advanced Latin: Seneca—Letters of Seneca; their philosophical, literary, and cultural background. Classics majors and minors must take course for letter grade. May be repeated for credit.
3-5 units, Win (Bailey, M)

CLASSLAT 113. Advanced Latin: Tacitus Annales—Close reading of the first book of the *Annals:* Tiberius' accession following the death of Augustus in 14 C.E., the persistence of monarchy, and the diminution of a Republican constitution. Nuances and style; Tacitus' place in the tradition of ancient historical writing; and the later reception of his writings.
3-5 units, Spr (Parker, G)

CLASSLAT 175A,B/275A,B. Latin Syntax—(First-year graduate students register for 275A,B.) Intensive review of Latin syntax. Begins Autumn Quarter and continues through the fifth week of Winter Quarter. See CLASSGEN 205A,B for supplemental courses. Classics majors and minors must take course for letter grade. Prerequisite for undergraduates: three years of Latin.
4 units, **A:** *Aut,* **B:** *Win (Devine, A)*

GRADUATE

These courses have subject code CLASSGEN.

CLASSGEN 205A,B. The Semantics of Grammar—Supplements CLASSLAT/CLASSGRK 275. Introduction to the grammatical encoding of semantic and pragmatic meaning. 205A: morphology-semantics interface (gender, tense, aspect, case). 205B: syntax-pragmatics interface (Latin word order). Begins in Autumn Quarter and continues through 5th week of Winter Quarter.
2 units, **A:** *Aut,* **B:** *Win (Devine, A)*

CLASSGEN 207A,B,C/208A,B,C. Survey of Greek and Latin Literature—Required two-year sequence. Focus is on the origins, development, and interaction of Greek and Latin literature, history, and philosophy. Greek and Latin material taught in alternate years. All major genres of Latin literature through Cicero. The social contexts of their production and consumption.

CLASSGEN 207A. Survey of Greek and Latin Literature: Republican Latin
4-5 units, alternate years, not given this year

CLASSGEN 207B. Survey of Greek and Latin Literature: Augustan Age Latin
4-5 units, alternate years, not given this year

CLASSGEN 207C. Survey of Greek and Latin Literature: Imperial Latin
4-5 units, alternate years, not given this year

CLASSGEN 208A. Survey of Greek and Latin Literature: Archaic Greek
4-5 units, Aut (Martin, R)

CLASSGEN 208B. Survey of Greek and Latin Literature: Classical Greek
4-5 units, Win (Nightingale, A)

CLASSGEN 208C. Survey of Greek and Latin Literature: Hellenistic and Late Greek
4-5 units, Spr (Bowie, E)

COURSES IN TRANSLATION

These courses have subject code CLASSGEN.

UNDERGRADUATE

CLASSGEN 9. Greek and Latin Roots of English—Goal is to improve vocabulary, comprehension of written English, and standardized test scores through learning the Greek and Latin components of English. Focus is on patterns and processes in the formation of the lexicon. Terminology used in medicine, business, education, law, and humanities; introduction to principles of language history and etymology. Greek or Latin not required.
3 units, Sum (Staff)

CLASSGEN 18. Greek Mythology—The heroic and divine in the literature, mythology, and culture of archaic Greece. Interdisciplinary approach to the study of individuals and society. Illustrated lectures. Readings in translation of Homer, Hesiod, Herodotus, and the poets of lyric and tragedy. GER:DB-Hum
3-5 units, Win (Martin, R)

CLASSGEN 22N. Technologies of Civilization: Writing, Number, and Money—Stanford Introductory Seminar. Preference to freshmen. The technological keys to the growth of civilization that enabled the creation of complex societies and enhanced human cognition. The role of cognition in shaping history and the role of history in shaping cognition. Global perspective, emphasizing the Western tradition and its ancient Greek roots. GER:DB-Hum
4-5 units, Spr (Netz, R)

CLASSGEN 24N. Sappho: Erotic Poetess of Lesbos—Stanford Introductory Seminar. Preference to freshmen. Sappho's surviving fragments in English; traditions referring to or fantasizing about her disputed life. How her poetry and legend inspired women authors and male poets such as Swinburne, Baudelaire, and Pound. Paintings inspired by Sappho in ancient and modern times, and composers who put her poetry to music. GER:DB-Hum, EC-Gender
4-5 units, Spr (Peponi, A)

CLASSGEN 34. Ancient Athletics—The cultural history of ancient athletics, including funerary games described in Homer and Virgil. The balance between soul and body sought by ancient philosophers including Plato. Striving for excellence, finding glory without seeking it, and aiming for self-mastery in athleticism and intellectual training. Scholar-athletes at Nemea, Delphi, and Isthmia; city-state festivals hosted by Athens and Sparta. GER:DB-Hum
3-5 units, Aut (Hunt, P)

CLASSGEN 36. Projecting Ancient Rome—How films about ancient Rome entertain audiences and address political and social concerns of the present. How contemporary audiences relate to ancient Romans on the screen and whether films are historically accurate or not. How cinematic traditions have interpreted and misinterpreted ancient Rome. Sources include Hollywood and Italian cinema. GER:DB-Hum
4-5 units, Aut (Pieraccini, L)

CLASSGEN 47. Hannibal—Hannibal's strategic crossing of the Alps with an army and elephants in 218 B.C.E. and his subsequent engagements with the Romans. Background on Punic Carthage and the First and Second Punic Wars in N. Africa, Gaul, and Italy. Primary source texts include Polybius and Livy. Primary research from instructor's current sponsored fieldwork under the National Geographic Society. GER:DB-Hum

4-5 units, Win (Hunt, P)

CLASSGEN 60. The Life and Death of a Roman City: Pompeii—The development of Pompeii from its early settlements to its luxurious urban center. Focus is on aspects of daily life such as family, slavery, economy, women, politics and religion. The décor of private houses and civic buildings, including the imperial display of power. The impact of Pompeii on the modern world, including art, architecture, and urban design. GER:DB-Hum

4-5 units, Win (Pieraccini, L)

CLASSGEN 66. Herodotus—For Ancient History field of study majors; others by consent of instructor. Close reading technique. Historical background to the Greco-Persian Wars; ancient views of empire, culture, and geography; the wars and their aftermath; ancient ethnography and historiography, including the first narrative of ancient Egypt. GER:DB-Hum

4-5 units, Win (Manning, J)

CLASSGEN 81. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature focus: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum

4 units, Win (Anderson, L; Landy, J)

CLASSGEN 94. Ethics of Pleasure—The concept of pleasure in Greek culture, thought, poetry, and philosophy. How physical, sensual, and intellectual types of pleasure are described and defined in Greek texts and visual arts. The relationship between individual and public/political experiences of pleasure; the intersection between aesthetics and ethics. GER:DB-Hum, GER: EC-EthicReas

3-5 units, Spr (Peponi, A)

CLASSGEN 111. Croesus and Solon: Polemical Interpretation of *Olbos*—Croesus, ruler of Lydia in the 6th century B.C.E. until the kingdom was absorbed into the Persian Empire; how he became a part of Greek culture. Historical, artistic, and poetic sources relating to his personality and reign. The concept of *olbos* or prosperity. Readings include the Athenian legislator and poet Solon, Herodotus, and the praise poet Bacchylides. GER:DB-Hum

4-5 units, Spr (González de Tobia)

CLASSGEN 176. Majors Seminar: Exemplary Lives—The ancients were conditioned by the paradigmatic figures of their own past, and for centuries this continued to be the chief reason that people studied the classics. Focus is on a return to this practice and its history. Sources include ancient refractions of Socrates, Plato, Alcibiades, Scipio, Epictetus, Cicero, Marcus Aurelius, Diogenes Laertius, and Plutarch. Biographical material on saints and martyrs: how the concept of the paradigmatic life was carried forward into the Christian era. GER:DB-Hum, WIM

4-5 units, Win (Gleason, M)

CLASSICS/HISTORY

These courses have subject code CLASSHIS.

CLASSHIS 60. The Romans—How did a tiny village create a huge empire and shape the world, and why did it fail? Roman history, imperialism, politics, social life, economic growth, and religious change. GER:DB-Hum

3-5 units, alternate years, not given this year

CLASSHIS 101. The Greeks—Greek history from the rise of the city state through Alexander the Great's conquest of Persia. Economics, society, culture, and technology. Competition and cooperation within and between states; the emergence of strong forms of citizenship along with chattel slavery and gender inequality; the origins and practices of democracy; and relations with non-Greek peoples. Focus is on ancient sources and archaeological remains. GER:DB-Hum

4-5 units, Win (Ober, J)

CLASSHIS 105. History and Culture of Ancient Egypt—From 3000-30 B.C.E. Emphasis is on long-term social and economic development. GER:DB-Hum, EC-GlobalCom

4-5 units, Spr (Manning, J)

CLASSHIS 106/206. Life and Death in China's Late Antiquity—Multidisciplinary, heuristic approach. How to piece together the worldview of life and death during the Eastern Han dynasty and subsequent Three Kingdoms period; the emergence of a new elite that would dominate the sociopolitical landscapes of medieval China and the birth of the Silk Road, the world's first international highway of commerce, culture, and religion. Sources include: materials and methods of archaeology, history, textual studies, and art history to interpret excavated evidence; and visual and interactive resources. GER:DB-Hum

4-5 units, Win (Hsu, H)

CLASSHIS 137/237. Models of Democracy—(Same as COMM 212/312, POLISCI 237/337.) Ancient and modern varieties of democracy; debates about their normative and practical strengths and the pathologies to which each is subject. Focus is on participation, deliberation, representation, and elite competition, as values and political processes. Formal institutions, political rhetoric, technological change, and philosophical critique. Models tested by reference to long-term historical natural experiments such as Athens and Rome, recent large-scale political experiments such as the British Columbia Citizens' Assembly, and controlled experiments.

3-5 units, Win (Fishkin, J; Ober J.)

CLASSICS, ART/ARCHAEOLOGY

These courses have subject code CLASSART.

CLASSART 61. Introduction to Greek Archaeology—The material remains of Greek civilization, including architecture, art, and written sources, and how to interpret them; what they reveal about the world of the Greeks and about current western civilization. How has reception of the classical past influenced modern political and social development? Topics include: the palace societies of the Bronze Age, the archaic age of colonization and the rise of the polis; the beginnings of classical Athenian democracy; and the conquests of Alexander the Great. GER:DB-Hum

3-5 units, Aut (Krotscheck, U)

CLASSART 81. Introduction to Roman Archaeology—Methods and materials, from the 8th century B.C.E. to the 4th century C.E. The physical remains of the Roman world and their relationship to today. What material culture reveals about the Romans; the legacy of the Romans in the modern world. Sculpture, wall painting, mosaics, tombs, and architecture; and practical, field-oriented approaches. Settlement patterns; development of artistic and architectural expertise; monumentalization in the late republic and early empire; and shifts and tensions in social norms. GER:DB-Hum

4-5 units, Win (Butler, M)

CLASSART 101/201. Archaic Greek Art—(Same as ARTHIST 101/301.) The development of Greek art and culture from protogeometric beginnings to the Persian Wars, 1000-480 B.C.E. The genesis of a native Greek style; the orientalizing phase during which contact with the Near East and Egypt transformed Greek art; and the synthesis of East and West in the 6th century B.C.E. GER:DB-Hum

4 units, Aut (Maxmin, J)

CLASSART 102/202. Classical and 4th-Century Greek Art—(Same as ARTHIST 102/302.) The formation of the classical ideal in 5th-century Athenian art, and its transformation and diffusion in the 5th and 4th centuries against changing Greek history, politics, and religion. GER:DB-Hum

4 units, Win (Maxmin, J)

CLASSART 109. Greek Art in and Out of Context—(Same as ARTHIST 203.) The cultural contexts in which art served religious, political, commercial, athletic, sympotic, and erotic needs of Greek life. GER:DB-Hum

5 units, Aut (Maxmin, J)

CLASSART 110. Appropriations of Greek Art—(Same as ARTHIST 204A.) The history of the appropriation of Greek art by Rome, the Renaissance, Lord Elgin, and Manet. GER:DB-Hum

5 units, Spr (Maxmin, J)

CLASSART 126. Alpine Archaeology—What distinguishes archaeological research in high montane environments with year-round cold temperatures from other archaeological contexts and fieldwork? Comparison with other global field methodologies. Emphasis is on Gallo-Roman, Celtic, and medieval finds. Required for students participating in Stanford's late summer dig in the Grand-St-Bernard pass in the Alps. GER:DB-Hum

3-5 units, Spr (Hunt, P)

INDIVIDUAL STUDY

CLASSGEN 160. Directed Readings (Undergraduate)

1-15 units, Aut, Win, Spr, Sum (Staff)

CLASSGEN 199. Undergraduate Thesis: Senior Research

2-10 units, Aut, Win, Spr, Sum (Staff)

CLASSGEN 260. Directed Reading in Classics (Graduate Students)

1-15 units, Aut, Win, Spr, Sum (Staff)

CLASSGEN 360. Dissertation Research in Classics

1-10 units, Aut, Win, Spr, Sum (Staff)

GRADUATE SEMINARS

Graduate seminars vary each year. The following are given this year.

GENERAL (CLASSGEN)

CLASSGEN 220. Family, Gender, and Production in Ancient Rome—(Same as HISTORY 311A.) Seminar. The household as the basic unit of production in Rome in the context of family relations and ideologies of gender. Methodological challenges of doing social and economic history from literary, epigraphic, and literary texts. Demography of family and kinship in ancient Rome. Ideologies of gender and family roles and their influence on economic production. Economic theories of the family and human capital.

4-5 units, Win (Saller, R)

CLASSGEN 225. Metamorphoses of Dido—Focus is on Dido in Virgil; the complexities of her characterization and its bearing on an overall view of the poem, her scant previous appearances, and intertextual models. The continuing fascination with Dido by later authors from Ovid to the 20th century. Possible topics include Latin and Christian authors, medieval rewritings, Chaucer, Marlowe, and Dido in music and painting.

4-5 units, Spr (Schiesaro, A)

CLASSGEN 235. Petronius and Apuleius—Petronius' *Satyricon* and Apuleius' *Metamorphoses* represent the surviving Latin novel. Differences between them. Readings include Petronius' dinner at Trimalchio's and Apuleius' love story of Cupid and Psyche. Philological analysis, history of the novel, and social history of the Roman empire. The afterlife of these texts. Recent scholarship.

4-5 units, Spr (Parker, G)

CLASSGEN 237. Augustine on the Body—(Same as COMPLIT 337.) Ideas of the body in Greek and Roman literature and philosophy. Focus is on Augustine; his concepts of the edenic body, human body, and resurrected body. Asceticism in pagan and Christian culture in late antiquity. How did pagan and Christian cultural ideologies affect ascetic practices? To what extent did the Christians diverge from pagan practices of self-control in the 3rd and 4th centuries; how did philosophers and theologians treat sexuality and procreation in the context of elite self-fashioning?

4-5 units, Spr (Nightingale, A)

CLASSGEN 245. Roman Receptions of Hellenistic Poetry—The beginnings of Latin literature in Greek literature, primarily in texts transmitted through imperial courts of the Greek east such as Alexandria and Pergamum. Aesthetic, formal, and theoretical aspects of transmission; cultural contexts of reception, including Ennius and Lucilius, Catullus and Cicero, Horace and Vergil, and Propertius and Ovid.

4-5 units, Aut (Stephens, S)

CLASSGEN 283. Catullus: Textual Criticism and Related Points of Interest—Housman's definition of textual criticism as the science of discovering error in texts and the art of removing it. How scholars have attempted to emend problematic passages in Catullus.

4-5 units, Aut (Lain, N)

CLASSGEN 314. Fragments—The reconstruction and interpretation of fragmentary texts; how to deal with Latin poetry in fragments, emphasizing the Republican and Augustan ages. Sources include anthologies by E. Courtney and Adrian Hollis. Techniques of analysis including philology, textual criticism, and questions about Greek models. The importance of fragments for literary and cultural history.

4-5 units, Win (Barchiesi, A)

CLASSGEN 321. Classical Seminar—(Same as HUMNTIES 321.) Topic this year is interpreting antiquity: methodologies and interpretations of ancient texts. The dialogue between literature and philosophy in Greek and Roman cultures. Sources include Homer, Greek tragedy, Plato, Aristotle, Virgil, Petronius, Augustine, and Nietzsche's *Birth of Tragedy*.

3-5 units, Aut (Nightingale, A)

CLASSGEN 324. Choral Poetry and Performance—Representative readings of choral lyric poetry. Interpretation of the most complex choral discourse developed in archaic and classical Greece. The cultural context in which choral performances took place in the Greek polis.

4-5 units, Win (Peponi, A)

CLASSGEN 352. Ovid's *Metamorphoses*—Competing 20th-century approaches. Emphasis is on new research and how to compose research papers. Topics include: narratology, reception, gender, poetics, time and space, mythology, material culture, hellenization, romanization, orientalism, allusion and intertextuality, and emotions.

4-5 units, Win (Barchiesi, A)

HISTORY (CLASSHIS)

CLASSHIS 206. Life and Death in China's Late Antiquity—(Graduate section; see 106.)

4-5 units, Win (Hsu, H)

CLASSHIS 237. Models of Democracy—(Graduate section; see 137.)

3-5 units, Win (Fishkin, J; Ober J.)

CLASSHIS 250A,B. Greek Political Economy—(Same as POLISCI 332R,332S.) First of two-part course. Did large-scale kingdoms radically change the Greek world after Alexander; or had new conditions already emerged from the Peloponnesian War? Continuities and discontinuities across the classical/hellenistic divide. Focus is on states and economies in the 4th and 3rd centuries B.C.E. Sources include primary sources and recent scholarship on Greek economic thought and practices with reference to city states (Athens, Rhodes), federations (Achaean, Aetolian), and empires (Ptolemaic, Seleukid). Spring Quarter emphasis is on presentation of research by faculty and students.

4-5 units, **250A:** *Win,* **250B:** *Spr (Manning, J; Ober, J)*

CLASSHIS 365. The First Great Divergence: Late Antique and Early Medieval Europe and China—Divergences in long-term trends in state formation in E. and W. Eurasia after the fall of the Roman and Han empires: contexts, causes, and consequences. Students attend presentations of the Mellon Sawyer seminar. See http://classics.stanford.edu/news/divergence.

4-5 units, Aut (Morris, I; Scheidel, W)

ART AND ARCHAEOLOGY (CLASSART)

CLASSART 201. Archaic Greek Art—(Graduate section; see 101; same as ARTHIST 101/301

4 units, Aut (Maxmin, J)

CLASSART 202. Classical and 4th-Century Greek Art—(Graduate section; see 102; same as ARTHIST 102/302

4 units, Win (Maxmin, J)

CLASSART 250. Cultural Heritage and Classical Antiquities—Comparative analysis of American and Italian cultural heritage practices concerning Greek and Roman antiquities. Themes include ethical, cultural, and legal situations of classical artifacts in American museums; constructions of the classical past in national contexts and the role of antiquities museums; and changing concepts of material relationships with the past. One-week field trip to Rome to compare installation and presentation practices in major museums.

5 units, Win (Trimble, J)

CLASSART 323. Archaeology of the Roman Economy—Recent developments. Focus is on changing frameworks, including Mediterraneanization and concepts of growth; differences between historians' and archaeologists' interests and methods; problems of scale and integration; relationships of models, fieldwork design, and archaeological data. Case studies may include the olive oil industry; the marble trade and connections of art and economics; and the Roman army and its economic workings and impact.

5 units, Spr (Trimble, J)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ARCHLGY 99A. Historical Archaeology in the Archive, Lab, and Underground: Methods

5 units, Aut (Williams, B)

ARCHLGY 101B/301B. Humanized Landscapes: Archaeological Approaches to Human/Environment Interactions

3-5 units, Aut (Contreras, D)

ARCHLGY 103C/303C. Visualizing Archaeological Knowledge In the Information Age

3-5 units, Win (Webmoor, T)

ARCHLGY 105A/305A. Global Heritage and Cultural Property

3-5 units, Spr (Staff)

ARCHLGY 106A/306A. Museums and Collections

3-5 units, Spr (Staff)

ARCHLGY 107A. Archaeology as a Profession

5 units, Win (Camp, S)

ARCHLGY 108A. Archaeological Field Methods

5 units, Win (Jones, A)

ARTHIST 233 The Art Museum: History and Practice

5 units, Spr (Marshall, J)

CASA 108. History of Archaeological Thought—(Same as ARCHLGY 103.)

5 units, Aut (Meskell, L)

CASA 138/238. Archaeology of Sex, Sexuality, and Gender

5 units, Spr (Voss, B)

CASA 150. Archaeological Methods

5 units, Spr (Hodder, I)

CASA 156. Interpreting Space and Place: An Introduction to Mapmaking

5 units, Aut (Engel, C)

CASA 158/258. Sex, Death, and the Body in Ancient Egypt

5 units, Win (Meskell, L)

CASA 172/272. Object Lessons

3-5 units, Aut (Meskell, L)

CASA 360. Archaeological Methods and Research Design

5 units, Spr (Hodder, I)

CASA 373. Introduction to Archaeological Theory

5 units, Win (Hodder, I)

COMPLIT 123. The Novel, The World—(Same as ENGLISH 184.)

5 units, Spr (Moretti, F)

ECON 114. Economy and Economics of Ancient Greece

5 units, Win (Amemiya, T)

ENGLISH 51N. Drama Queens: Powerful Women on Stage

3 units, Aut (Friedlander, L)

ENGLISH 103. Crusades: Interdisciplinary Approaches—(Same as HISTORY 215, MEDVLST 165, RELIGST 140.)

3-5 units, Spr (Buc, P; Summit, J; Gelber, H)

ENGLISH 112A. Wicked Witches of the West: Dangerous Women in Greek and Shakespearean Tragedy

5 units, Win (Friedlander, L)

ENGLISH 270. From Plato to Postmodernism: The Anglo-American Critical Tradition

5 units, Win (Evans, M)

ENGLISH 302A,B. The History of the Book

5 units, **A:** *Aut,* **B:** *Win (Orgel, S)*

ENGLISH 314. Epic and Empire—(Same as COMPLIT 320A.)

5 units, Win (Parker, P)

HISTORY 203A/303A. Theories of the State from the Ancient World to the Present

4-5 units, Win (Baker, K; Sheehan, J)

HISTORY 205B/305B. Quantitative Methods in Historical Research

4-5 units, Aut (Klein, H)

HISTORY 305. Graduate Workshop in Teaching

1 unit, Spr (Kollmann, N; Roberts, R)

HPS 154. What is Science? Explaining Nature from Pythagoras to Popper

3-5 units, Aut (McCaskey, J)

PHIL 10. God, Self, and World: An Introduction to Philosophy

5 units, Win (Perry, J)

PHIL 20. Introduction to Moral Philosophy—(Same as ETHICSOC 20.)

5 units, Spr (Schapiro, T)

PHIL 30. Introduction to Political Philosophy—(Same as ETHICSOC 30, POLISCI 3.)
5 units, Aut (Hussain, N)

PHIL 100. Greek Philosophy
4 units, Aut (Bobonich, C)

PHIL 113/213. Hellenistic Philosophy
4 units, Aut (Bobonich, C)

PHIL 170/270. Ethical Theory—(Same as ETHICSOC 170.)
4 units, Aut (Jaworska, A)

PHIL 173A. Aesthetics: Metaphor across the Arts
4 units, Spr (Hills, D)

PHIL 173B/273B. Metaethics
4 units, Spr (Hussain, N)

PHIL 312. Aristotle's Psychology
4 units, Win (Bobonich, C)

RELIGST 237. Jewish and Christian Rome, 1st to 6th Centuries
3-5 units, Win (Gregg, R; Fonrobert, C)

OVERSEAS STUDIES

Students should discuss with their major advisers which overseas courses best meet individual needs. Descriptions are in the "Overseas Studies" section of this bulletin, at the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu/.

BERLIN

OSPBER 24. Greek Tragedy and German Culture: An Artistic Symbiosis
3-5 units, Aut (Rehm, R)

COMMUNICATION

Emeriti: (Professors) Henry S. Breitrose, Richard A. Brody, Donald F. Roberts; *(Professors, Teaching)* Ronald Alexander, Marion Lewenstein, James Risser
Chair: James Fishkin
Director, Institute for Communication Research: James Fishkin
Director, John S. Knight Fellowships for Professional Journalists: James R. Bettinger
Director, Media Studies: Jeremy Bailenson
Director, Undergraduate Studies: Shanto Iyengar (on leave Autumn)
Deputy Director, John S. Knight Fellowships for Professional Journalists: Dawn E. Garcia
Acting Director, Journalism: Ann Grimes
Professors: James Fishkin, Theodore L. Glasser, Shanto Iyengar, Jon Krosnick, Clifford Nass, Byron B. Reeves (on leave)
Associate Professor: Marcyliena Morgan
Assistant Professors: Jeremy Bailenson, Fred Turner (on leave)
Courtesy Professors: Jan Krawitz, Lawrence Lessig, Walter W. Powell, Kristine M. Samuelson
Lecturers: John Markoff, Gary Pomerantz, Howard Rheingold, James Wheaton, Gregg Zachary
Visiting Lorry I. Lokey Professorship in Professional Journalism: Joel Brinkley, Ann Grimes
Visiting Associate Professor: Beth Noveck
Visiting Hearst Professional in Residence: Glenn Frankel
Consulting Lecturer: Felicity Barringer

Department Offices: McClatchy Hall, Building 120, Room 110
Mail Code: 94305-2050
Phone: (650) 723-1941
Web Site: http://communication.stanford.edu

Courses given in Communication have the subject code COMM. For a complete list of subject codes, see Appendix.

The Department of Communication engages in research in communication and offers curricula leading to the B.A., M.A., and Ph.D. degrees. The M.A. degree prepares students for a career in journalism. The department also offers current Stanford University undergraduates a coterminal program with an M.A. emphasis in Media Studies. The Ph.D. degree leads to careers in university teaching and research-related specialties.

The Institute for Communication Research offers research experience primarily to advanced Ph.D. students.

The John S. Knight Fellowships program brings outstanding mid-career journalists to the University to study for an academic year. The John S. and James L. Knight Foundation sponsors twelve U.S. journalists. They are joined by eight International Fellows sponsored by the Shinyoung Journalism Fund, the Lyle and Corrine Nelson International Fellowship Fund, the Knight Foundation, the Fulbright Program, the Koura Foundation, Yahoo Inc., and others.

ADMISSION

Prospective Undergraduates—Write to the University's Office of Undergraduate Admissions, Stanford University, Stanford, California 94305-3020.

Prospective Coterminal Students—Applications are available online at http://registrar.stanford.edu/shared/publications.htm#Coterm.

Prospective Graduate Students—Online applications are preferred and can be submitted on the web at http://gradadmissions.stanford.edu.

The department requires that applicants for graduate admission submit verbal and quantitative scores from the Graduate Record Examination (GRE). Admission to each graduate degree program is competitive, based on the pool of applicants each year rather than on standard criteria that can be stated in advance. The GRE should be taken no later than early November prior to the early December application deadline.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

PREPARATION

Before declaring the major, students must have completed or be concurrently enrolled in one of the following:

COMM 1A (formerly COMM 1) or COMM 1B
COMM 106
COMM 108

Students interested in declaring the major should see the student services administrator in Building 120, Room 110A, during scheduled office hours. Students are required to take at least 60 units (approximately 12 courses), not counting statistics, to complete the major.

PROGRAM OF STUDY

The undergraduate curriculum is intended for liberal arts students who wish to develop an understanding of communication in society, drawing on the perspective of the social sciences. Undergraduates majoring in Communication are expected to become acquainted with the fundamental concerns, theoretical approaches, and methods of the field, and to acquire advanced knowledge in one or more of the sub-areas of communication institutions, processes, and effects.

While the department does not attempt to provide comprehensive practical training at the undergraduate level, the curriculum provides a diverse range of internship opportunities including professional print journalism, some of which are funded by the department's Rebele Internship Program.

The department is committed to providing students with analytical and critical skills for future success in graduate programs, professional schools, or immediate career entry.

The major is structured to provide several levels of study: a core curriculum, intended to expose students to a broad-based understanding of communication theory and research, and a number of intermediate-level options and electives. Majors also have the opportunity to do advanced research in the form of senior projects and honors theses.

All undergraduate majors are required to complete a set of core communication courses which include COMM 1A (formerly COMM 1), Media Technologies, People, and Society (5 units) or COMM 1B, Media, Culture, and Society (5 units); COMM 104W, Reporting, Writing, and Understanding the News (WIM, 5 units); COMM 106, Communication Research Methods (5 units); and COMM 108, Media Processes and Effects (5 units). Core courses are usually given only once each year.

The department also requires completion of or concurrent registration in an introductory statistics course (STATS 60 or PSYCH 10) prior to registration in COMM 106, Communication Research Methods, in preparation for courses in methodology and advanced courses in communication processes and effects. It is recommended that this be done as soon as possible so as not to prevent registration in a course requiring statistical understanding. The statistics course does not count toward the 60 units to complete the Communication major.

In addition to the core courses and the statistics requirement, undergraduate majors select courses from the areas described below. Many of the courses require core courses as prerequisites.

Area I: Communication Processes and Effects—Area I emphasizes the ways in which communication scholars conduct research in, and consider the issues of, human communication. These studies aim to provide expert guidance for social policy makers and media professionals. A minimum of two courses must be taken from COMM 146, 149, 160, 162, 166, 169, 170, 172.

Area II: Communication Systems/Institutions—Area II considers the roles and interaction of institutions such as broadcasting, journalism, constitutional law, and business within communication and mass communication contexts. A minimum of two courses must be taken from COMM 104W, 116, 117, 120, 125, 131, 136, 140, 147, 148, 182.

Options—The Communication curriculum is designed to provide a theoretical base that can be effectively applied to numerous environments. The potential options listed below are not required, but are examples of how to focus interests.

1. Communication Technologies
   a) Department of Communication (COMM):
      120. Digital Media in Society
      166. Virtual People
      169. Computers and Interfaces: Psychology and Design
      172. Psychological Processing of Media
   b) Affiliated department offerings (elective credit toward the major):
      1) Computer Science (CS)
         105. Introduction to Computers
         106A. Programming Methodology
         147. Introduction to HCI
         201. Computers, Ethics, and Social Responsibility
         247. Human Computer Interaction: Interaction Design Studio
      2) Science, Technology, and Society (STS)
         101. Science, Technology, and Contemporary Society
2. Communication and Public Affairs
   a) Department of Communication (COMM)
      125. Perspectives on American Journalism
      136. Democracy and the Communication of Consent
      160. The Press and the Political Process
      162. Analysis of Presidential Campaigns
      170. Communication and Children
   b) Affiliated department offerings (elective credit toward the major)
      1) Department of Political Science (POLISCI)
         123. Politics and Public Policy
      2) Department of Psychology (PSYCH)
         75. Cultural Psychology
         167. Seminar on Aggression
         180. Social Psych. Perspectives on Stereotyping and Prejudice
      3) Public Policy Program (PUBLPOL)
         104. Economic Policy Analysis
         194. Technology Policy
3. Media Practices and Performance
   a) Department of Communication (COMM)
      120. Digital Media in Society
      125. Perspectives on American Journalism
      131. Media Ethics and Responsibilities
      160. The Press and the Political Process

The remainder of the 60 required units may be fulfilled with any elective Communication courses, or crosslisted courses in other departments.

To be recommended for the B.A. degree in Communication, the student must complete at least 60 units (approximately twelve courses) in the department. No more than 10 units of transfer credit or Summer Session may be applied to meet department requirements. Communication majors must receive a letter grade for all Communication courses unless they are offered only for satisfactory/no credit (S/NC), and maintain a grade point average (GPA) of 2.0 (C) in courses towards the major.

MINORS

PREPARATION

Before declaring the minor, students must have completed or be concurrently enrolled in one of the following:

COMM 1A (formerly COMM 1) or COMM 1B
COMM 106
COMM 108

Students interested in declaring the minor should apply via Axess. Students are required to take 35 units (approximately 7 courses), not counting statistics, to complete the minor.

PROGRAM OF STUDY

The minor is structured to provide a foundation for advanced course work in communication through a broad-based understanding of communication theory and research.

The minor in Communication consists of three introductory Communication core courses that include COMM 1A (formerly COMM 1), Media Technologies, People, and Society (5 units), or COMM 1B, Media, Culture, and Society (5 units); COMM 106, Communication Research Methods (5 units); and COMM 108, Media Processes and Effects (5 units).

In addition to the three core courses, the minor requires a minimum of four intermediate-level elective courses approved by the department. The department also requires completion of or concurrent registration in an introductory statistics course (STATS 60 or PSYCH 10) prior to registration in COMM 106, Communication Research Methods. It is recommended that the course in statistics be taken as early as possible, preferably in the Autumn Quarter of the junior year. The Statistics course does not count toward the 35 units to complete the Communication minor.

Students interested in declaring a minor must do so no later than registration day in the Spring Quarter of the junior year. Core courses are usually offered only once annually, and they constitute a sequence:

Prerequisite—introductory statistics course (for example, PSYCH 10)

Core Courses—COMM 1A or 1B, 106, 108

Area I: Communication Processes and Effects—a minimum of one course from COMM 146, 149, 160, 162, 166, 169, 170, 172

Area II: Communication Systems/Institutions—a minimum of one course from COMM 104, 116, 117, 120, 125, 131, 136, 140, 147, 148, 182

Elective courses—totaling 10 units.

Some courses are not given every year. Refer to the *Time Schedule* for details.

HONORS PROGRAM

The honors program provides undergraduates the opportunity to undertake a significant program of research in an individual professor/student mentoring relationship. The aim is to guide students through the process of research, analysis, drafting, rethinking, and redrafting, which is essential to excellence in scholarship. Working one-on-one with a faculty adviser, seniors earn 15 Communication units, culminating in an honors thesis. In order to be eligible for the honors program, interested majors must have: (1) successfully completed both a research methods and statistics course, (2) selected an adviser, and (3) submitted an application to the department by the end of their junior year. An application may be picked up outside Room 110, Building 120.

Students are expected to make steady progress on their honors thesis throughout the year. Students who fail to submit a satisfactory draft Autumn Quarter will be dropped from the program.

A final copy of the honors thesis must be read and approved by the adviser and submitted to the department by the eighth week of Spring Quarter (exact date to be arranged). It becomes part of a permanent record held by the department. Honors work may be used to fulfill communication elective credit but must be completed and a letter grade submitted prior to graduation. A student failing to fulfill all honors requirements may still receive independent study credit for work completed and it may be applied toward fulfilling major requirements.

The designation "with honors" is awarded by the Department of Communication to those graduating seniors who, in addition to having completed all requirements for the Communication major:

1. complete an honors thesis
2. maintain a distinguished GPA in all Communication course work
3. are recommended by the Communication faculty

COTERMINAL BACHELOR'S AND MASTER'S PROGRAM

The Department of Communication offers current Stanford University undergraduates a coterminal program with an M.A. emphasis in Media Studies specializing in either social sciences or journalism; see "Media Studies Program" below for more information.

Applications for coterminal study must be submitted at least four quarters in advance of the expected master's degree conferral date. Applicants must have earned a minimum of 120 units toward graduation (UTG) as shown on the undergraduate unofficial transcript. This includes allowable advanced placement (AP) and transfer credit. Applications may be submitted no later than November 19, 2007 for admission beginning in either Winter or Spring Quarter 2007-08 or Autumn Quarter 2008-09. There is no rolling admission in the Communication department. Requirements include: Application for Admission to Coterminal Master's Program form, preliminary program proposal, statement of purpose, three letters of recommendation from Stanford professors, a written statement from a Communication professor agreeing to act as a graduate adviser and a current, unofficial Stanford transcript. GRE scores are not required. Coterminal applications are submitted directly to the department. Review procedures and the Graduate Admissions Committee determine criteria.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

MASTER OF ARTS

University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin.

The department awards a terminal M.A. degree in Communication with a field of study of Journalism. Applicants for this program, and for doctoral work, are evaluated for admission on different criteria. Work to fulfill graduate degree requirements must be in courses numbered 100 or above.

Students who complete an M.A. degree and who desire entry into the Ph.D. program must file a Graduate Program Authorization Petition application that may be picked up at the Registrar's Information Windows or at http://registrar.stanford.edu/shared/publications.htm#GradStud. Such students are considered alongside all other doctoral applicants.

The M.A. degree in Media Studies is available only to current Stanford University undergraduates who are majoring in another department.

JOURNALISM

Stanford's graduate program in Journalism focuses on the knowledge and skills required to report, analyze, and write authoritatively about public issues and digital media. The curriculum combines a sequence of specialized reporting and writing courses with seminars and courses devoted to deepening the students' understanding of the roles and responsibilities of American news media in their coverage of public issues.

The program emphasizes preparation for the practice of journalism and a critical perspective from which to understand it. The program's objective is twofold: (1) to graduate talented reporters and writers to foster public understanding of the significance and consequences of public issues and the debates they engender; and (2) to graduate thoughtful journalists to respond openly and eloquently when called on to explain and defend the methods of their reporting and the quality of their writing.

CURRICULUM

The curriculum includes several required courses, examples of which are shown below, and a master's project:

216. Journalism Law
217. Digital Journalism
220. Digital Media in Society
225. Perspectives on American Journalism
240. New Media Entrepreneurship
273. Public Issues Reporting I
274. Public Issues Reporting II
289. Journalism M.A. Project
291. Graduate Journalism Seminar

Additionally, students are usually required to take two specialized writing courses, chosen from a list of seven or eight, and three approved electives from among graduate-level courses in the Department of Communication, or from among courses on campus that deal substantively with issues of public importance. The M.A. degree in Communication (Journalism) requires a minimum of 49 units.

Except for the Graduate Journalism Seminar and the Journalism Project, all courses must be taken for a letter grade. To remain in good academic standing, students must maintain a grade point average (GPA) of 3.0 or better. Graduation requires a GPA of 3.0 or better.

JOURNALISM PROJECT

The Journalism master's project, a requirement for graduation, is intended as an opportunity for students to showcase their talents as writers and reporters. It is also an opportunity to undertake an in-depth critique of an area of journalism in which the author has a special interest. Work on the project usually begins during Winter Quarter and continues through Spring Quarter. It represents a major commitment of time, research, and writing. Although it is not a requirement that the project be published, it must be judged by a member of the faculty to be of a quality acceptable for publication. At a minimum, the project should demonstrate the rigor and discipline required of good scholarship and good journalism; it should offer ample evidence of students' ability to gather, analyze, and synthesize information in a manner that goes beyond what ordinarily appears in daily news media.

MEDIA STUDIES COTERMINAL MASTER'S PROGRAM

The Media Studies coterminal master's program provides a broad introduction to scholarly literature in mass communication and offers a social sciences or journalism track. This one-year program is designed for current Stanford University undergraduates. Media Studies students need to satisfy four basic requirements including 1, 2a or 2b, 3, and either 4 or 5 depending on which track is being followed:

1. *Required Units and GPA:* students must complete a minimum of 45 units in Communication and related areas, including items 2a or 2b, and 3 below. Courses, except for COMM 290, Media Studies M.A. Project, and COMM 289, Journalism Master's Project, must be taken for a letter grade if offered. Courses in related areas outside the department must be approved by the student's adviser. To remain in good academic standing, students must maintain a grade point average (GPA) of 3.0 or better. Graduation requires a GPA of 3.0 or better.

2a. *Core Requirements Social Science Track:* students must complete COMM 206, 208, and a statistics course. Typically, the statistics requirement is met with STATS 160. Other courses occasionally are approved as a substitute before the student is admitted to the program. The statistics course does not count toward the 45 units.

2b. *Core Requirements Journalism Track:* students must complete COMM 104, 273, 274, and a statistics course. Typically, the statistics requirement is met with STATS 160. Other courses occasionally are approved as a substitute before the student is admitted to the program. The statistics course does not count toward the 45 units. It is recommended that Journalism track students also complete COMM 291, a 1-unit seminar, each quarter.

3. *Six Media Studies Courses:* students must complete a minimum of six additional Communication courses from the following list concerned with the study of media. Journalism track students must include one course from the COMM 277, Specialized Writing and Reporting, series as part of these six media studies courses. Social Science track students have the option of including a maximum of one course from this series as part of these six courses. Any additional course taken from the COMM 277 series is considered elective credit for students from either track. Not all the listed courses are offered every year and the list may be updated from one year to the next. In addition to the core requirements and a minimum of six courses listed below, students may choose additional courses from the list and any related course approved by the student's adviser.

   208. Media Processes and Effects*
   211. Media Technologies, People, and Society
   216. Journalism Law
   217. Digital Journalism
   220. Digital Media in Society
   225. Perspectives on American Journalism
   231. Media Ethics and Responsibility
   236. Democracy and the Communication of Consent
   238. Democratic Theory
   240. New Media Entrepreneurship
   246. Language and Discourse: Race, Class, and Gender
   248. Hip-Hop and Don't Stop: Introduction to Modern Speech Communities
   249. Ethnography of Modern Speech Communities
   260. The Press and the Political Process
   262. Analysis of Presidential Campaigns
   266. Virtual People
   268. Experimental Research in Advanced User Interfaces
   269. Computers and Interfaces: Psychology and Design
   270. Communication and Children
   272. Psychological Processing of Media
   277. Specialized Writing and Reporting
   291. Graduate Journalism Seminar**
   314. Doctoral Research Methods IIB***
   318. Doctoral Research Methods II***

* May be taken as one of the six media studies courses by Journalism track students only. It is a core requirement for the Social Science track students.

** May be taken by Journalism track students only.

*** These courses are designed for Ph.D. students. Master's students require consent of faculty.

4. *The Media Studies M.A. Project:* students following the Social Science track enroll in COMM 290 to complete a project over two consecutive quarters that must be pre-approved and supervised by the adviser.
5. *The Journalism Master's Project:* students following the Journalism track usually begin work on the project during Winter Quarter and continue through Spring Quarter when credit is awarded. Students enroll for COMM 289 in the second quarter. See above, "Master of Arts, Journalism."

Additional courses are chosen in consultation with an academic adviser. A course in statistical methods is recommended.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin. The minimum number of academic units required for the Ph.D. at Stanford is 135, up to 45 of which can be transferred either from a master's degree at the University or from another accredited institution.

The department offers a Ph.D. in Communication Theory and Research. First-year students are required to complete introductory courses in communication theory and research, research methods, and statistics. These core courses, grounded in the social science literature, emphasize how people respond to media and how media institutions function. In addition, Ph.D. students must complete a minimum of three literature survey courses and related advanced seminars in Communication. Students also take significant course work outside the department in their area of interest. Each student builds a research specialty relating communication to current faculty interests in such areas as ethics, human-computer interactions, information processing, information technology, law, online communities, politics and voting, virtual reality, and youth and media. Regardless of the area of specialization, the Ph.D. program is designed primarily for students interested in university research and teaching or other research or analyst positions.

The Ph.D. program encompasses four years of graduate study (subsequent to completion of the B.A. degree) during which, in addition to fulfilling University residency requirements, Ph.D. candidates are required to:

1. Complete all departmental course requirements with grades of 'B+' or above. Currently these courses include COMM 206, 208, 311, 314, 317, and 318. Students are also required to take STATS 160 and two advanced methods courses.
2. Pass the general qualifying examinations by the end of the second academic year of study and pass a specialized area examination by the end of the third academic year of study.
3. Demonstrate proficiency in tools required in the area of research specialization. Identified with the advice of the faculty, such tools may include detailed theoretical knowledge, advanced statistical methods, computer programming, a foreign language, or other technical skills.
4. Complete at least two pre-dissertation research projects (the Major Project and the Complementary Project).
5. Teach or assist in teaching at least two courses, preferably two different courses, at least one of which is ideally a core undergraduate course (COMM 1A, 1B, 106, and 108).
6. Complete a dissertation proposal and proposal meeting approved by the dissertation committee.

7. Apply for candidacy by the end of the second year of graduate study. The requirements and procedures for applying for candidacy can be found in the document, "Official Rules and Procedures for the Ph.D. in the Department of Communication," available from the student services administrator of the department.
8. Complete a dissertation satisfactory to a reading committee of three or more faculty members in the Department of Communication and one faculty member not in the Department of Communication.
9. Pass the University oral examination, which is a defense of the dissertation.

Because the multifaceted nature of the department makes it possible for the Ph.D. student to specialize in areas that draw on different related disciplines, the plan of study is individualized and developed between the faculty adviser and the student.

Ph.D. candidacy is valid for five years.

Other requirements and details of the requirements can be found in the document, *Official Rules and Procedures for the Ph.D. in the Department of Communication*, available from the student services administrator of the department.

PH.D. MINOR

Candidates for the Ph.D. degree in other departments who elect a minor in Communication are required to complete a minimum of 20 units of graduate courses in the Department of Communication, including a total of three theory or research methods courses, and are examined by a representative of the department. A department adviser in consultation with the individual student determines the particular communication theory and methods courses.

THE INSTITUTE FOR COMMUNICATION RESEARCH

The Institute is an office of project research for the faculty of the Department of Communication and operates under grants to faculty from government, industry, and non-profit organizations. Research assistantships are often available to qualified Ph.D. students in Communication.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

PRIMARILY FOR UNDERGRADUATES

COMM 1A. Media Technologies, People, and Society—(Graduate students register for 211.) Open to non-majors. Introduction to the concepts and contexts of communication. A topics-structured orientation emphasizing the field and the scholarly endeavors represented in the department. GER:DB-SocSci

5 units, Aut (Nass, C)

COMM 1B. Media, Culture, and Society—The institutions and practices of mass media, including television, film, radio, and digital media, and their role in shaping culture and social life. The media's shifting relationships to politics, commerce, and identity. GER:DB-SocSci

5 units, not given this year (Iyengar, S; Turner, F)

COMM 104W. Reporting, Writing, and Understanding the News—Techniques of news reporting and writing. The value and role of news in democratic societies. GER:DB-SocSci, WIM

5 units, Aut (Zachary, G), Win (Frankel, G), Spr (Grimes, A)

COMM 106. Communication Research Methods—(Graduate students register for 206.) Conceptual and practical concerns underlying commonly used quantitative approaches, including experimental, survey, content analysis, and field research in communication. Pre- or corequisite: STATS 60 or consent of instructor. GER:DB-SocSci

5 units, Win (Gauthier, L; Groom V)

COMM 107. The First Amendment in the Digital Age—(Graduate students register for 207.) Interdisciplinary. Legal, institutional, sociological, and technological framework for free expression in democracy. History, values, and principles of the First Amendment. The challenge of new technology to old doctrine. Impact of the Internet on issues of free speech, such as political criticism, fair use, defamation, low value speech, professional privilege, and public forum in an era of private networks. How do new social networking technologies produce the expertise and accountability promoted by the First Amendment?

5 units, Spr (Noveck, B)

COMM 108. Media Processes and Effects—(Graduate students register for 208.) The process of communication theory construction including a survey of social science paradigms and major theories of communication. Recommended: 1 or PSYCH 1. GER:DB-SocSci

5 units, Aut (Bailenson, J)

COMM 116. Journalism Law—(Graduate students register for 216.) Laws and regulation impacting journalists. Topics include libel, privacy, news gathering, protection sources, fair trial and free press, theories of the First Amendment, and broadcast regulation. Prerequisite: Journalism M.A. student or advanced Communication major.

5 units, Aut (Wheaton, J)

COMM 117. Digital Journalism—(Graduate students register for 217.) Seminar and practicum. The implications of new media for journalists. Professional and social issues related to the web as a case of new media deployment, as a story, as a research and reporting tool, and as a publishing channel. Prerequisite: Journalism M.A. student or consent of instructor.

5 units, Win (Rheingold, H)

COMM 118Q. Theories of Film Practice—Stanford Introductory Seminar. Preference to sophomores. How theory connects with practice in the production of film and television. Film and television from the perspectives of practitioners who have theorized about their work in directing, editing, screenwriting, cinematography, and sound, and social scientists whose research has explored similar issues empirically. Write-2

4 units, Win (Breitrose, H)

COMM 120. Digital Media in Society—(Graduate students register for 220.) Contemporary debates concerning the social and cultural impact of digital media. Topics include the historical origins of digital media, cultural contexts of their development and use, and influence of digital media on conceptions of self, community, and state. GER:DB-SocSci

5 units, not given this year (Turner, F)

COMM 125. Perspectives on American Journalism—(Graduate students register for 225.) Issues, ideas, and concepts in the development of American journalism, emphasizing the role of the press in society, the meaning and nature of news, and professional norms that influence conduct in and outside the newsroom. Prerequisite: 1 or junior standing. GER:DB-SocSci

5 units, Aut (Glasser, T)

COMM 131. Media Ethics and Responsibilities—(Graduate students register for 231.) The development of professionalism among American journalists, emphasizing the emergence of objectivity as a professional and the epistemological norm. An applied ethics course where questions of power, freedom, and truth autonomy are treated normatively so as to foster critical thinking about the origins and implications of commonly accepted standards of responsible journalism. GER:DB-SocSci

5 units, Win (Glasser, T)

COMM 136. Democracy and the Communication of Consent—(Graduate students register for 236; same as POLISCI 134.) Focus is on competing theories of democracy and the forms of communication they presuppose, combining normative and empirical issues, and historical and contemporary sources. Topics include representation, public opinion, mass media, small group processes, direct democracy, the role of information, and the prospects for deliberative democracy. GER:DB-SocSci

5 units, Aut (Fishkin, J)

COMM 140. New Media Entrepreneurship—(Graduate students register for 240.) Primarily for graduate journalism and computer science students. Silicon Valley's new media culture, digital storytelling skills and techniques, web-based skills, and entrepreneurial ventures. Guest speakers.
5 units, Spr (Grimes, A)

COMM 146. Language and Discourse: Race, Class, and Gender—(Graduate students register for 246.) Theories concerning the discursive construction of identity and representation of cultures. Relationships between power and powerful speech. How language mediates and constructs identity; how it is associated with race, class and gender; and how people resist and manipulate these associations. Sources include conversation, public and popular culture, education, literature, and film. GER:DB-SocSci
5 units, Spr (Morgan, M)

COMM 147. History and Future of Journalism—(Graduate students register for 247.) History of U.S. journalism. Problems in the industry today: can the nation's newspapers survive in the era of online journalism; can online news sites and blogs take their place; can television be a reliable source for serious news?
5 units, Spr (Brinkley, J)

COMM 148. Hip-Hop and Don't Stop: Introduction to Modern Speech Communities—(Graduate students register for 248.) Focus this year is hip-hop and the media. Hip-hop as a global phenomenon with social influences beyond the music and entertainment industries. The development of standards. Hip-hop in the U.S. and its role as a cultural, political, social, and artistic resource for youth. Perspectives include cultural and linguistic anthropology, and media studies. Guest lecturers.
5 units, Win (Morgan, M)

COMM 149. Ethnography of Modern Speech Communities—(Graduate students register for 249.) Concepts and analytical techniques in the social sciences that privilege observation, participation, video recording, and transcription of spontaneous interaction rather than experimental tasks or introspection. Interconnections among communications, social sciences, linguistics, and sociocultural anthropology. Focus is on details of everyday activities in communities and interactive environments. Topics include language socialization, literacy, music, and the visual arts, the power of language, miscommunication, and universal and culture-specific properties of human communication.
5 units, not given this year (Morgan, M)

COMM 160. The Press and the Political Process—(Graduate students register for 260; same as POLISCI 323R.) The role of mass media and other channels of communication in political and electoral processes. GER:DB-SocSci
5 units, Win (Iyengar, S)

COMM 162. Analysis of Presidential Campaigns—(Graduate students register for 262; same as POLISCI 323S.) Seminar. The evolution of American political campaigns, and the replacement of the political party by the mass media as intermediary between candidates and voters. Academic literature on media strategies, the relationship between candidates and the press, the effects of campaigns on voter behavior, and inconsistencies between media campaigns and democratic norms. Do media-based campaigns enable voters to live up to their civic responsibility? Has the need for well-financed campaigns increased the influence of elites over nominations? Have citizens become disengaged? GER:DB-SocSci
5 units, Spr (Iyengar, S)

COMM 166. Virtual People—(Graduate students register for 266.) The concept of virtual people or digital human representations; methods of constructing and using virtual people; methodological approaches to interactions with and among virtual people; and current applications. Viewpoints including popular culture, literature, film, engineering, behavioral science, computer science, and communication.
5 units, Spr (Bailenson, J)

COMM 167. Advanced Seminar in Virtual Reality Research—Restricted to students with previous research experience in virtual reality. Experimental methods and other issues.
1-3 units, Aut (Bailenson, J)

COMM 169. Computers and Interfaces—(Graduate students register for 269.) Interdisciplinary. User responses to interfaces and design implications of those responses. Theories from different disciplines illustrate responses to textual, voice-based, pictorial, metaphoric, conversational, adaptive, agent-based, intelligent, and anthropomorphic interfaces. Group design project applying theory to the design of products or services for developing countries. GER:DB-SocSci
5 units, Win (Nass, C)

COMM 170. Communication and Children I—(Graduate students register for 270.) Developmental approach to how children come to use and process mass media, what information they obtain, and how their behavior is influenced by the media. Prerequisite: 1, PSYCH 1, or SOC 1. GER:DB-SocSci
5 units, not given this year (Roberts, D)

COMM 172. Psychological Processing of Media—(Graduate students register for 272.) The literature related to psychological processing and the effects of media. Topics: unconscious processing; picture perception; attention and memory; emotion; the physiology of processing media; person perception; pornography; consumer behavior; advanced film and television systems; and differences among reading, watching, and listening. GER:DB-SocSci
5 units, not given this year (Reeves, B)

COMM 177C. Specialized Writing and Reporting Environmental Journalism—(Graduate students register for 277C.) The development of journalism with an environmental focus. Emphasis is on climate change and associated issues of energy and mobility. Students cover subjects such as the rise of the environmental movement, businesses' relationship to the environment, toxic waste, endangered species, and water and air pollution. Prerequisite: 104 or consent of instructor.
5 units, Spr (Barringer, F)

COMM 177D. Specialized Writing and Reporting: Magazine Journalism—(Graduate students register for 277D.) How to report, write, edit, and read magazine articles, emphasizing long-form narrative. Tools and templates of story telling such as scenes, characters, dialogue, and narrative arc. How the best magazine stories defy or subvert conventional wisdom and bring fresh light to the human experience through reporting, writing, and moral passion. Prerequisite: 104 or consent of instructor.
5 units, Aut (Frankel, G)

COMM 177F. Specialized Writing and Reporting: Literary Journalism—(Graduate students register for 277F.) Using the tools of literature to tell the true stories of journalism. Characterization, narrative plotting, scene-setting, point of view, tone and style, and the techniques of reporting for literary journalism, interviewing, and story structure. Prerequisite: 104 or consent of instructor.
5 units, Win (Bettinger, J)

COMM 177G. Specialized Writing and Reporting: Covering a Business Beat—(Graduate students register for 277G.) How to write news and feature stories about companies and personalities in the business world. Prerequisite: 104 or consent of instructor.
5 units, Win (Grimes, A)

COMM 177K. Specialized Writing and Reporting: Human Rights Journalism—(Graduate students register for 277K.) The evolution of human rights law and enforcement, and the role of journalists in uncovering, pursuing, and publicizing political violence, detention, and torture. Case studies from S. Africa, Latin America, Israel and Palestine, N. Ireland, Bosnia, Rwanda, and Sudan and Darfur. Human rights issues in the U.S. in the aftermath of 9/11. Students conduct research and write journalistic reports on foreign and domestic issues. Prerequisite: 104 or consent of instructor.
5 units, Spr (Frankel, G)

COMM 177R. Specialized Writing and Reporting: Covering Silicon Valley—(Graduate students register for 277R.) Techniques to write and report about Silicon Valley technologies. Visits from professional writers. Prerequisite: 104 or consent of instructor.
5 units, Spr (Zachary, G; Markoff, J)

COMM 177S. Specialized Writing and Reporting: Sports Journalism—(Graduate students register for 277S.) Workshop. The history of sports writing from the 20s to present. Reporting, interviewing, deadline writing, and how to conceptualize and develop stories. Students write features and news stories for publication in a new sports section in The Cardinal Inquirer, an online publication of the graduate program in journalism. Prerequisite: 104 or consent of instructor.
5 units, Spr (Pomerantz, G)

COMM 177Y. Specialized Writing and Reporting: Foreign Correspondence: Working in the Middle East—(Graduate students register for 277Y.) Issues and techniques for working as a journalist in a dangerous part of the world. Prerequisite: 104 or consent of instructor.
5 units, Aut (Brinkley, J)

COMM 182. Virtual Communities and Social Media—(Graduate students register for 282.) Taught by the originator of the terms virtual community and smart mobs. How the concept of community has changed from agricultural to industrial to networked societies. Much class discussion takes place in social cyberspaces.
5 units, Aut (Rheingold, H)

COMM 190. Senior Project—Research project. Prerequisite: senior standing.
5 units, Aut, Win, Spr, Sum (Staff)

COMM 195. Honors Thesis—Qualifies students to conduct communication research. Student must apply for department honors thesis program during Spring Quarter of junior year.
5 units, Aut, Win, Spr, Sum (Staff)

COMM 199. Individual Work—For students with high academic standing. May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

PRIMARILY FOR MASTER'S STUDENTS

COMM 206. Communication Research Methods—(Graduate section; see 106.)
4 units, Win (Gauthier, L; Groom, V)

COMM 207. The First Amendment in the Digital Age—(Graduate section; see 107.)
4 units, Spr (Noveck, B)

COMM 208. Media Processes and Effects—(Graduate section; see 108.)
4 units, Aut (Bailenson, J)

COMM 211. Media Technologies, People, and Society—(Graduate section; see 1A.)
4 units, Aut (Nass, C)

COMM 212. Models of Democracy—(For undergraduates and M.A. students; Ph.D. students register for 312; same as CLASSHIS 137/237, POLISCI 237/337.) Ancient and modern varieties of democracy; debates about their normative and practical strengths and the pathologies to which each is subject. Focus is on participation, deliberation, representation, and elite competition, as values and political processes. Formal institutions, political rhetoric, technological change, and philosophical critique. Models tested by reference to long-term historical natural experiments such as Athens and Rome, recent large-scale political experiments such as the British Columbia Citizens' Assembly, and controlled experiments.
3-5 units, Win (Fishkin, J; Ober, J)

COMM 216. Journalism Law—(Graduate section; see 116.)
4 units, Aut (Wheaton, J)

COMM 217. Digital Journalism—(Graduate section; see 117.)
4 units, Win (Rheingold, H)

COMM 220. Digital Media in Society—(Graduate section; see 120.)
4 units, not given this year (Turner, F)

COMM 225. Perspectives on American Journalism—(Graduate section; see 125.)
4 units, Aut (Glasser, T)

COMM 231. Media Ethics and Responsibilities—(Graduate section; see 131.)
4 units, Win (Glasser, T)

COMM 236. Democracy and the Communication of Consent—(Graduate section; see 136; same as POLISCI 134.)
4 units, Aut (Fishkin, J)

COMM 236G. Democracy, Justice, and Deliberation—(For undergraduates and M.A. students; Ph.D. students register for 336G.) Decision processes that make a normative claim to resolve questions of public choice, at any of these levels of choice: first principles, constitutions, public policies, or particular outcomes. Topics include democratic theory, the theory of justice and issues of deliberation in small groups, public consultations, conventions, juries, and thought experiments popular in contemporary political theory. Readings include Madison, de Tocqueville, Mill, Marx, Rawls, Nozick, Ackerman, and Schudson. Preference to graduate students. Prerequisite: consent of instructor.
1-5 units, not given this year (Fishkin, J)

COMM 238. Democratic Theory: Normative and Empirical Issues—(For undergraduates and M.A. students; Ph.D. students register for 338.) Conflicting visions in terms of normative conflicts and empirical evidence. How citizens communicate with each other and their representatives, and how their representatives deliberate. Topics include theories of deliberation, how democracy is transformed when brought to the mass public, how informed a public is needed, and potential pathologies of small group communication in settings including juries, town meetings, and contemporary public consultations. Readings include Madison, Burke, Mill, Lippmann, Dewey, Schumpeter, Dahl, Sunstein, and Mansbridge.
1-5 units, not given this year (Fishkin, J)

COMM 239. Questionnaire Design for Surveys and Laboratory Experiments: Social and Cognitive Perspectives—The social and psychological processes involved in asking and answering questions via questionnaires for the social sciences; optimizing questionnaire design; open versus closed questions; rating versus ranking; rating scale length and point labeling; acquiescence response bias; don't-know response options; response choice order effects; question order effects; social desirability response bias; attitude and behavior recall; and introspective accounts of the causes of thoughts and actions.
4 units, not given this year (Krosnick, J)

COMM 240. New Media Entrepreneurship—(Graduate section; see 140.)
4 units, Spr (Grimes, A)

COMM 244. Democracy, Press, and Public Opinion—(For undergraduates and M.A. students; Ph.D. students register for 344.) The democratic tradition provides conflicting visions of what a democracy is or might be, offering different views of the role of the press and citizens in engaging public issues. Focus is on democratic theory with empirical work on public opinion and the role of the media. Topics include campaigns, the effects of new technology, competing strategies of public consultation, public journalism, and possibilities for citizen deliberation. Prerequisite: consent of instructor.
1-4 units, not given this year (Fishkin, J)

COMM 246. Language and Discourse: Race, Class, and Gender—(Graduate section; see 146.)
4 units, Spr (Morgan, M)

COMM 247. History and Future of Journalism—(Graduate section; see 147.)
4 units, Spr (Brinkley, J)

COMM 248. Hip Hop and Don't Stop: Introduction to Modern Speech Communities—(Graduate section; see 148.)
4 units, Win (Morgan, M)

COMM 249. Ethnography of Modern Speech Communities—(Graduate section; see 149.)
4 units, not given this year (Morgan, M)

COMM 260. The Press and the Political Process—(Graduate section; see 160; same as POLISCI 323R.)
4 units, Win (Iyengar, S)

COMM 262. Analysis of Presidential Campaigns—(Graduate section; see 162; same as POLISCI 323S.)
4 units, Spr (Iyengar, S)

COMM 266. Virtual People—(Graduate section; see 166.)
4 units, Spr (Bailenson, J)

COMM 268. Experimental Research in Advanced User Interfaces—(For undergraduates and M.A. students; Ph.D. students register for 368.) Project-based course involves small groups designing and implementing an experiment concerning voice and agent user interfaces. Each group is involved in a different, publishable research project. Prerequisite: consent of instructor.
1-5 units, Win, Spr (Nass, C)

COMM 269. Computers and Interfaces—(Graduate section; see 169.)
4 units, Win (Nass, C)

COMM 270. Communication and Children I—(Graduate section; see 170.)
4 units, not given this year (Roberts, D)

COMM 272. Psychological Processing of Media—(Graduate section; see 172.)
4 units, not given this year (Reeves, B)

COMM 273. Public Issues Reporting I—Reporting and writing on government and public policies and issues; their implications for the people and the press. Required for journalism M.A. students.
4 units, Aut (Grimes, A)

COMM 274. Public Issues Reporting II—Student teams study one major public policy issue that has broad societal impact. Students report and write individually, and as a team produce a body of journalism that advances the understanding of a new issue each year, published on a web site and offered for publication to newspapers and other media outlets. Prerequisites: 273, Journalism M.A. student.
4 units, Win (Brinkley, J)

COMM 277C. Specialized Writing and Reporting Environmental Journalism—(Graduate section; see 177C.)
4 units, Spr (Barringer, F)

COMM 277D. Specialized Writing and Reporting: Magazine Journalism—(Graduate section; see 177D.)
4 units, Aut (Frankel, G)

COMM 277F. Specialized Writing and Reporting: Literary Journalism—(Graduate section; see 177F.)
4 units, Win (Bettinger, J)

COMM 277G. Specialized Writing and Reporting: Covering a Business Beat—(Graduate section; see 177G.)
4 units, Win (Grimes, A)

COMM 277K. Specialized Writing and Reporting: Human Rights Journalism—(Graduate section; see 177K.)
4 units, Spr (Frankel, G)

COMM 277R. Specialized Writing and Reporting: Covering Silicon Valley—(Graduate section; see 177R.)
4 units, Spr (Zachary, G; Markoff, J)

COMM 277S. Specialized Writing and Reporting: Sports Journalism—(Graduate section; see 177S.)
4 units, Spr (Pomerantz, G)

COMM 277Y. Specialized Writing and Reporting: Foreign Correspondence: Working in the Middle East—(Graduate section; see 177Y.)
4 units, Aut (Brinkley, J)

COMM 282. Virtual Communities and Social Media—(Graduate section; see 182.)
4 units, Aut (Rheingold, H)

COMM 289. Journalism Master's Project
4 units, Spr (Staff)

COMM 290. Media Studies M.A. Project—Individual research for coterminal Media Studies students.
1 unit, Aut, Win, Spr, Sum (Staff)

COMM 291. Graduate Journalism Seminar—Required of students in the graduate program in Journalism. Forum for current issues in the practice and performance of the press. Journalists in or visiting the Bay Area are often guest speakers. May be repeated for credit.
1 unit, Aut (Grimes, A), Win (Staff), Spr (Bettinger, J)

COMM 299. Individual Work
1-4 units, Aut, Win, Spr, Sum (Staff)

PRIMARILY FOR DOCTORAL STUDENTS

COMM 308. Graduate Seminar in Political Psychology—(Same as POLISCI 324.) For students interested in research in political science, psychology, or communication. Methodological techniques for studying political attitudes and behaviors. May be repeated for credit.
1-3 units, Aut, Win, Spr (Krosnick, J)

COMM 310. Methods of Analysis Program in the Social Sciences (MAPSS) Workshop—(Same as POLISCI 402.) Colloquium series. Creation and application of new methodological techniques for social science research. Presentations on methodologies of use for social scientists across departments at Stanford by guest speakers from Stanford and elsewhere. See http://mapss.stanford.edu. May be repeated for credit.
1 unit, Aut, Win, Spr (Krosnick, J)

COMM 311. Theory of Communication—Required of Communication doctoral students.
1-5 units, Win (Roberts, D)

COMM 312. Models of Democracy—(Same as 212; see 212; same as CLASSHIS 137/237, POLISCI 237/337.)
3-5 units, Win (Fishkin, J; Ober, J)

COMM 314. Doctoral Research Methods II B—Part of the doctoral research methods sequence. Focus is on the logic of qualitative research methods and modes of inquiry relevant to the study of communication and meaning. Prerequisite: Communication Ph.D. student, or consent of instructor.
1-5 units, Spr (Glasser, T)

COMM 317. Doctoral Research Methods I—Approaches to social science research and their theoretical presuppositions. Readings from the philosophy of the social sciences. Research design, the role of experiments, and quantitative and qualitative research. Cases from communication and related social sciences. Prerequisite: consent of instructor.
1-5 units, not given this year (Fishkin, J)

COMM 318. Doctoral Research Methods II—Prerequisite: consent of instructor.
1-5 units, Win (Krosnick, J)

COMM 319. Doctoral Research Methods III—Prerequisite: consent of instructor.
1-5 units, not given this year

COMM 320G. Advanced Topics in New Media and American Culture—Primarily for Ph.D. students. Prerequisite: 220 (formerly 219) or consent of instructor.
1-5 units, not given this year (Turner, F)

COMM 325G. Comparative Studies of News and Journalism—Focus is on topics such as the roles and responsibilities of journalists, news as a genre of popular literature, the nexus between press and state, and journalism's commitment to political participation.
1-5 units, not given this year (Glasser, T)

COMM 326. Advanced Topics in Human Virtual Representation—Topics include the theoretical construct of person identity, the evolution of that construct given the advent of virtual environments, and methodological approaches to understanding virtual human representation. Prerequisite: consent of instructor.
1-5 units, Win (Bailenson, J)

COMM 331G. Communication and Media Ethics—Limited to Ph.D. students. Advanced topics in press ethics and responsibility. Prerequisite: 231 or consent of instructor.
1-3 units, not given this year (Glasser, T)

COMM 336G. Democracy, Justice, and Deliberation—(Same as 236G; see 236G.)
1-5 units, not given this year (Fishkin, J)

COMM 338. Democratic Theory: Normative and Empirical Issues—(Same as 238; see 238.)
1-5 units, not given this year (Fishkin, J)

COMM 344. Democracy, Press, and Public Opinion—(Same as 244; see 244.)
1-4 units, not given this year (Fishkin, J)

COMM 348. Gender, Culture, and Communication—The field of gender and communication and principal questions in feminist theory in the context of linguistics, media studies, and sociolinguistics. Historiographical and theoretical perspectives on feminism and technology. International and multicultural focus. Areas include discourse and interaction, gender and culture, communication theory, gender and media, cultural studies, political economy, and symbolic communication. How everyday interactions, media, film, popular culture, and journalism incorporate gender and sexuality and perpetuate stereotypes of men, women, and sexuality. Prerequisite: consent of instructor.
1-5 units, not given this year (Morgan, M)

COMM 349. Ethnography of Communication—Ethnographic methods and the study of discourse and interaction. The impact of ethnography on research and field methods; how results validate knowledge across disciplines. The relationship of ethnography of communication to disciplines such as anthropology, linguistics, communications, and sociology. Focus is on the integration of ethnography and other research techniques for the documentation of communication and its role in the establishment and management of social encounters. Prerequisite: consent of instructor.
1-5 units, Win (Morgan, M)

COMM 360G. Political Communication—Limited to Ph.D. students. Advanced topics. Prerequisite: 260 or consent of instructor.
1-5 units, not given this year (Iyengar, S)

COMM 361. Field Experimentation in Political Communication Research—The design of large-scale field experiments. Recent developments in analysis of experimental data including matching, propensity scores, and other techniques that address the problem of selection bias. Prerequisite: consent of instructor.
4 units, not given this year

COMM 368. Experimental Research in Advanced User Interfaces—(Same as 268; see 268.)
1-5 units, Win, Spr (Nass, C)

COMM 370G. Communication and Children—Limited to Ph.D. students. Prerequisite: 270 or consent of instructor.
1-5 units, not given this year (Roberts, D)

COMM 372G. Seminar in Psychological Processing—Limited to Ph.D. students. Advanced topics. Prerequisite: 272 or consent of instructor.
1-5 units, not given this year (Reeves, B)

COMM 374G. Freedom and Control of Communication—The meaning of freedom of public communication in democratic communities, focusing on the tensions between freedom and control, rights and opportunities, individual liberty and political equality.
1-5 units, not given this year (Glasser, T)

COMM 379. History of the Study of Communication—The origins of communication/media theory and research emphasizing the rise of communication as a separate field of study. The influence of schools of thought concerning the scope and purpose of the study of communication. Readings include foundational essays and studies. Prerequisite: Ph.D. student or consent of instructor.
1-5 units, Win (Glasser, T)

COMM 380. Curriculum Practical Training—Practical experience in the communication industries. Prerequisites: graduate standing in Communication, consent of instructor. Meets requirements for Curricular Practical Training for students on F-1 visas. May be repeated four times for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

COMM 397. Complementary Project—Individual research for Ph.D. candidates.
1-6 units, Aut, Win, Spr, Sum (Staff)

COMM 398. Major Research Project—Individual research for Ph.D. candidates.
1-6 units, Aut, Win, Spr, Sum (Staff)

COMM 399. Advanced Individual Work
1-9 units, Aut, Win, Spr, Sum (Staff)

OVERSEAS STUDIES

Courses approved for the Communication major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

FLORENCE

OSPFLOR 49. The Cinema Goes to War: Fascism and World War II as Represented in Italian and European Cinema
5 units, Win (Campani, E)

COMPARATIVE LITERATURE

Emeriti: (Professors) Joseph Frank, John Freccero, René Girard, Herbert Lindenberger, Mary Pratt; *(Courtesy Professors)* W. B. Carnochan, Gerald Gillespie, Marjorie G. Perloff

Chair: Russell Berman

Director of Admissions: Russell Berman

Director of Graduate Studies: Hans Ulrich Gumbrecht

Director of Undergraduate Studies: Andrea Nightingale

Chair of Curriculum Committee: Andrea Nightingale

Professors: John Bender (English, Comparative Literature), Russell Berman (German Studies, Comparative Literature), Margaret Cohen (Comparative Literature, on leave), Amir Eshel (German Studies, Comparative Literature, on leave Autumn, Spring), Roland Greene (English, Comparative Literature), Hans U. Gumbrecht (French and Italian, Spanish and Portuguese, Comparative Literature), Seth Lerer (English, Comparative Literature, on leave Autumn, Winter), Franco Moretti (English, Comparative Literature), Elisabeth Mudimbe-Boyi (French and Italian, Comparative Literature), Andrea Nightingale (Classics, Comparative Literature), David Palumbo-Liu (Comparative Literature, on leave), Patricia Parker (English, Comparative Literature), Ramón Saldívar (English, Comparative Literature), Jeffrey T. Schnapp (French and Italian, Comparative Literature)

Associate Professor: Monika Greenleaf (Slavic Languages and Literatures, Comparative Literature, on leave Autumn, Spring)

Courtesy Professors: David G. Halliburton, John Wang

Lecturers: Andrea Bachner (Humanities Fellow), Marisa Galvez, Ann Gelder, Jessie Labov, Shafiq Shamel

Consulting Professor: Hayden White

Visiting Professors: Karl Heinz Bohrer (German Studies, Comparative Literature, Spring), Dan Miron (Comparative Literature, Winter)

Department Offices: Building 260, Room 209
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Phone: (650) 723-3566
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Web Site: http://complit.stanford.edu

Courses given in Comparative Literature have the subject code COMPLIT. For complete list of subject codes, see Appendix.

The Department of Comparative Literature offers courses in the history and theory of literature through comparative approaches. The department accepts candidates for the degrees of Bachelor of Arts and Doctor of Philosophy.

The field of Comparative Literature provides students the opportunity to study imaginative literature in all its forms. While other literary disciplines focus on works of literature as parts of specific national or linguistic traditions, Comparative Literature draws on literature from all contexts in order to examine the nature of literary phenomena from around the globe and from different historical moments, while exploring how literary writing interacts with other elements of culture and society. The field studies literary expression through examinations of genres such as novels, epics, and poetry, and new aesthetic forms such as cinema and electronic media. Although Comparative Literature does not restrict its focus to single traditions or periods, it does investigate the complex interplay of the literary imagination and historical experience. Attention is also paid to questions of literary theory, aesthetic philosophy, and cultural interpretation.

Along with the traditional model of comparative literature that juxtaposes two or more national literary cultures, the department supports teaching and research that examine literary phenomena with additional tools of inquiry such as literary theory, the relationship between literature and philosophy, and the enrichment of literary study with other disciplinary methodologies. Comparative Literature also encourages the study of aspects of literature that surpass national boundaries, such as transnational literary movements or the dissemination of particular genres. In each case, students emerge from the program with enhanced verbal and writing skills, a command of literary studies, the ability to read analytically and critically, and a more global knowledge of literature.

UNDERGRADUATE PROGRAM

BACHELOR OF ARTS

The Department's undergraduate programs are designed to enhance students' appreciation of literature in all its diversity, particularly through introductory courses that include treatments of the primary literary genres. The course of study at intermediate and advanced levels is intentionally flexible in order to accommodate student interest in areas such as specific geographical regions, historical periods, and interdisciplinary connections between literature and other fields such as philosophy, music, the visual arts, and the social sciences. A Comparative Literature major prepares a student to become a better reader and interpreter of literature, through enhanced examination of texts and the development of a critical vocabulary to discuss them. It prepares students for a lifetime of reading literature and the enrichment and enjoyment that entails. However the attention to verbal expression and interpretive argument also serves students who plan to proceed into careers requiring strong language skills. In addition, the major in Comparative Literature provides preparation for those students who intend to pursue an advanced degree as a gateway to an academic career.

The major in Comparative Literature requires students to enroll in a set of core courses offered by the department, to complete electives in the department, and to enroll in additional literature courses, or other courses approved by the adviser, offered by other departments. This flexibility to combine literature courses from several departments and addressing literature from multiple traditions is the hallmark of the Comparative Literature major. Students may count courses which read literature in translation; however, students, and especially those planning to pursue graduate study in Comparative Literature, are encouraged to develop a command of non-native languages.

Declaring the Major—Students declare the major in Comparative Literature through Axess. Students should meet with the Director of Undergraduate Studies to discuss appropriate courses and options within the major, and to plan the course of study. Majors are also urged to attend department events such as public talks and seminars.

Advising—Students majoring in Comparative Literature should consult with the Director of Undergraduate Studies at least once a year. The director monitors progress to completion of the degree. Students are also encouraged to develop relationships with other faculty members who may act as mentors.

Overseas Campuses and Abroad Programs—The Department of Comparative Literature encourages time abroad, both for increased proficiency in language and the opportunity for advanced course work. Course work done at campuses other than Stanford is counted toward the major at the discretion of the Director of Undergraduate Studies and is contingent upon the Office of the University Registrar's approval of transfer credit. To that end, students abroad are advised to save syllabi, notes, papers, and correspondence.

Honors College—The Department of Comparative Literature encourages honors students to enroll in the honors college scheduled during the weeks preceding the beginning of every academic year. Applications to the college are available from the department administrator. The honors college is coordinated by the Division of Literatures, Cultures, and Languages (DLCL).

REQUIREMENTS

All majors in Comparative Literature (including honors) are required to complete the following courses

1. COMPLIT 101, What is Literature? (5 units) This gateway to the major is normally taken by the end of sophomore year. It provides an introduction to literature and its distinctions from other modes of linguistic expression, and a fundamental set of interpretive. This course fulfills the Writing in the Major requirement for 2007-08.
2. *The genre core:* COMPLIT 121, Poems, Poetry, Worlds: An Introductory Course; 122, Literature as Performance; 123, The Novel, the World (5 units each). Students should complete these courses as soon as possible. Each course draws on examples from multiple traditions to ask questions about the logic of the individual genres.

3. COMPLIT 199, Lives in Literature. (5 units) This senior seminar is designed as a culmination to the course of study. It provides an outlook on careers in literature and reflection on the nature of the discipline.
4. *Comparative Literature electives:* Majors must enroll in at least three additional Comparative Literature courses in consultation with their adviser.
5. *Other electives:* Students must complete course work for a total of at least 65 units. These electives may be drawn from Comparative Literature offerings, from other literature departments, or from other fields of interdisciplinary relevance to the student's interest, in consultation with the adviser.

MAJOR TRACKS

Students may choose to structure their elective choices or to enroll in supplementary course work in literature beyond the required 65 units in order to achieve a particular emphasis in their studies at Stanford. Students may choose to pursue concentrations in literary studies, in interdisciplinary approaches to literature, or in philosophy and literature. Students may also design their own area of emphasis within the major. To explore these options, students should discuss study plans with their adviser; see http://complit.stanford.edu/undergrad/core.html. Examples of tracks include:

Literary Studies—Literary works are shaped by a complex interplay of historical forces and constraints, including contacts between differing cultures and traditions; the evolution of literary genres, practices, and conventions; shifts in media and technologies of reproduction and diffusion; and the imitation of model authors. By combining in-depth work in a primary literature with work in a second literature, this option emphasizes the study of such phenomena.

Students pursuing this option would typically take courses in both languages with a similar focus such as a specific literary genre, a historical epoch, or a theoretical question. Students in this option would also typically write at least one seminar paper that is comparative in nature.

Interdisciplinary Approaches to Literature—Literary creation is a complex human enterprise that intersects with other fields of human endeavor and creation. An interdisciplinary approach is designed to promote the focused study of intersections between literature and the arts (including film, music, and painting), and other disciplines (including anthropology, feminist studies, history, history of science, linguistics, and philosophy).

Students pursuing this option would typically take a series of courses focused upon an interdisciplinary approach to a topic such as: a single discipline or closely related cluster of disciplines; the cultural history of a single historical epoch; one or more of the fine arts, media, or film studies; or area studies. Students in this option would also typically write at least one seminar paper that is interdisciplinary in nature.

Philosophical and Literary Thought—Undergraduates may major in Comparative Literature with a special track in interdisciplinary studies at the intersection of literature and philosophy. Students in this option take courses alongside students from other departments that also have specialized options associated with the program for the study of Philosophical and Literary Thought. Each student in this option is assigned an adviser in Comparative Literature, and student schedules and course of study must be approved in writing by the adviser, the Director of Undergraduate Studies of Comparative Literature, and the Director of Undergraduate Studies of the program. See http://philit.stanford.edu/programs.

A total of 65 units must be completed for this option, including the following requirements:

1. Five courses using materials in the original language and making up an intellectually coherent program in the literature of a language other than the student's native tongue. Bilingual students may satisfy this requirement in either of their original languages or in a third language. The coherence of this program must be approved in writing by the Director of Undergraduate Studies of Comparative Literature.
2. *Philosophy and Literature Gateway Course* (4 units): COMPLIT 181 (enroll in PHIL 81, FRENGEN 181, OR ITALGEN 181). This course should be taken as early as possible in the student's career, normally in the sophomore year.
3. *Philosophy Writing in the Major* (5 units): PHIL 80. Prerequisite: introductory philosophy class.
4. *Aesthetics, Ethics, Political Philosophy* (ca. 4 units): one course from the PHIL 170 series.
5. *Language, Mind, Metaphysics, and Epistemology* (ca. 4 units): one course from the PHIL 180 series.
6. *History of Philosophy* (ca. 8 units): two courses in the history of philosophy, numbered above PHIL 100.
7. *Related Courses* (ca. 8 units): two upper division courses relevant to the study of philosophy and literature as identified by the committee in charge of the program. A list of approved courses is available from the undergraduate adviser of the program in philosophical and literary thought.
8. One course, typically in translation, in a literature distant from that of the student's concentration and offering an outside perspective on that literary tradition.
9. *Capstone Seminar* (ca. 4 units): in addition to COMPLIT 199, students take a capstone seminar of relevance to philosophy and literature approved by the undergraduate adviser of the program in philosophical and literary thought. The student's choice of a capstone seminar must be approved in writing by the Director of Undergraduate Studies of Comparative Literature and by the Director of Undergraduate Studies of the program.
10. *Seminar Paper Requirement:* students must write at least one seminar paper that is interdisciplinary in nature. This paper brings together material from courses taken in philosophy and literature, and may be an honors paper (see below), an individual research paper (developed through independent work with a faculty member), or a paper integrating materials developed for two separate courses (by arrangement with the two instructors). Though it may draw on previous course work, the paper must be an original composition, 18-20 pages in length. It must be submitted to the Director of Undergraduate Studies and receive approval no later than the end of Winter Quarter in the fourth year of study.

At least two of the courses counted toward requirements 1, 2, 7, 8, and 9 must be taught by Comparative Literature faculty. Transfer units may not normally be used to satisfy requirements 2, 3, 4, 5, 6 and 9. Units devoted to acquiring language proficiency are not counted toward the 65-unit requirement.

DIGITAL HUMANITIES MODULE

The Comparative Literature department, in collaboration with the Humanities Lab, offers a digital humanities module that can be combined with any of the department's major programs. Students who are interested in digital humanities should contact the department's Director of Undergraduate Studies who facilitates coordination with the Humanities Lab. Students planning to combine the Comparative Literature major and the digital humanities module must fulfill the following requirements in addition to the general major requirements:

1. CS 105 or equivalent
2. Participate in the Humanities Lab gateway core seminar, HUMNTIES 198J/ENGLISH 153H, Digital Humanities: Literature and Technology (5 units)
3. Complete the HUMNTIES 201, Digital Humanities Practicum (2-5 units), in the junior year
4. Complete one digital project, in lieu of the course's main writing requirement, in a course offered in the department under the supervision of the course instructor and humanities lab adviser. This should usually be done in an upper-division course.

Students are encouraged to enroll in DLCL 99, Multimedia Course Lab, when working on the digital course project. For more information on the Digital Humanities Lab, see http://shl.stanford.edu.

MINORS

The undergraduate minor in Comparative Literature represents an abbreviated version of the major. It is designed for students who are unable to pursue the major but who nonetheless seek an opportunity to gain a deeper understanding of literature. Plans for the minor should be discussed with the Director of Undergraduate Studies. The minimum number of units required for a minor at Stanford is 20. Requirements for the minor in Comparative Literature include:

1. COMPLIT 101: What is Literature?
2. One course from the genre core: COMPLIT 121, 122, or 123
3. At least two other Comparative Literature courses

MINOR IN LITERATURE AND MINOR IN MODERN LANGUAGES

The Division of Literatures, Cultures, and Languages offers two undergraduate minor programs, the minor in Literature and the minor in Modern Languages. These minors draw on literature and language courses offered in this and other literature departments. See the "Literatures, Cultures, and Languages" section of this bulletin for further details about these minors and their requirements.

HONORS PROGRAM

The honors option offers motivated Comparative Literature majors the opportunity to write a senior honors paper. During Spring Quarter of the junior year, a student interested in the honors program should consult with the Director of Undergraduate Studies and submit a thesis proposal (2-5 pages), along with an outline of planned course work for the senior year. During this quarter, the student may enroll for 2 units of credit for independent research in COMPLIT 189B to prepare this statement and undertake initial planning for the honors paper. The proposal is reviewed by the honors committee, including the Director of Undergraduate Studies and the chair of the department.

The Director of Undergraduate Studies designates a faculty tutor appropriate to the topic and a second reader for approved honors papers.

Students in the honors program enroll in DLCL 189 (5 units) in Autumn Quarter of the senior year to refine the project description and begin research in preparation for composing the honors paper. During Winter Quarter of the senior year, the student enrolls in COMPLIT 189A (5 units), independent study with the faculty tutor, to draft the honors paper.

At the end of the quarter, the student submits a completed draft to the tutor. If approved, two copies are forwarded to the honors committee, which ultimately awards honors. If revisions are advised, the student has until the fifth week of Spring Quarter to submit the final paper. Students who did not enroll in a 189B course in the junior year may enroll in COMPLIT 189B in Spring Quarter of the senior year while revising the thesis, if approved by the thesis advisor. 10-12 units of course work associated with the honors paper (DLCL 189 and COMPLIT 189A and 189B) may be counted toward the 65 units required for the major.

Honors papers vary considerably in length as a function of their topic, historical scope, and methodology. They may make use of previous work developed in seminars and courses, but display an enhanced comparative or theoretical scope. Quality rather than quantity is the key criterion. Typically, however, honors papers are 40-70 pages.

Honors Awards—The two readers of any honors thesis in Comparative Literature may elect to nominate the thesis in question for University-wide awards. In addition, the department honors committee evaluates on a competitive basis the honors theses completed in a given year and nominates one for University-wide awards competitions.

GRADUATE PROGRAM

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The Ph.D. program is designed for a small group of students whose linguistic background, breadth of interest in literature, and curiosity about the problems of literary scholarship and theory (including the relation of literature to other disciplines) make this program more appropriate to their needs than the Ph.D. in one of the individual literatures. Students take courses in at least three literatures (one may be that of the native language), to be studied in the original. The program is designed to encourage familiarity with the major approaches to literary study prevailing today.

Before starting graduate work at Stanford, students should have completed an undergraduate program with a strong background in one literature and some work in a second literature studied in the original language. Since the program demands an advanced knowledge of two non-native languages and a reading knowledge of a third non-native language, students should at the time of application have an advanced enough knowledge of one of the three to take graduate-level courses in that language when they enter the program. They should be making enough progress in the study of a second language to enable them take graduate courses in that language not later than the beginning of the second year, and earlier if possible. Applicants are expected to take an intensive course in the third language before entrance.

Students are admitted under a fellowship plan which attempts to integrate financial support and completion of residence requirements with their training as prospective university teachers. Tenure as a fellow, assuming satisfactory academic progress, is for a maximum of four or five years. The minimum teaching requirement is the same regardless of financial support. (For specific teaching requirements, see below.) Five years of support are normally available, from a combination of fellowships and teaching assistantships, to Ph.D. candidates admitted to the Comparative Literature Department who are making satisfactory progress toward the degree.

APPLICATION PROCEDURES

Competition for entrance into the program is keen. The program is kept small so that students have as much opportunity as possible to work closely with faculty throughout the period of study. Completed applications are due December 4. Because of the special nature of comparative literature studies, the statement of purpose included in the application for admission should contain the following information besides the general plan for graduate work called for on the application:

1. A detailed description of the applicant's present degree of proficiency in each of the languages studied, indicating the languages in which the applicant is prepared to do graduate work at present and outlining plans to meet additional language requirements of the program.
2. A description of the applicant's area of interest (for instance, theoretical problems, genres, periods) within literary study and the reasons for finding comparative literature more suitable to his or her needs than the study of a single literature. Applicants should also indicate what they think will be their primary field, including the literatures on which they intend to concentrate.

All applicants should arrange to have the results of the general section of the Graduate Record Examination sent to the Department of Comparative Literature.

Recommendations should, if possible, come from faculty in at least two of the literatures in which the student proposes to work.

Applicants must submit a copy of an undergraduate term paper which they consider representative of their best work.

DEGREE REQUIREMENTS

Residence—A candidate for the Ph.D. degree must complete three years (nine quarters) of full-time work, or the equivalent, in graduate study beyond the B.A. degree. The student must take 135 units of graduate work, in addition to the doctoral dissertation, of which at least 72 units must be within the department. At least three consecutive quarters of course work must be taken at Stanford.

Languages—Students must know three non-native languages, two of them sufficiently to qualify for graduate courses in these languages and the third sufficiently to demonstrate the ability to read a major author in this language. Only the third language may be certified by examination. The other two are certified by graduate-level course work specified below. Language preparation must be sufficient to support graduate-level course work in at least one language during the first year and in the second language during the second year. Students must demonstrate a reading knowledge of the third non-native language no later than the beginning of the third year.

Literatures made up of works written in the same language (such as Spanish and Latin American) are counted as one. One of the student's three literatures usually is designated as the primary field, the other two as secondary fields, although some students may offer two literatures at the primary level (six or more graduate courses).

Teaching—Fellows, whatever their sources of financial support, are ordinarily required to undertake a total of five quarters of supervised apprenticeships and teaching at half time. Fellows must complete whatever pedagogy courses are required by the departments in which they teach. The department's minimum teaching requirement is a total of three quarters.

Minimum Course Requirements—Students are advised that the range and depth of preparation necessary to support quality work on the dissertation, as well as demands in the present professional marketplace for coverage of both traditional and interdisciplinary areas of knowledge, render these requirements as bare minimums. The following are required:

1. COMPLIT 369
2. COMPLIT 396L
3. A sufficient number of courses (six or more) in the student's primary field to assure knowledge of the basic works in one national literature from its beginnings until the present.
4. At least two additional complementary courses, with most of the reading in the original, in each of two different national literatures. Students whose primary field is a non-native language are required to take two courses in one additional literature not their own.

Minimum course requirements must be completed before the student is scheduled to take the University oral examination. These requirements are kept to a minimum so that students have sufficient opportunity to seek out new areas of interest. A course is an offering of 3-5 units. Independent study may take the place of up to two of the required courses, but no more; classroom work with faculty and other students is central to the program.

Examinations—Three examinations are required. The first two are one-hour exams, taken at the end of the first and second year of study. One of these is on literary genre, designed to demonstrate the student's knowledge of a substantial number of literary works in a single genre, ranged over several centuries and over at least three national literatures. This exam is also designed to demonstrate the student's grasp of the theoretical problems involved in his or her choice of genre and in the matter of genre in general. The other of these examinations is on literary theory and criticism, designed to demonstrate the student's knowledge of a particular problem in the history of literary theory and criticism, or the student's ability to develop a particular theoretical position. In either case, this exam should demonstrate wide reading in theoretical and critical texts from a variety of periods. The third and last is the University oral examination.

1. *First One-Hour Examination*: students are urged to make this the genre exam, though they may be granted permission to take the theory/criticism exam at this point. This exam is administered toward the close of the Spring Quarter of the student's first year. All first-year students take the exam during the same period, with an examination committee established by the department. Exam lists should be approved by the Director of Graduate Studies well in advance of the exam. Students are urged to focus on poetry, drama, or the novel or narrative, combining core recommendations from the department with selections from their individual areas of concentration. Any student who does not pass the exam in Spring Quarter would have the opportunity to retake the exam the following Autumn Quarter. Students who do not pass the exam a second time may merit department action or review.
2. *Second One-Hour Examination*: students are urged to make this the theory/criticism exam though they may be granted permission to take the genre exam at this point. This exam is administered toward the close of the Spring Quarter of the student's second year. All second-year students take the exam during the same period, with an examination committee established by the department. Exam lists should be approved by the Director of Graduate Studies well in advance of the exam. Any student who does not pass the exam may merit department action or review.
3. *University Oral Examination*: students are urged to complete this exam by the end of their third year. The oral exam is individually scheduled, with a committee established by the student in consultation with the Director of Graduate Studies. The exam covers a literary period, to consist of in-depth knowledge of a period of approximately a century in three or more literatures with primary emphasis on a single national literature or, in occasional cases, two national literatures. The reading list covers chiefly the major literary texts of this period but may also include some studies of intellectual backgrounds and modern critical discussions of the period. Students must demonstrate a grasp of how to discuss and define this period as well as the concept of periods in general. This examination is not to be on the dissertation topic, on a single genre, or on current criticism, but rather on a multiplicity of texts from the period. Students whose course work combines an ancient with a modern literature have the option of dividing the period sections into two wholly separate periods.

Qualifying Procedures—The department meets at the end of each year to review student progress. Performance on the first one-hour examination, together with class performance and general progress, are taken into consideration. Students are admitted to candidacy upon completion of the first one-hour examination and departmental review. As soon as the student has completed the qualifying procedures, the chair recommends the student for admission to candidacy for the Ph.D. At this time, the student is also recommended for the Master of Arts degree in Comparative Literature if 45 units of work at Stanford have been completed and the student has not already completed an M.A. before entering the program.

Colloquium—The colloquium normally takes place in the quarter following the University oral examination. The colloquium lasts one hour, begins with a brief introduction to the dissertation prospectus by the student lasting no more than five minutes, and consists of a discussion of the prospectus by the student and the three readers of the dissertation. At the end of the hour, the faculty readers vote on the outcome of the colloquium. If the outcome is favorable (by majority vote), the student is free to proceed with work on the dissertation. If the proposal is found to be unsatisfactory (by majority vote), the dissertation readers may ask the student to revise and resubmit the dissertation prospectus and to schedule a second colloquium.

The prospectus must be prepared in close consultation with the dissertation adviser during the months preceding the colloquium. It must be submitted in its final form to the readers no later than one week before the colloquium. A prospectus should not exceed ten double spaced pages, in addition to which it should include a working bibliography of primary and secondary sources. It should offer a synthetic overview of the dissertation, describe its methodology and the project's relation to prior scholarship on the topic, and lay out a complete chapter by chapter plan.

It is the student's responsibility to schedule the colloquium no later than the first half of the quarter after that quarter in which the student passed the University Oral Examination. The student should arrange the date and time in consultation with the department administrator and with the three examiners. The department administrator schedules an appropriate room for the colloquium.

Members of the dissertation reading committee ordinarily are drawn from the University oral examination committee, but need not be the same.

PH.D. MINOR

This minor is designed for students working toward the Ph.D. in the various foreign language departments. Students working toward the Ph.D. in English are directed to the program in English and Comparative Literature described among the Department of English offerings. Students must have:

1. A knowledge of at least two foreign languages, one of them sufficient to qualify for graduate-level courses in that language, the second sufficient to read a major author in the original language.
2. A minimum of six graduate courses, of which three must be in the department of the second literature and three in the Department of Comparative Literature, the latter to include a seminar in literary theory or criticism. At least two of the three courses in comparative literature should originate in a department other than the one in which the student is completing the degree. Except for students in the Asian languages, students must choose a second literature outside the department of their major literature.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement.

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Classics, English, French and Italian, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese, in the Program in Modern Thought and Literature, and in the Division of Literatures, Cultures, and Languages.

Course Numbering System:

Course Topic	*Number*
Authors	10–19
Genre	20–29
Periods and Movements	30–39
Cultures	40–49
Philosophy and Theory	50–59
Required courses:	101, 121, 122, 123, 199, 369, 396L

GENERAL

These courses are aimed at freshmen and sophomores who are non-majors (and/or potential majors) and provide an entry point to the discipline of Comparative Literature.

All majors are required, as soon as possible after declaration, to complete COMPLIT 101. During the senior year, majors enroll in 199.

COMPLIT 10N. Shakespeare and Performance in a Global Context—Stanford Introductory Seminar. Preference to freshmen. The problem of performance including the performance of gender through the plays of Shakespeare. In-class performances by students of scenes from plays. The history of theatrical performance. Sources include filmed versions of plays, and readings on the history of gender, gender performance, and transvestite theater. GER:DB-Hum, EC-Gender

3 units, Spr (Parker, P)

COMPLIT 11Q. Shakespeare, Playing, Gender—Stanford Introductory Seminar. Preference to sophomores. Focus is on several of the best and lesser known plays of Shakespeare, on theatrical and other kinds of playing, and on ambiguities of both gender and playing gender. Topics: transvestism inside and outside the theater, medical and other discussions of sex changes from female to male, hermaphrodites, and fascination with the monstrous. GER:DB-Hum, EC-Gender

3 units, Win (Parker, P)

COMPLIT 30N. Fascism and Culture—(Same as ITALGEN 30N.) Stanford Introductory Seminar. Preference to freshmen. Intellectual and political roots of fascism, its critique of liberal democracy and communism, and legacies. Themes include: fascism versus nazism; collectivism versus individualism; radical right attitudes towards technology and industrialization; and comparisons between mid-20th century fascisms and subcultures of the contemporary new right including Jean-Marie Le Pen's Front National and what has been called Islamofascism. Readings from key fascist thinkers and theorists; case studies of artists, writers, architechts, and filmmakers who embraced fascism including Ezra Pound, Leni Riefenstahl, F.T. Marinetti, and Mario Sironi.

4 units, Aut (Schnapp, J)

COMPLIT 101. What is Literature?—How do scholars distinguish literary texts from other written genres such as history, philosophy, journalism, memoirs, biographies, lyrics, graffiti, or billboards? Who decides what is literature? What are the boundaries between literary and nonliterary texts. To what extent do literary texts offer a moral or political message? What are the aesthetic effects of literary as opposed to nonliterary texts? Sources include various genres, texts, and interpretive theories and methodologies. GER:DB-Hum, WIM

5 units, Spr (Nightingale, A)

COMPLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.

5 units, Win (Staff)

COMPLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.

2 units, Spr (Staff)

COMPLIT 194. Independent Research

1-5 units, Aut, Win, Spr (Staff)

COMPLIT 199. Senior Seminar: Lives in Literature—Required of Comparative Literature seniors; others by consent of instructor. Literary careers and professions; graduate study and scholarly careers; teaching literature in schools; creative writing as a career; libraries and archives; opportunities for literary critics; the publishing industry; book retailing; literature in theater and museums. Literature as avocation: how to cultivate reading for pleasure. Guest speakers and field trips. GER:DB-Hum

5 units, Aut (Berman, R)

UNDERGRADUATE/GRADUATE

COMPLIT 119/219. Dostoevsky and His Times—(Same as SLAVGEN 151/251.) Major works in English translation with reference to related developments in Russian and European culture, literary criticism, and intellectual history. GER:DB-Hum

4 units, Win (Frank, J)

COMPLIT 121. Poems, Poetry, Worlds: An Introductory Course—What is poetry? How does it speak in many voices? Why does it matter? Poetry as genre, a field in literary studies, and indispensable to an educated person's world view. Poetry in crosscultural comparison as experience, invention, form, sound, knowledge, and part of the world. Readings include medieval to modern poetry of western Europe and the Americas; contemporary poetry of Europe, Latin America, Africa, and the U.S.; and present-day experimental digital, sound, and visual poetry. GER:DB-Hum

5 units, Aut (Greene, R)

COMPLIT 122. Literature as Performance—(Same as FRENGEN 122.) Theater as performance and as literature. The historical tension between performance and sexuality in the Western tradition since Greek antiquity. Non-European forms and conventions of performance and theatricality. The modern competition between theater and other forms of performance and media such as sports, film, and television. Sources include: classical Japanese theater; ancient Greek tragedy and comedy; medieval theater in interaction with Christian rituals and its countercultural horizons; the classical age of European theater including Shakespeare, Lope de Vega, and Molière. GER:DB-Hum

5 units, Win (Gumbrecht, H)

COMPLIT 123. The Novel, The World—(Same as ENGLISH 184.) Combining perspectives of the novels of the world as anthropological force with the sense of reality, and as protean form that has reshaped the literary universe. Readings from: ancient Greece; medieval Japan and Britain; and early modern Spain, China, and Britain; romantic theories of the novel; 19th-century realism and popular fiction; modernist experiments; and postmodern pastiches. GER:DB-Hum

5 units, Spr (Moretti, F)

COMPLIT 126A. Medieval Theatre: The Profane Staging of Sacrality—Mystery, miracle, and carnival plays of different literary traditions including liturgical and vernacular drama. How to define medieval theatre in relation to other contemporary genres; how it incorporated profane, everyday life into religious subject matter. The changing social context of medieval theatre in terms of dramatic characters, comedy in religious subject matter, and the growth of urban centers and acting fraternities. GER:DB-Hum

3-5 units, Spr (Galvez, M)

COMPLIT 127. Postcolonial *Bildungsroman*—Narratives of personal development which dramatize the clash of traditional and modern modes of individuation in postcolonial cultures. The problem of postcolonial education historically and formally as it emerges in fiction from Africa, the Arab world, and the Caribbean. The postcolonial endeavor to imagine alternative modernities; practical literary explorations of modernity's cultural imperatives.
3-5 units, Win (Tanoukhi, N)

COMPLIT 129. From Poetry of Praise to the Abolition of the Rhyme—Major poetic forms in Persian poetry. The relationship between form and content. Themes such as praise, nature, love, and authorship. The role of Sufism in the development of Persian poetry. The reception of Persian poetry in Europe and the U.S.. Writers include Sa'di, Rumi, Nizami Arozi, Khayam, Hafiz, and Nima. GER:DB-Hum
5 units, Spr (Shamel, M)

COMPLIT 132. The Literature of the New Europe—(Same as COMPLIT 232.) Premise is that a reconfigured canon of new European literature which better fits Europe's expanding and transnational contours would focus on texts of a shifting, complex cultural heritage, including texts by immigrants, and those that anticipate integration and assimilation issues. Attention to early modern authors with multiple allegiances and transnational backgrounds, and 20th-century bilingual, bicultural authors writing outside the nation. GER:DB-Hum
3-5 units, Win (Labov, J)

COMPLIT 141. Literature and Society in Africa and the Caribbean—(Same as FRENLIT 133.) Major African and Caribbean writers. Issues raised in literary works which reflect changing aspects of the societies and cultures of Francophone Africa and the French Caribbean. Topics include colonization and change, quest for identity, tradition and modernity, and new roles and status for women. Readings in fiction and poetry. Authors include Laye Camara, Mariama Ba, and Joseph Zobel. In French. Prerequisite: FRENLANG 126 or consent of instructor. GER:DB-Hum, EC-GlobalCom
4 units, Spr (Boyi, E)

COMPLIT 142. The Literature of the Americas—(Same as ENGLISH 172E.) Comparative perspective, emphasizing continuities and crises common to N., Central, and S. American literatures and distinctive national and cultural elements. Topics include: modes of representation of an American new world experience; myths of America as utopia; and critiques of notions of self and nation to which such myths give rise in political, historical, and literary forms. GER:DB-Hum, EC-AmerCul
5 units, Aut (Greene, R; Saldívar, R)

COMPLIT 147. Comparative Approaches to African American and Asian American Literature—(Same as ASNAMST 147A, CSRE 147A.) Cultural nationalism, feminism, multiculturalism, and literary canonization. Case studies comparing novels by Zora Neale Hurston and Maxine Hong Kingston, Ralph Ellison and Chang-rae Lee, and Toni Morrison and Fae Myenne Ng. Thematic and formal similarities; cultural, historical, and critical contexts.
5 units, Spr (Tang, A)

COMPLIT 149. What is Nobel Literature? Reading, Assessing, and Interpreting the Nobel Novels on the World Stage—Recent Nobel laureates in literature: Gabriel García Márquez, Nadine Gordimer, Toni Morrison, Kenzaburo Oe, and V.S. Naipaul. These writers come from different locations, yet each participates in a global conversation about the human condition. The impact of their identities upon their thought and writing. How the Nobel prize is awarded. The role of literature in the world, and analytical skills for reading literary texts. GER:DB-Hum, EC-GlobalCom
5 units, Sum (Palumbo-Liu, D)

COMPLIT 154. Heidegger on Hölderlin—(Same as GERLIT 154.) The encounter of Friedrich Hölderlin, a poet with philosophical passions in the first half of the 19th century, and Martin Heidegger, a philosopher who wrote poetically in the 20th century. What Hölderlin's poems and Heidegger's philosophy reveal about the essence and potential of lyrical texts: how neither attributes representational function to poetic texts, but sees them as existential and historical sites in which events can take place. In English; texts also available in German. GER:DB-Hum
5 units, Aut (Gumbrecht, H)

COMPLIT 155. Of Beauties and Beasts: Tales of Transformation from Antiquity to the Present—Representative texts from the literary traditions initiated by Ovid's Metamorphoses, concerning transformation: human to animal, man to woman, beast to beauty, nose to man. A conceptual toolbox for understanding the social and cultural function of narratives about transformation across time and place. Theoretical readings from history, mythology, psychology, and literary studies.
5 units, Spr (Pojarska, E)

COMPLIT 156. Weather in Literature: The Aesthetics of Time—From antiquity to the present. Mythological and biblical weather; the relationship between weather and representations of landscape; extreme weather and climate change; literary weather and the experience of time. Texts include *The Odyssey, Exodus, The Tempest, Robinson Crusoe,* and *Walden.*
5 units, Aut (Marno, D)

COMPLIT 157. Imitation of Life—What happens when authors create human characters, and when readers create them from authors' words? How do readers decide whether a character seems real, and what if the characterization is a bit off from their sense of reality? What are the relationships between external and internal characterizations, and how does each strategy foster or frustrate the sense of a human presence? When is characterization an impersonation, and what are the ethical and aesthetic concerns of speaking in another person's voice whether the other is fictional or a self-portrait? GER:DB-Hum
3-5 units, Win (Gelder, A)

COMPLIT 181. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum
4 units, Win (Anderson, L; Landy, J)

COMPLIT 214/314. Thomas Mann—(Same as GERLIT 285/385.) Key work, including short fiction, major novels, and essays. Mann's relation to naturalism and modernism, the conservative revolution and democracy; his American exile. Engagement with myth and the reception of romanticism, Wagner, and Nietzsche. Music in literature. Mann and Adorno. Readings in German include *Death in Venice, The Magic Mountain,* and *Doctor Faustus.* GER:DB-Hum
3-5 units, Win (Berman, R)

COMPLIT 218. Sholem Aleichem and Jewish Minority Discourse—Theories of minority discourse and minority literature; their applicability to modern Jewish writing, using Sholem Aleichem as a test case. How modern Hebrew and Yiddish literatures reacted to their purported minority, emphasizing Aleichem's reaction to these problems. Texts available in English.
5 units, Win (Miron, D)

COMPLIT 242. Framing the Other: Intercultural Projections between China and the West—Crosscultural intersections and mutual projections between the West and China emphasizing the 20th century. The production of representations of the other and their contexts; rethinking cultural contact. Possible alternatives to frequently biased and flawed projections of the other. Can orientalist and occidentalist fantasies be reshaped into grounds for an openness toward the other? GER:DB-Hum
5 units, Win (Bachner, A)

COMPLIT 247. The Modern Jewish Literary Complex—Does a unified modern Jewish canon exist; if not, what interactions among Jewish literatures have evolved through the last two centuries? Focus is comparative. Writers such as Reb Nakhman, Heine, Kafka, Bialik, Agnon, Amichai, Sholem Aleichem, I. L. Peretz, Bashevis-Singer, Y. Glatshteyn, Primo Levi, Jean Amery, Charles Reznikoff, Henry Roth, and Cynthia Ozick. Texts are available in English.
5 units, Win (Miron, D)

COMPLIT 249. Tradition and Modernity in Contemporary Iranian Literature—Modern Iranian literary texts in light of narrative theory and cultural alterity. Formal aesthetic aspects and social historical contexts. The problem of censorship in Iranian literary history. Were the sources of Iranian and Muslim modernity derived from the West or as an indigenous development? GER:DB-Hum, EC-GlobalCom
5 units, Aut (Milani, A)

COMPLIT 250. Literature, History, and Representation—(Same as FRENLIT 248.) Literary works as historical narratives; texts which envision ways of reconstructing or representing an ancient or immediate past through collective or individual narratives. Narration and narrator; relation between individual and collective history; historical events and how they have shaped the narratives; master narratives; and alternative histories. Reading include Glissant, Césaire, Dadié, Cixous, Pérec, Le Clézio, Mokkedem, Benjamin, de Certeau, and White.
3-5 units, Spr (Boyi, E)

COMPLIT 257C/357C. Crowds—(Same as FRENGEN 317, ITALGEN 317.) The place of human multitudes in the Western sociopolitical imagination from 1789 to the present. Theories of collectivity in works such as Tarde's *Laws of Imitation*, Le Bon's *Psychology of Crowds*, Freud's writings on mass psychology, and Canetti's *Crowds and Power*. Representations of crowds in literature, art, theater, and film. How modern mythologies are informed by premodern precedent and reflect upon the question of multitudes in postindustrial societies. Students write semantic histories and curate a virtual gallery.
3-5 units, Aut (Schnapp, J)

COMPLIT 311. Shakespeare, Islam, and Others—(Same as ENGLISH 373D.) Shakespeare and other early modern writers in relation to new work on Islam and the Ottoman Turk in early modern studies. *Othello, Twelfth Night, Titus Andronicus, The Merchant of Venice,* and other Shakespeare plays. Kyd's *Solyman and Perseda*, Daborne's *A Christian Turned Turk*, Massinger's *The Renegado*, Marlowe's *The Jew of Malta,* and literary and historical materials.
5 units, Spr (Parker, P)

COMPLIT 320A. Epic and Empire—(Same as ENGLISH 314.) Focus is on Virgil's *Aeneid* and its influence, tracing the European epic tradition (Ariosto, Tasso, Camoes, Spenser, and Milton) to New World discovery and mercantile expansion in the early modern period.
5 units, Win (Parker, P)

COMPLIT 320P. Materials and Methods for the Study of Poetry—(Same as ENGLISH 350C.) For graduate students in all national literatures and for comparatists. The intellectual and professional tools relevant to scholarship on poetry in any language. Theoretical issues and practical knowledge of forms, techniques, and cultural formations in verse. Topics such as voice, tropes, lineation, stanzas, meters, visuality, sound, prose poems, and translation.
3-5 units, Win (Greene, R)

COMPLIT 321. Present Pasts: History, Fiction, Temporality—(Same as GERLIT 299.) Relationship among history, memory, and literature in contemporary novels that engage with recent history. Theories of this relationship, including the proposition that Western culture in the second half of the 20th century is characterized by a crisis of temporality and an aversion to or dissatisfaction with traditional conceptions of the past. Readings include: Toni Morrison, J.M. Coetzee, Amos Oz, Orhan Pamuk, and Haruki Murakami; and theoretical works including Adorno, Heidegger, Benjamin, Jameson, Elias, and Huyssen.
5 units, Win (Eshel, A; White, H)

COMPLIT 329. Novel of the Americas—(Same as ENGLISH 309A.) The possibility of identifying aesthetic visions of an American imaginary in terms not defined by nationalist ideologies but open to the consequences of transnational forces. How America has been invented as a category in sociocultural terms; the form the American novel has taken. Readings include Chopin's *The Awakening,* Cather's *Death Comes for the Archbishop,* Faulkner's *Absalom, Absalom,* Asturias's *Men of Maize,* Carpentier's *The Kingdom of this World,* Paredes's *The Shadow,* Silko's *Almanac of the Dead, and* Proulx's *Accordion Crimes.*
5 units, Spr (Saldívar, R)

COMPLIT 331C. Institutions of Enlightenment: The Invention of the Public Sphere—(Same as ENGLISH 303F.) The cultural foundations of the Enlightenment as public sphere and its relationship to the private or intimate sphere. The invention and naturalization of fundamental institutions of the Enlightenment such as the public, the private, the market, public opinion, literature, the individual, society, culture, knowledge, and politics.
5 units, Spr (Bender, J)

COMPLIT 334. German Romanticism—(Same as GERLIT 320.) Prose, lyrics, and aesthetic theory of the earlier Jena Romantics and late Romanticism. Why literary Romanticism was later understood as a revolutionary step toward modernity. Readings include Tieck, Novalis' *Hymnen an die Nacht,* Schlegel's *Rede über die Mythologie,* Brentano, Eichendorff, and Hoffmann.
3-4 units, Spr (Bohrer, K)

COMPLIT 335. F. T. Marinetti and Futurism—(Same as ITALGEN 353E.) Futurist artistic and literary theory and practice from its foundation by Marinetti through its avatars around the world. Focus is on readings from Marinetti; attention to writers and visual artists including Apollinaire, Mayakovsky, and Léger. Topics include: machines and culture; the futurist theater of surprise; poetry and performance; visual poetics and war; futurism's ties to bolshevism and fascism; and aeropainting and aeropoetry.
4 units, Spr (Schnapp, J)

COMPLIT 337. Augustine on the Body—(Same as CLASSGEN 237.) Ideas of the body in Greek and Roman literature and philosophy. Focus is on Augustine; his concepts of the edenic body, human body, and resurrected body. Asceticism in pagan and Christian culture in late antiquity. How did pagan and Christian cultural ideologies affect ascetic practices? To what extent did the Christians diverge from pagan practices of self-control in the 3rd and 4th centuries; how did philosophers and theologians treat sexuality and procreation in the context of elite self-fashioning?
4-5 units, Spr (Nightingale, A)

COMPLIT 352. Decadence and Vitalism—(Same as GERLIT 325.) A major motif in European literature from 1890 to 1920, the interdependence of the topics and their ideological and political implications. Readings include Nietzsche, Wilde, H.v.Hofmannsthal, Mann, Chekhov, D'Annunzio, Jünger, Marinetti, D.H. Lawrence, and Musil.
3-4 units, Spr (Bohrer, K)

COMPLIT 353. Theme, Thematics, Thematology in Postmodern Writing—Theorization of the concept of theme, the writing practice of thematization, and how theme negotiates the crossing of literal, figurative, moral, and mystical levels of significance in a discourse. Readings include Pynchon's *The Crying of Lot 49,* Coetzee's *Disgrace,* Sebald's *Austerlitz,* Levy's *Survival in Auschwitz,* Barthes' *S/Z,* and Jameson.
3-5 units, Win (White, H)

COMPLIT 359A .Philosophical Reading Group—(Same as FRENGEN 395, ITALGEN 395.) Discussion of one contemporary or historical text from the Western philosophical tradition per quarter in a group of faculty and graduate students. For admission of new participants, a conversation with H. U. Gumbrecht is required. May be repeated for credit.
1 unit, Aut, Win, Spr (Gumbrecht, H)

COMPLIT 369. Introduction to Graduate Studies: Criticism as Profession—(Same as GERLIT 369.) Major texts of modern literary criticism in the context of professional scholarship today. Readings of critics such as Lukács, Auerbach, Frye, Ong, Benjamin, Adorno, Szondi, de Man, Abrams, Bourdieu, Vendler, and Said. Contemporary professional issues including scholarly associations, journals, national and comparative literatures, university structures, and career paths.

5 units, Aut (Berman, R)

COMPLIT 370. Anthropology of Speed—(Same as FRENGEN 370, ITALGEN 370.) Ideas about accelerated motion; its significance and effects on cultures, from prehistory to the present. Impact of transportation revolutions on beliefs regarding selfhood and society. The rise of forms of intelligence and human skill sets that interact with, resist, or enable such revolutions. Topics include: speed and divinity; the evolution of conventions and techniques for capturing accelerated movement; speed and accident; velocity and liminal states such as inspiration, transport, and intoxication; and cognitive implications of sped-up states and their impact on cultural norms.

3-5 units, Spr (Schnapp, J)

COMPLIT 395. Research

1-15 units, Aut, Win, Spr (Staff)

COMPLIT 396L. Pedagogy Seminar I—(Same as ENGLISH 396L.) Required for first-year Ph.D. students in English, Modern Thought and Literature, and Comparative Literature (except for Comparative Literature students teaching in a foreign language). Preparation for surviving as teaching assistants in undergraduate literature courses. Focus is on leading discussions and grading papers.

2 units, Aut (Jones, G)

COMPLIT 399. Dissertation

1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSE

Comparative Literature majors are advised to consult the "Literatures, Cultures, and Languages" section of this bulletin for additional offerings.

DLCL 189. Honors Thesis Seminar

5 units, Aut (Surwillo, L)

COMPARATIVE STUDIES IN RACE AND ETHNICITY (CSRE)

Director: C. Matthew Snipp

Curriculum Committee: Gordon Chang, Michele Elam, Charlotte Fonrobert, Vera Grant, Vered Shemtov, Yvonne Yarbro-Bejarano

Affiliated Faculty and Teaching Staff: David Abernethy (Political Science, emeritus), Anthony Antonio (Education), Rick Banks (Law), Lucius Barker (Political Science, emeritus), Donald Barr (Sociology), Joel Beinin (History), Karen Biestman (Native American Studies), Lawrence Bobo (Sociology), Albert Camarillo (History), Martin Carnoy (Education), Clayborne Carson (History), Gordon Chang (History), I-Chant Chiang (Asian American Studies), Karen Cook (Sociology), Michele Dauber (Law), Linda Darling-Hammond (Education), Carolyn Duffey (Comparative Studies in Race and Ethnicity), Jennifer Eberhardt (Psychology), Paulla Ebron (Anthropology), Penny Eckert (Linguistics), Harry Elam (Drama), Michele Elam (English), James Ferguson (Anthropology), Shelley Fisher-Fishkin (English), James Fishkin (Communication), George Fredrickson (History, emeritus), Estelle Freedman (History), Mariaelena Gonzalez (Chicana/o Studies), Vera Grant (African and African American Studies), David Grusky (Sociology), Georgina Hernandez (Comparative Studies in Race and Ethnicity), Korina Jocson (Asian American Studies), Miyako Inoue (Anthropology), Shanto Iyengar (Communication), Gavin Jones (English), Terry Karl (Political Science), Pamela Karlan (Law), Matthew Kohrman (Anthropology), Jan Krawitz (Art and Art History), Jon Krosnick (Communication), Teresa LaFromboise (Education), David Laitin (Political Science), Liisa Malkki (Anthropology), Hazel Markus (Psychology), Barbaro Martinez-Ruiz (Art and Art History), Douglas McAdam (Sociology), Monica McDermott (Sociology), Elisabeth Mudimbe-Boyi (French and Italian), James Montoya (Comparative Studies in Race and Ethnicity), Cherríe Moraga (Drama), Marcyliena Morgan (Communication), Paula Moya (English), Na'ilah Nasir (Education), Hilton Obenzinger (Undergraduate Advising and Research), Susan Olzak (Sociology), Amado Padilla (Education), José Palafox (Chicana/o Studies), David Palumbo-Liu (Comparative Literature), Arnold Rampersad (English), Robert Reich (Political Science), John Rickford (Linguistics), Cecilia Ridgeway (Sociology), Richard Roberts (History), Aron Rodrigue (History), Michael Rosenfeld (Sociology), Ramón Saldívar (English), Joel Samoff (Center for African Studies), Stephen Sano (Music), Debra Satz (Philosophy), JoEllen Shively (Native American Studies), C. Matthew Snipp (Sociology), Paul Sniderman (Political Science), Stephen Sohn (English), Claude Steele (Psychology), James Steyer (Comparative Studies in Race and Ethnicity), Amy Tang (Asian American Studies), Nirvana Tanoukhi (Comparative Studies in Race and Ethnicity), Ewart Thomas (Psychology), Jeanne Tsai (Psychology), Linda Uyechi (Music), Guadalupe Valdés (Education; Spanish and Portuguese), Richard White (History), Michael Wilcox (Anthropology), Joy Williamson (Education), Bryan Wolf (Art and Art History), Sylvia Yanagisako (Anthropology), Yvonne Yarbro-Bejarano (Spanish and Portuguese), Bob Zajonc (Psychology, emeritus), Steven Zipperstein (History)

Teaching Fellows: MarYam Hamedani, Julie Arvil Minich, Marcela Maria Muñiz

Program Offices: Building 360, Room 361D
Mail Code: 94305-2152
Phone: (650) 723-8449
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Web Site: http://ccsre.stanford.edu

Courses given in CSRE have the subject code CSRE. For a complete list of subject codes, see Appendix.

UNDERGRADUATE PROGRAMS

MAJORS

CORE CURRICULUM

The Interdisciplinary Program in Comparative Studies in Race and Ethnicity (CSRE) provides students the opportunity to structure a major or minor in comparative ethnic studies or to focus their course work in a single ethnic studies area. Four majors and minors (Asian American Studies, Comparative Studies, Chicana/o Studies, and Native American Studies) are offered as part of CSRE. All courses taken for the major must be taken for a letter grade. In addition, majors in the Program in African and African American Studies enroll in the core curriculum offered by CSRE. The directors of the programs and of each major constitute the CSRE curriculum committee, the policy making body for the interdisciplinary program.

Students who declare any of the five majors participate in a common curriculum of the CSRE consisting of at least two introductory core courses and a senior seminar. Individually designed majors in Jewish Studies may also enroll in the CSRE core curriculum.

There are two types of introductory, interdisciplinary core courses taught by senior CSRE-affiliated faculty: regular core courses that compare across racial and ethnic groups; and single-group core courses that focus on a specific racial or ethnic group.

MINORS

Students who wish to minor in the study areas must complete six courses (a minimum of 30 units) from the approved CSRE course list, two of which must be introductory core courses. Proposals for the minor must be approved by the director of each study area.

DIRECTED READING AND RESEARCH

Directed reading and research allows students to focus on a special topic of interest. In organizing a reading research plan, the student consults with the director of the major and one or more faculty members specializing in the area or discipline.

SENIOR SEMINAR

Research and the writing of the senior honors thesis or senior paper is under the supervision of a faculty project adviser. All CSRE-related students, even those who opt to write honors theses in other departments and programs, must enroll in CSRE 200X, Senior Seminar, offered in Autumn Quarter. The course takes students through the process of research including conceptualization, development of prospectus, development of theses, research, analysis, and writing. This course meets the Writing in the Major requirement (WIM). Those who opt to write senior papers are organized into tutorial groups in Autumn Quarter.

RELATED PROGRAMS

CSRE-related majors have several unique opportunities available to them. The program supports full-time paid summer internships for those who apply to work in a non-profit or government agency in a public policy-related area. The CSRE Public Policy/Leadership Institute is a two week, pre-Autumn Quarter seminar that provides exposure to critical public policy issues and is taught by a leading faculty member. The residence-based institute provides room and board and all seminar materials for participants, including a visit to Sacramento to meet with policy makers. The CSRE program also sponsors quarterly career workshops and informal luncheons for all majors and minors.

HONORS

Majors in each of the study areas who meet academic qualifications (at least a grade point average of 3.5 in CSRE-related courses) may apply for honors. Majors are expected to participate in a Spring Quarter junior workshop in preparation for honors thesis research. Prizes for best undergraduate honors theses are awarded annually by the CSRE curriculum committee.

AFRICAN AND AFRICAN AMERICAN STUDIES (AAAS)

Director: Michele Elam

Since 1997-98, AAAS has been a CSRE-related major. For major and minor descriptions and requirements, see the “African and African American Studies” section of this bulletin.

ASIAN AMERICAN STUDIES

Director: Gordon Chang

Asian American Studies (AAS) provides an interdisciplinary approach to understanding the historical and current experiences of persons of Asian ancestry in the United States. In using the term “Asian American,” the AAS faculty recognize that the term seeks to name a rapidly developing, complex, and heterogeneous population and that there is neither a single Asian American identity nor one community that comprises all Asian Americans. Asian Americans include those with ancestral ties to countries or regions in East Asia, South Asia, Southeast Asia, or the Philippines, among others.

AAS brings together courses that address the artistic, historical, humanistic, political, and social dimensions of Asian Americans and is an appropriate course of study for students interested in a variety of concerns related to Asian Americans, including: artistic and cultural contributions; current social significance; historical experiences; immigration, intellectual, and policy issues; relationships with other social groups; and the construction of the notion of Asian American as it addresses important theoretical and practical issues.

REQUIREMENTS

Asian American majors must take the 15-unit CSRE core curriculum including two introductory core courses and a senior seminar taken in Autumn Quarter of the senior year. One single-group, core course that focuses on a non-Asian ethnic group may be counted toward the 15-unit core requirement.

Majors are required to take one foundational thematic course in Asian American Studies, such as COMPLIT 148, Introduction to Asian American Cultures. Majors must complete an additional 40 units of course work from an approved list. One course must have an international dimension, preferably a focus on Asia. Five other courses must have an Asian American focus and must be selected from social science and humanities departments. Majors must take two courses offering a comparative perspective on race and ethnicity. Students may obtain credit for their study of a related Asian language towards their degree. A total of 60 units of course work is required for the major.

Students who wish to minor in Asian American Studies must complete two core introductory courses and four additional courses related to the thematic concentration. A total of 30 units of approved course work is required for the minor.

CHICANA/O STUDIES

Director: Yvonne Yarbro-Bejarano

Chicana/o Studies is an interdisciplinary major focusing on the Mexican-origin population of the U.S., the second largest ethnic group in the nation. Students who major or minor in Chicana/o Studies have an opportunity to select from courses in the humanities, social sciences, and courses offered by affiliated faculty in the School of Education.

REQUIREMENTS

Chicana/o Studies majors must take the 15-unit CSRE core curriculum including two introductory core courses and a senior seminar taken in Autumn Quarter of the senior year. One single-group, core course that focuses on a non-Mexican origin group may be counted toward the 15-unit core requirement.

Majors are required to take CHICANST 180E/SPANLIT 180E, Introduction to Chicana/o Studies. Majors complete an additional 40 units of courses relevant to the thematic concentration and approved by the adviser. A total of 60 units of course work are required for the major.

Students who wish to minor in Chicana/o Studies must complete two core introductory courses, including CHICANST 180E/SPANLIT 180E, Introduction to Chicana/o Studies, and one additional course from the approved list available from the CSRE undergraduate program office, and four additional courses related to the thematic concentration. A total of 30 units of approved course work is required for each minor.

COMPARATIVE STUDIES IN RACE AND ETHNICITY

Director: C. Matthew Snipp

Comparative Studies in Race and Ethnicity, the largest of the five major/minors offered in the program, does not focus on a particular ethnic group. Rather, a student in consultation with the adviser designs a curriculum in relation to a thematic concentration that compares various ethnic groups or explores topics that cut across group experiences in the United States and elsewhere in the world. For example, students may compare groups within the U.S., or compare groups in the U.S. to ethnic groups elsewhere, or study the diaspora of a single group or the sovereignty of indigenous peoples within and across different national contexts. Students in this major are able to take advantage of courses in over 22 fields offered by the affiliated faculty of CSRE.

REQUIREMENTS

All CSRE-related majors enroll in the 15-unit CSRE core curriculum, which consists of two introductory core courses and a senior seminar taken in Autumn Quarter of the senior year. One single-group, core course may be counted toward the 15-unit core requirement.

Comparative Studies majors complete another 45 units of course work relevant to the thematic concentration they have chosen in consultation with the adviser.

Students who wish to minor in Comparative Studies must complete six courses (a minimum of 30 units) from the approved course list.

TAUBE CENTER FOR JEWISH STUDIES

Directors: Charlotte Fonrobert, Vered Shemtov

Jewish Studies is an affiliated program of CSRE. For program and course descriptions, see the “Jewish Studies” section of this bulletin.

NATIVE AMERICAN STUDIES

Director: C. Matthew Snipp

Native American Studies provides an intensive approach to understanding the historical and contemporary experiences of Native American people. Attention is paid not only to the special relationship between tribes and the federal government, but to issues across national boundaries, including tribal nations within Canada, and North, Central, and South America. In using the term “Native American,” the NAS faculty recognize the heterogeneous nature of this population. Native Americans include the Alaska Native population, which comprises Aleuts, Eskimo, and other Native American people residing in Alaska.

The purpose of the Native American Studies major and minor is to introduce students to approaches in the academic study of Native American people, history, and culture. Students who major in Native American Studies have the opportunity of doing advanced work in related fields, including literature, sociology, education, and law. In addition to specialized course work on Native American issues, students also are expected to concentrate in a traditional discipline such as anthropology, history, or psychology to ensure a well rounded educational experience. The area of concentration and related course work should be selected in consultation with a faculty adviser in Native American Studies. All courses in the program promote the discussion of how academic knowledge about Native Americans relates to the historical and contemporary experiences of Native American people and communities.

REQUIREMENTS

Native American Studies must take the 15-unit CSRE core curriculum, including two introductory core courses and a senior seminar taken in Autumn Quarter of the senior year. One single-group, core course that focuses on a non-Native American group may be counted toward the 15-unit core requirement.

Majors complete an additional 45 units of course work that satisfy three categories of their thematic concentration: Native American focus, comparative focus, and a methodology/research course. A total of 60 units of coursework are required for the major.

Students who wish to minor in Native American Studies must complete two core introductory courses and four additional courses related to the thematic concentration. A total of 30 units of approved course work is required for the minor.

THEMATIC CONCENTRATION IN THE INSTITUTE FOR DIVERSITY IN THE ARTS (IDA)

Students in any major in the Comparative Studies in Race and Ethnicity undergraduate program can choose a concentration in the Institute for Diversity in the Arts. The concentration is not declared on Axess; it does not appear on the transcript or diploma. Students interested in IDA should contact the CSRE undergraduate program office.

A minimum of 60 units is required for the thematic concentration in IDA. Students take two of the CSRE core courses (10 units), one of which must focus on the arts; in addition, CSRE 200X is required of students in the IDA concentration and is taken in Autumn Quarter of the senior year (5 units, WIM). As a capstone experience, majors must write an honors thesis or senior paper.

IDA concentration students must also complete a senior project. Possible senior projects include a stage production, CD, or arts workshop curriculum in a community setting. Students who elect to write an honors thesis may incorporate their project as the basis for their thesis.

In addition to the core curriculum, students complete 45 units drawing from new and existing courses in departments and programs such as Art and Art History, Music, Drama, and Comparative Literature, as well as the five CSRE major areas of study: African and African American Studies; Asian American Studies; Chicana/o Studies; Comparative Studies; and Native American Studies. Thematic courses may focus on performance, visual aesthetics, writing for performance, critical studies in art and performance, and critical arts theory.

THEMATIC CONCENTRATION IN PUBLIC SERVICE

The Public Service thematic concentration is designed to ensure that CSRE students interested in public service have access to a structured curriculum providing a solid grounding in the theory and practice of public service that enables them to become future leaders in the sphere of public life. This concentration is not declared on Axess; it does not appear on the transcript or diploma. This thematic concentration can be completed within any of the majors within CSRE. Students should consult with the CCSRE undergraduate program director and the chair of African and African American Studies, Asian American Studies, Chicana/o Studies, or Native American Studies to ensure that the courses chosen for the Public Service thematic concentration also fulfill the requirements of the respective majors. Students who wish to pursue a thematic concentration in public service must organize their studies to include 15 credits of approved CSRE core courses, including CSRE 200X, CSRE Senior Seminar, in which students with a thematic concentration in public service may select a topic for their senior paper or honors thesis that reflects their interest in public or experience with a past internship.

In addition to the usual core requirements expected of all CCSRE majors, students who wish to pursue a thematic concentration in Public Service must take an additional 40 units organized around four subject matter areas: organization and leadership; inquiry and assessment; serving diverse communities; and service learning. They also must complete 5 units in a public service internship. Students interested in the Public Service thematic concentration should contact the CSRE Undergraduate Program Office for details about its requirements.

THEMATIC CONCENTRATION IN AMERICAN DIVERSITY

The American diversity concentration is designed for students who wish to explore how the United States was and is constituted with relation to issues of race and ethnicity. The concentration investigates how American domestic and foreign policy, law, history, culture, and society are formed within conversations, debates, policies and studies regarding race and ethnicity. Issues of immigration, citizenship, empire and expansion, defense, diplomacy, human rights, public welfare, social justice and law, educational rights and other topics are explored from the angle of how racial and ethnic difference impacts debate and policy.

The concentration is not declared on Axess, it does not appear on the transcript or diploma. Students interested in the American diversity thematic concentration should contact the CSRE undergraduate program office.

The American diversity concentration requires 15 units including two approved CSRE core courses and CSRE 200X, Senior Seminar (WIM) taken Autumn Quarter of the senior year. One single-group core course may be counted toward the 15 unit core requirement. In addition to the core requirements, students must take an additional 45 units of course work relevant to the thematic concentration which may include courses such as:

ARTHIST 178. Ethnicity and Dissent in the U.S. and Literature
COMM 148. Hip Hop and Don't Stop: Introduction to Modern Speech Communities
COMPLIT 148. Comparative Fictions of Ethnicity
CSRE 203A. Changing Face of America: Strategies for Civil Rights and Education in the 21st Century
EDUC 177. Education of Immigrant Students
EDUC 201. History of Education in the U.S.

THEMATIC CONCENTRATION IN RACE AND THE AMERICAN CITY

The race and the American city concentration is designed for students who wish to develop methodologies, data, and theoretical and conceptual materials concerning how urban life, infrastructure, and policies are influenced by race and ethnicity. As a virtual laboratories of social interaction, cities embody negotiations around resources, residences, financial districting, economic flow, health and educational resources, environmental policies, and city planning. A primary goal is for students to learn how they might contribute to the social and political discourse on race and ethnicity in the U.S. Participation in a public service internship and or Stanford in Washington is encouraged.

The concentration is not declared on Axess, it does not appear on the transcript or diploma. Students interested in the race and the American city concentration should contact the CSRE undergraduate program office.

The race and the American city concentration requires 15 units including two approved CSRE core courses and CSRE 200X, Senior Seminar (WIM) taken Autumn Quarter of the senior year. One single-group core course may be counted toward the 15 unit core requirement. In addition to the core requirements, students must take an additional 45 units of course work relevant to the thematic concentration which may include courses such as:

COMM 148. Hip Hop and Don't Stop: Introduction to Modern Speech Communities
NATIVEAM 117A. Diversity in American Indian Cultures
HISTORY 260. Race and Ethnicity in the American Metropolis
SOC 144. Race and Crime in America

COURSES

CORE

ANTHROPOLOGY

CASA 88. Theories of Race and Ethnicity
5 units, Aut (Yanagisako, S)

COMPARATIVE LITERATURE

COMPLIT 142. Literature of the Americas—(Same as English 172E).
5 units, Aut (Greene, R; Saldívar, R)

COMPARATIVE STUDIES IN RACE AND ETHNICITY

CSRE 196C. Introduction to Comparative Studies in Race and Ethnicity—(Same as ENGLISH 172D, PSYCH 155.) How different disciplines approach topics and issues central to the study of ethnic and race relations in the U.S. and elsewhere. Lectures by senior faculty affiliated with CSRE. Discussions led by CSRE teaching fellows. GER:DB-SocSci
5 units, Win (Moya, P; Markus, H)

CSRE 200X. CSRE Senior Seminar
5 units, Aut (Snipp, C; Hamedani, M)

EDUCATION

EDUC 177/277. Education of Immigrant Students: Psychological Perspectives
4 units, Win (Padilla, A)

EDUC 245. Understanding Racial and Ethnic Identity Development
3-5 units, Aut (LaFromboise, T)

PHILOSOPHY

PHIL 177. Philosophical Issues of Race and Racism
4 units, Win (Satz, D)

PSYCHOLOGY

PSYCH 75. Introduction to Cultural Psychology
5 units, alternate years, not given this year

SOCIOLOGY

SOC 147A/247A. Comparative Ethnic Conflict
5 units, Win (Olzak, S)

THEMATIC FOR MAJORS AND MINORS

AFRICAN AND AFRICAN AMERICAN STUDIES

For courses in African and African American Studies with the subject code AFRICAAM, see the "African and African American Studies" section of this bulletin.

ASIAN AMERICAN STUDIES

ASNAMST 147A. Comparative Approaches to African American and Asian American Literature—(Same as COMPLIT 147, CSRE 147A.) Cultural nationalism, feminism, multiculturalism, and literary canonization. Case studies comparing novels by Zora Neale Hurston and Maxine Hong Kingston, Ralph Ellison and Chang-rae Lee, and Toni Morrison and Fae Myenne Ng. Thematic and formal similarities; cultural, historical, and critical contexts.
5 units, Spr (Tang, A)

ASNAMST 180C. Asian American Sexualities—(Same as CSRE 180C, PSYCH 180C.) Seminar. Mutual constitution of culture and sexuality among Asian Americans; attitudes, behaviors, taboos, and identity. How masculinity and femininity are portrayed in the media; cultural attitudes toward homosexuality; and sexual politics. Social, political, and psychological implications.
5 units, Win (Chiang, I)

ASNAMST 181K. New Media Literacies and Popular Culture—(Same as CSRE 181K.) Individual and social uses of new media literacies. Students develop a Wikipedia page, class blog, and new media final project for public screening and exhibition.
5 units, Aut (Jocson, K)

ASNAMST 200R. Directed Research—May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

ASNAMST 200W. Directed Reading
1-5 units, Aut, Win, Spr (Staff)

CHICANA/O STUDIES

CHICANST 121C. Chicana/o Film Practices—(Same as CSRE 121C.) The ideological parameters of Chicanismo, including migration, labor, organized state violence, collectivism, familialism, spirtual practices, gender, and sexual politics. The cultural, aesthetic, and political dimensions of film form, including formal and textual analysis.
5 units, not given this year

CHICANST 165G. American Dreams: Mexican Americans, Immigration since 1964, and the Middle Class—(Same as CSRE 165G, SOC 165G.) How does the Mexican American population stand in relation to the attainment of middle-class status? Topics include immigration, religion, political participation, the labor market, marriage, and pan-ethnic identification. Introduction to sociological methodology. Final project.
5 units, Win (Gonzalez, M)

CHICANST 180E. Introduction to Chicana/o Studies—(Same as CSRE 180E, SPANLIT 180E.) Historical and contemporary experiences that have defined the status of Mexican-origin people living in the U.S. Topics include the U.S./Mexico border and the borderlands; immigration and anti-immigration sentiment; literary and cultural traditions; music; labor; historical perspectives on Mexicans in the U.S. and the Chicano movement; urban realities; gender relations; political and economic changes; and inter- and intra-group interactions. Sources include social science and humanities scholarship. GER:DB-Hum, EC-AmerCul
5 units, Spr (Yarbro-Bejarano, Y; Palafox, J)

CHICANST 181S. U.S.-Mexico Borderlands in Comparative Perspective—(Same as CSRE 181S.) The border as zone of political, social, economic, and cultural interaction, conflict, and interdependence from before the U.S.-Mexico War. Manifest destiny, the incorporation of the boundary into the capitalist world system, and contemporary boundary issues including the border industrialization program, urbanization and migration, and the function of borders in reinforcing global apartheid.
5 units, Spr (Palafox, J)

CHICANST 187C. Latino Children: Cultural and Social Contexts of Development—(Same as CSRE 187C.) Ecological contexts, including family, school, and society, that shape the psychosocial and educational outcomes of Latino children. Sources include developmental and cultural psychology, anthropology of education, and sociology.
5 units, not given this year

CHICANST 200R. Directed Research
1-5 units, Aut, Win, Spr (Staff)

CHICANST 200W. Directed Reading
1-5 units, Aut, Win, Spr (Staff)

COMPARATIVE STUDIES IN RACE AND ETHNICITY

CSRE 11. Making and Unmaking Race, Ethnicity, and Difference in the 21st Century—Guest speakers, panel presentations, films screenings, and sartistic performances. May be repeated for credit.
1 unit, Aut (Markus, H)

CSRE 131A. Race and Reconciliation in Post-Apartheid Literature—How the writers of the new S. Africa have narrated the past as a way of imagining its future. Racial reconciliation in new S. African literature, and the relationship between literary aesthetics and racial politics for a society in transition. Negotiation and invention motivated by a desire to surmount racial differences through integration into a national culture and a yearning for racial identity through the revival of diverse ethnic origins.
5 units, Spr (Tanoukhi, N)

CSRE 145A. Poetics and Politics of Caribbean's Women Literature—(Same as CASA 145A.) Mid 20th-century to the present. How historical, economic, and political conditions in Haiti, Cuba, Jamaica, Antigua, and Guadeloupe affected women. How Francophone, Anglophone, and Hispanophone women novelists, poets, and short story writers respond to similar issues and pose related questions. Caribbean literary identity within a multicultural and diasporic context; the place of the oral in the written feminine text; family and sexuality; translation of European master texts; history, memory, and myth; and responses to slave history, colonialism, neocolonialism, and globalization. GER: DB-SocSci, EC-Gender
5 units, Win (Duffey, C)

CSRE 190. Disciplinary Boundaries: Research Methods in the Academy—Faculty presentations from Anthropology, English, Psychology, Political Science, History, Sociology, and Drama. Collaborative research, and feminist ethnographic methods.
3 units, not given this year

CSRE 192. Race and Slavery in Brazil and the United States—Did race motivate enslavement or was racial profiling a product of slavery? Brazilian or American slavery and what it means to be a person of color in these countries today. Love, hatred, and endurance in two divided societies. Sources include historical narratives, literature, film, music, and iconography.
5 units, not given this year

CSRE 198. Internship for Public Service—Restricted to CSRE comparative studies majors with a concentration in public service. Students consult with the CSRE undergraduate program director and CSRE affiliated faculty to develop an internship. Group meetings. May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

CSRE 199. Pre-Honors Seminar—For students interested in writing a senior honors thesis. Conceptualizing and defining a manageable honors project, conducting interdisciplinary research, the parameters of a literature review essay, and how to identify a faculty adviser.
1 unit, Win (Hamedani, M)

CSRE 200R. Directed Research
1-5 units, Aut, Win, Spr (Staff)

CSRE 200W. Directed Reading
1-5 units, Aut, Win, Spr (Staff)

CSRE 200Y. CSRE Senior Honors Research
1-10 units, Win (Hamedani, M)

CSRE 200Z. CSRE Senior Honors Research
1-10 units, Spr (Hamedani, M)

CSRE 201B. Building Community: Art, Culture, and Social Change—How creative projects build and strengthen communities of common concern. Projects focus on cultural reclamation, multiculturalism, cultural equity and contemporary cultural wars, media literacy, independent film, and community-based art. Guest artists and organizers, films, and case studies.
5 units, Aut (Hernandez, G)

CSRE 203A. The Changing Face of America: Civil Rights and Education Strategies for the 21st Century—For students with leadership potential who have studied these topics in lecture format. Race discrimination strategies, their relation to education reform initiatives, and the role of media in shaping racial attitudes in the U.S.
5 units, Spr (Montoya, J; Steyer, J)

NATIVE AMERICAN STUDIES

NATIVEAM 109B. Indian Country Economic Development—(Same as CSRE 109B.) The history of competing tribal and Western economic models, and the legal, political, social, and cultural implications for tribal economic development. Case studies include mineral resource extraction, gaming, and cultural tourism. 21st-century strategies for sustainable economic development and protection of political and cultural sovereignty.
5 units, Aut (Biestman, K)

NATIVEAM 117S. History of California Indians—(Same as CSRE 117S.) Demographic, political, and economic history of California Indians, 1700s-1950s. Processes and events leading to the destruction of California tribes, and their effects on the groups who survived. Geographic and cultural diversity. Spanish, Mexican, and Anglo-American periods. The mission system. GER:EC-AmerCul
5 units, Win (Shively, J)

NATIVEAM 200R. Directed Research
1-5 units, Aut, Win, Spr (Staff)

NATIVEAM 200W. Directed Reading
1-5 units, Aut, Win, Spr (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

AFRICAAM 101. African American Lecture Series
1-3 units, Aut, Win, Spr (Grant, V)

AFRICAAM 105. Introduction to African and African American Studies—(Same as SOC 147B/247B.)
5 units, Spr (Staff)

AFRICAST 111. Education for All? The Global and Local in Public Policy Making in Africa
5 units, Spr (Samoff, J)

AFRICAST 212. AIDS, Literacy and Land in Africa: Foreign Aid and Development in Africa
5 units, Win (Samoff, J)

AMSTUD 183. Border Crossings and American Identities—(Same as CASA 183.)
5 units, Aut (Duffey, C)

ARTHIST 192. Introduction to African Art
4 units, Win (Martinez-Ruiz, B)

ARTHIST 193A/393A. Caribbean and Latin American Art: Empire, Identity, and Society
4 units, not given this year (Martinez-Ruiz, B)

ARTHIST 195/395. Introduction to Black Atlantic Visual Traditions
4 units, not given this year (Martinez-Ruiz, B)

ARTHIST 292A. Researching Africa: Problem and Theory in African Art
5 units, not given this year (Martinez-Ruiz, B)

CASA 16. Native Americans in the 21st Century: Encounters, Identity, and Sovereignty in Contemporary America
5 units, not given this year

CASA 88. Theories in Race and Ethnicity
5 units, Aut (Yanagisako, S)

CASA 113/213. Women in Islam: The Central Asian Case
5 units, not given this year

CASA 117/217. Archaeology of the American Southwest: Contemporary Peoples, Contemporary Debates
5 units, not given this year

COMM 148/248. Hip Hop and Don't Stop: Introduction to Modern Speech Communities
4-5 units, Win (Morgan, M)

COMPLIT 41Q. Ethnicity and Literature
3-5 units, not given this year

COMPLIT 141. Literature and Society in Africa and the Caribbean
4 units, Spr (Boyi, E)

COMPLIT 142. The Literature of the Americas—(Same as ENGLISH 172E.)
5 units, Aut (Greene, R; Saldívar, R)

COMPLIT 144. Arab Minorities in a Transnational Context: Fictions of Race, Ethnicity, Periphery
3-5 units, not given this year

COMPLIT 148. Introduction to Asian American Cultures
3-5 units, not given this year

DANCE 42. Dances of Latin America
2 units, Aut, Spr (Cashion, S)

DANCE 43. Afro-Peruvian and Afro-Brazilian Dance
1 unit, Win (Cashion, S)

DANCE 168. Dance and Culture in Latin America
4 units, Spr (Cashion, S)

DRAMA 17N. *Del Otro Lado:* Latina/o Performance Art in the U.S.—(Same as SPANLIT 178N.)
3 units, Win (Staff)

DRAMA 110. Identity, Diversity, and Aesthetics: The Institute for Diversity in the Arts
5 units, Win (Elam, H)

DRAMA 160/260. Performance, Dance History, and Gender
4 units, Aut (Staff)

DRAMA 177/277. Playwriting
5 units, Win (Moraga, C)

DRAMA 179G. Indigenous Identity in Diaspora People of Color Art Practice in North America
5 units, Spr (Moraga, C)

EDUC 115Q. Identities, Race, and Culture in Urban Schools
3 units, Spr (Nasir, N)

EDUC 146X. Perspectives on the Education of Linguistic Minorities—(Same as APPLLING 207.)
3-5 units, Spr (Valdés, G)

EDUC 149/249. Theory and Issues in the Study of Bilingualism—(Same as SPANLIT 207.)
3-5 units, Aut (Valdés, G)

EDUC 165/265. History of Higher Education in the U.S.—(Same as HISTORY 158C.)
3-4 units, Aut (Staff)

EDUC 179. Urban Youth and Their Institutions: Research and Practice
4-5 units, Aut (McLaughlin, M)

EDUC 181/381. Multicultural Issues in Higher Education
4 units, Win (Antonio, A)

EDUC 193B. Peer Counseling in the Chicano/Latino Community
1 unit, Aut (Martinez, A)

EDUC 193C. Peer Counseling in the African American Community
1 unit, Aut (Edwards, S)

EDUC 193F. Psychological Well-Being on Campus: Asian American Perspectives
1 unit, Spr (Brown, N)

EDUC 193N. Peer Counseling in the Native American Community
1 unit, Win (Simms, W)

EDUC 201. History of Education in the United States—(Same as HISTORY 158B.)
3-4 units, Spr (Staff)

EDUC 201B. Education for Liberation
3-4 units, not given this year

EDUC 233A. Adolescent Development and Mentoring in the Urban Context
3 units, Aut (LaFromboise, T)

EDUC 245. Understanding Racial and Ethnic Identity Development
3-5 units, Aut (LaFromboise, T)

EDUC 340. Psychology and American Indian Mental Health
3-5 units, not given this year

ENGLISH 43/143. Introduction to African American Literature
3-5 units, Aut (Elam, M)

ENGLISH 43A/143A. American Indian Mythology, Legend, and Lore
3-5 units, Win (Fields, K)

ENGLISH 43B/143B. Introduction to Chicana/o Literature and Culture
3-5 units, Aut (Moya, P)

ENGLISH 43C/143C. Introduction to Asian American Literature
3-5 units, Aut (Sohn, S)

ENGLISH 138C. *Huckleberry Finn* and American Culture—(Same as AMSTUD 138C.)
5 units, Win (Fishkin, S)

ENGLISH 140A. Creative Resistance and the Holocaust
5 units, Win (Felstiner, J)

ENGLISH 146C. Hemingway, Hurston, Faulkner, and Fitzgerald
5 units, Aut (Jones, G)

ENGLISH 172B. Introduction to Feminist Studies—(Same as FEMST 101.)
5 units, Aut (Elam, M)

FEMST 120. Introduction to Queer Studies
4-5 units, Win (Hunter, M)

FEMST 208. Bernice Johnson Reagon and the Cultural Politics of Racial and Gender Justice
2 units, offered once only

HISTORY 54S. America's Cold War in Asia from Korea to Vietnam, 1945-1975
5 units, Aut (Kim, K)

HISTORY 55S. Border Lives, Border Identities: The History of Mexican American Women in the United States
5 units, Win (Flores, L)

HISTORY 59. Introduction to Asian American History
5 units, Aut (Chang, G)

HISTORY 150C. The United States in the Twentieth Century
5 units, Spr (Camarillo, A; Chang, G)

HISTORY 161. U.S. Women's History, 1890s-1990s
5 units, Spr (Freedman, E)

HISTORY 166. Introduction to African American History: The Modern African American Freedom Struggle
4-5 units, Aut (Carson, C)

HISTORY 248S/448A. African Societies and Colonial States
4-5 units, not given this year

HISTORY 255. Martin Luther King, Jr.: The Social Gospel and the Struggle for Justice
5 units, Spr (Staff)

HISTORY 258/358. History of Sexuality in the U.S.
4-5 units, not given this year

HISTORY 260. California's Minority-Majority Cities
5 units, Spr (McKibben, C)

HISTORY 265/365. New Research in Asian American History
4-5 units, not given this year

HUMBIO 122S. Social Class, Race, Ethnicity, Health
4 units, offered next year

LINGUIST 150. Language in Society
4 units, Win (Rickford, J)

LINGUIST 156. Language and Gender
4 units, not given this year

MUSIC 17Q. Perspectives in North American Taiko
4 units, Spr (Sano, S)

POLISCI 131. Children's Citizenship: Justice Across Generations—(Same as EDUC 158.)
5 units, not given this year

POLISCI 133. Ethics and Politics of Public Service—(Same as ETHICSOC 133.)
5 units, Aut (Reich, R)

POLISCI 141. The Global Politics of Human Rights
5 units, not given this year

POLISCI 221E. Seminar on Race in Institutional Contexts
5 units, Spr (Barker, L)

POLISCI 221F. Race and American Politics
5 units, Spr (Sniderman, P)

PSYCH 215. Mind, Culture, and Society
3 units, Win (Markus, H; Steele, C)

PSYCH 217. Topics and Methods Related to Culture and Emotion
1-3 units, Win (Tsai, J)

SOC 45Q. Understanding Race and Ethnicity in American Society
5 units, Aut (Snipp, C)

SOC 46N. Race, Ethnic, and National Identities: Imagined Communities
3 units, Spr (Rosenfeld, M)

SOC 120/220. Interpersonal Relations
5 units, Aut (Ridgeway, C)

SOC 136/236. Sociology of Law
3-5 units, Aut (Dauber, M)

SOC 138/238. American Indians in Comparative Historical Perspective
5 units, Win (Snipp, C)

SOC 139/239. American Indians in Contemporary Society
5 units, Spr (Snipp, C)

SOC 140/240. Introduction to Social Stratification
5 units, Win (Sandefur, R)

SOC 141B. Race, Ethnicity, Religion, and Health
5 units, Spr (Gonzalez, M)

SOC 142/242. Sociology of Gender
3-5 units, Win (Ridgeway, C)

SOC 143/243. Prejudice, Racism, and Social Change
5 units, not given this year

SOC 149/249. The Urban Underclass—(Same as URBANST 112.)
5 units, Aut (Rosenfeld, M)

SOC 155/255. The Changing American Family
5 units, Spr (Rosenfeld, M)

SPANLIT 101N. Visual Studies and Chicana/o Art
3-5 units, Spr (Yarbro-Bejarano, Y)

SPANLIT 193. The Cinema of Pedro Almodóvar
3-5 units, Spr (Resina, J)

SPANLIT 206. Language Use in the Chicano Community—(Same as EDUC 242, APPLLING 206.)
3-5 units, Spr (Valdés, G)

SPANLIT 286/386. The Films of Lourdes Portillo
3-5 units, Aut (Yarbro-Bejarano, Y)

SPANLIT 289. The Body in Chicana/o Cultural Representations
5 units, Aut (Staff)

DRAMA

Emeriti: (Professors) Helen W. Schrader, Carl Weber; *(Associate Professor)* William S. Eddelman; *(Senior Lecturer)* Patricia Ryan

Chair: Peggy Phelan

Drama Division

Professors: Jean-Marie Apostolidès (French and Italian, Drama), Harry J. Elam, Jr., Peggy Phelan (Drama, English), Alice Rayner, Rush Rehm (Drama, Classics)

Assistant Professor: Branislav Jakovljevic

Professor (Teaching): Michael F. Ramsaur

Associate Professor (Teaching): Janice Ross

Senior Lecturer: Connie Strayer

Lecturers: Maya Arad, Cynthia Bassham, Jeffrey Bihr, Alison Duxbury, Erik Flatmo, Daniel Klein, Kathryn Kostopoulos, Kris Salata, Leticia Samonte

Visiting Assistant Professors: Patrick Anderson, Jisha Menon

Artists in Residence: Amy Freed, Cherríe Moraga

Institute for Diversity in the Arts and Black Performing Arts Division

Division Director: Harry J. Elam, Jr.

Associate Director (IDA): Georgina Hernandez

Director (CBPA): Robert Moses

Joint IDA/BPA Steering Committee: Suzanne Abel (Haas Center for Public Service), Jan Barker Alexander (Black Community Services Center), Elena Becks (Staff), Enrique Chagoya (Associate Professor, Studio Art), Regina Covington (King Papers), Alice Endamne (*Black Arts Quarterly*), Diane Frank (Lecturer, Dance), Vera Grant (African and African American Studies), Tony Kramer (Senior Lecturer, Dance), Barbaro Martinez-Ruiz (Associate Professor, Art History), Julia Melancon (Staff), Cindy Ng (Asian American Activities Center), Janice Ross (Associate Professor, Teaching, Drama), Stephen Sano (Associate Professor, Teaching, Music), Laura Selznick (VPUE), Yvonne Yarbro-Bejarano (Professor, Chicana/o Studies), Patience Young (Cantor Arts Center)

Dance Division

Director: Tony Kramer

Senior Lecturers: Susan Cashion, Tony Kramer

Lecturers: Kristine Elliott, Diane Frank, Aleta Hayes, Muisi-Kongo Malonga, Rika Onizuka, Richard Powers, Ronnie Reddick

Artist in Residence: Robert Moses

Mail Code: Drama, 94305-5010; Dance, 94305-8125

Phone: Drama (650) 723-2576; Dance (650) 723-1234

Email: dramainfo@stanford.edu

Web Site (Drama): http://drama.stanford.edu/

Web Site (Dance): http://dance.stanford.edu/

Courses given in Drama have the subject code DRAMA. Courses given in Dance have the subject code DANCE. For a complete list of subject codes, see Appendix B.

DRAMA DIVISION

The Department of Drama bases its undergraduate and graduate programs on the integration of theory and performance. The faculty commit themselves to the idea that artists must be able to analyze their creative work and that scholars must approach their own specializations creatively. The department prepares students for continued work at the graduate level, either in the academy or in conservatory programs that educate artists for careers in the theater within a comprehensive liberal arts education. The Ph.D. program, which demands that its candidates work as both scholars and theater artists, prepares the students to pursue a career in university teaching and research, and to undertake further work in professional and university theaters.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The requirements for the B.A. degree in Drama are designed to integrate the critical and historical study of drama with the study and experience of performance. The major provides aesthetic and critical opportunities for students to develop special aptitudes. For example, a student may elect an emphasis in acting, directing, design, or critical theory, or may combine areas of emphasis. Examples of how students can structure course work to take advantage of such an emphasis are available from the major adviser. Students are encouraged to declare a major in their sophomore year.

The core program of Drama courses required of all majors is:

1. Performance/Literature/History: two courses with suffix 'H' (designating history) and two courses with suffix 'T' (designating topic) from 150-169
2. Stage Management Project: 134 or 34 plus two of 39A,B,C, or D
3. Senior Project: Drama majors must complete an approved senior project in the area of their specialization: a minimum of 2 units in DRAMA 200 or 205.

Two years of a college-level foreign language are recommended.

All majors, in addition to completing the core described above, are required to complete one of the following seven specializations:

1. *Acting:*
    a) DRAMA 120A,B, Fundamentals of Acting; DRAMA 121M, Movement and Character; DRAMA 121V, Voice and Stage Speech
    b) The student must have completed at least 4 units of DRAMA 29 and acted in at least two department productions.
    c) DRAMA 28, Makeup for the Stage
    d) 2 units of studio class in Dance
    e) three additional acting classes
    f) one course in dramatic literature
    g) 5 units of approved electives in Drama or Dance
    h) one of DRAMA 39A,B,C, or D
2. *Directing:*
    a) DRAMA 170A, Introduction to Directing; 170B, Advanced Directing; and 171, Undergraduate Theater Workshop
    b) one course in dramatic literature
    c) DRAMA 30, Introduction to Theatrical Design
    d) DRAMA 31, Introduction to Lighting and Production
    e) one course in acting
    f) one of 39A,B,C, or D
    g) 9 units of approved electives in Drama
3. *Playwriting/Dramaturgy:*
    a) DRAMA 177, Playwriting
    b) DRAMA 178, Intensive Playwriting
    c) DRAMA 170A, Introduction to Directing; 170B, Advanced Directing; and 171, Undergraduate Theater Workshop
    d) DRAMA 176, Undergraduate Dramaturgy Project
    e) one course in dramatic literature
    f) one course in acting
    g) one of 39A,B,C, or D
    h) 4 units of approved electives in Drama
4. *Design:*
    a) DRAMA 30, Introduction to Theatrical Design
    b) DRAMA 31, Introduction to Lighting and Production
    c) two of 131, 132, 133, or 135
    d) 2 units each: 39A,B, and C
    e) two of 231, 232, 233, or 235
    f) 11 units of approved electives in Drama or Art
5. *Technical Production/Stage Management:*
    a) DRAMA 30, Introduction to Theatrical Design
    b) DRAMA 31, Introduction to Lighting and Production
    c) one of 131, 132, 133
    d) 2 units each: 39A,B, and C
    e) DRAMA 34, Stage Management
    f) DRAMA 136, Drafting or MUSIC 19

   g) DRAMA 135, Sound Design for Theater
   h) 11 units of approved electives in Drama
6. *Dance:*
   a) one of: DANCE 102, Duets Project; DANCE 103, Marriage of Text and Movement; DANCE 105, Contemporary African Styles and Dancemaking; DANCE 106, Essence of Contemporary Dance Performance; DANCE 112, Collaborative Processes and Choreography; DANCE 113, Dual Processing: Movement and Choreography; DANCE 169, Choreography, Creation, Staging, and Reconstruction
   b) one additional dance theory class from DANCE 116, 166, 168, 197, or 242, or DRAMA 160
   c) DRAMA 31, Introduction to Lighting and Production
   d) one of DRAMA 39A,B,C, or D
   e) ten classes of studio work: at least one dance class from modern, jazz, world, ballet, social dance and improvisation plus contact, and acting; and two classes of Dance Performance: 100, 102, 103, 105, 106, 169
   f) 6 units of approved electives in Music and Art
7. *Performance Theory and Cultural Studies:*
   a) ENGLISH 163, Shakespeare
   b) one course in acting
   c) one of 39A,B,C, or D
   d) three courses in dramatic literature
   e) an ethnic drama class
   f) 6 units of course work in dramatic literature, criticism, theater history, history, art history to be determined in consultation with the undergraduate adviser

SENIOR PROJECT

Work for this project normally begins in Spring Quarter of the junior year and is completed by the end of the senior year. The student must do a senior project in his or her area of specialization: Acting, Directing, Playwriting/Dramaturgy, Design, Technical Production/Stage Management, Dance, or Performance Theory and Cultural Studies. The project can be a creative or research project, or a combination of both. The student has the option of writing an essay associated with the project. Students receive credit for senior projects through DRAMA 200, Senior Project, or DRAMA 205, Senior Project: Acting.

Students pursuing senior projects should consult with both the Department of Drama undergraduate adviser and a faculty adviser in the project's specialty area. These consultations should take place early in the junior year. Students must petition approval of senior projects through the Department of Drama undergraduate adviser. Projects are typically approved by the department faculty at the end of Spring Quarter of the junior year or the end of Autumn Quarter of the senior year.

The proposal should include an outline of the courses the student has taken and grades received in the area requirements, and should describe the courses in which the student plans to enroll as part of the project. It should describe in detail the purpose and methods involved in the project; a bibliography, if appropriate; and a one-to-two page abstract of the associated essay if an essay is part of the project.

MINOR

For students wishing to minor in Drama, the following core requirements must be met:

1. Three courses in Performance/Literature/History from 150-169.
2. Performance Practice: two of 39A,B,C, or D.
3. A practical production class in technical theater or performance: one of 29, 39A,B,C, or D.
4. Elective courses totaling a minimum of 16 units from the specified courses in any one of the seven specializations listed above would constitute a minor concentration in: Acting, Directing, Playwriting/Dramaturgy, Design, Technical Production/Stage Management, Dance, or Performance Theory and Cultural Studies.

HONORS PROGRAMS

DRAMA

For a limited number of students, the department confers the degree of Bachelor of Arts with Departmental Honors in Drama. To be considered for departmental honors, students must meet the following requirements in addition to the other requirements of the Drama major:

1. Application involves a written submission (including transcript) establishing the student's work-to-date in the department and outlining the area of research that the student wishes to pursue. No students are admitted to the honors program with a grade below 'B-' in a course (departmental or otherwise) that constitutes part of their Drama major.
2. Students must complete the Drama core requirements by the end of their junior year, earlier if possible. Only in exceptional circumstances can this requirement be waived; transfer from another university, extended overseas study, or temporary withdrawal from the major due to illness might constitute extenuating circumstances.
3. Students also must have completed half of the courses in their specialization by the end of their junior year.
4. Students must complete 4 units in the Honors Colloquia (described below), beginning Spring Quarter of their junior year and continuing the following three regular quarters. Each quarter's colloquium is offered for 1 unit, S/NC. In extenuating circumstances (overseas study, for example), an honors program student may substitute other equivalent work for one quarter of the colloquium, with the approval of the honors adviser.
5. GPA in courses counting towards the major must be 3.5 by the time of graduation.
6. By the end of the seventh week of the quarter in which they plan to graduate, all students in the honors program must submit an honors thesis (described below), to be read and evaluated by their thesis committee.
7. On the basis of a student's work in the Drama core, in the area of specialization, on the senior project, in the honors colloquia, and on the honors thesis, the faculty determines and confers honors on graduating students who have successfully completed the honors program.
8. Failure to meet any of these requirements, or to make satisfactory progress on the honors thesis, leads to dismissal from the honors program.

HONORS COLLOQUIA AND THESIS

The honors colloquia aim to engage honors program students in an ongoing discussion of important issues in the field, with particular focus on the students' areas of specialization and research. The honors program adviser convenes the colloquia three times per quarter and sets the agenda for meetings and discussion. The colloquia offer venues for honors students to discuss their work in the department (their senior projects, for example), and to present and discuss their research for their honors thesis. The honors thesis represents an extended engagement with an important issue or subject, determined by the student, the honors program adviser, and the student's senior project adviser. It typically consists of a long essay (7,500-10,000 words) presenting the student's research on the subject. As an honors thesis may deal with issues related to the student's senior project, or with issues related to the student's specialization, the honors program adviser, the senior project adviser, and another faculty member constitute the student's honors thesis committee. They read and evaluate the thesis, and make recommendations to the faculty at large regarding its strengths and weaknesses. In the case of an honors program student whose senior project does not involve production or performance but takes written form, the requirements for the honors thesis change. In discussions with the student's honors committee, the student develops a performance/production-based project that provides the equivalent of a written honors thesis.

HUMANITIES

An honors program in Humanities is available for Drama majors who wish to supplement their major with related and carefully guided studies. See the "Interdisciplinary Studies in Humanities" section of this bulletin for a description of the honors program. Students who enroll in this program may offer HUMNTIES 160 and two seminars from 190-198 in fulfillment of the departmental elective requirement.

GRADUATE PROGRAMS

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of the bulletin.

All graduate study in the Department of Drama leads to the Ph.D. degree. The doctoral program in Drama aims to integrate practical theater work with the critical and historical study of dramatic literature and theory. All candidates are expected to function both as scholars and as theater directors. The curriculum offers a two-year practical concentration in directing along with the study of critical and performance theory, aesthetics, history, and literature. The goal of the program is to give students a thorough knowledge of the field that leads to original and significant scholarly work grounded in practice as well as an inventive directorial practice that is based on solid scholarly analysis.

The following department requirements are in addition to the University's basic requirements for the doctorate.

1. *Units and Course Requirements—*
    a) a minimum of 135 units of graduate courses and seminars in support of the degree. These units are in addition to units for the doctoral dissertation.
    b) the core seminars: 300A, 300B, 301, 302, 303, 304
    c) a coherent program of three additional graduate seminars within the Department of Drama to be worked out with the adviser.
    d) the four workshops in directing: DRAMA 370, 372, 373, 374. In the first two years, students take 370, Concepts of Directing, 372, Projects in Directing, and 373, Directing and Dramaturgy. 372 consists of the conceptual development, design, and production of a short play in a multi-form space. In the second year, students take 374, Graduate Directors' Performance Project, to stage a more fully developed production chosen in consultation with the faculty.
    e) three graduate colloquia in directing: 380.
2. *Language Requirement*—The candidate must demonstrate reading knowledge of one foreign language in which there is a major body of dramatic literature. The language requirement must be met before the student can be advanced to candidacy. The language requirement may be fulfilled in any of the following ways:
    a) achievement of a sufficiently high score (70th percentile) on the foreign language examination prepared by the Educational Testing Service (ETS). Latin and Greek are not tested by ETS.
    b) a reading examination given each quarter by the various language departments, except for Latin and Greek
    c) pass with a grade of 'B' or higher a course in literature numbered 100 or higher in a foreign language department at Stanford.
3. *Teaching Requirement*—Four quarters of supervised teaching at half time are a required part of the Ph.D. program. The requirement is normally met by teaching three courses during the fourth year and one course during the fifth year. During non-teaching quarters in years four and five, students serve as research assistants.
4. *Examinations*—Candidates must complete three examinations (one comprehensive and two qualifying) by the end of the first three years of study at Stanford.
    a) *The comprehensive examination* is taken over the first weekend in December of the first year. The exam is based on texts given to the student by the department before the start of the first year. Students study these texts independently. For the exam, they should be able to identify and compare plays and playwrights from the list of texts in terms of dramatic genres, styles, and periods, and to address comparatively and analytically critical issues of texts and performance.
    b) *The first qualifying exam,* which must be completed before advancement to candidacy at the end of the second year, consists of three 25-35-page essays written in consultation with a faculty adviser. These essays should demonstrate mastery of the field such that a student would be able to teach an introductory class in the area. Reading lists for each period should be approved by the end of the first year. Each essay should cover a different period of dramatic literature and theater history. These essays should not duplicate any written work from seminars. After approval by the adviser, the graduate studies committee reads and evaluates these essays, one in each of Autumn, Winter, and Spring quarters. For the first qualifying examination, choose from the following periods of Western drama:
        Classical
        Medieval and Renaissance
        17th, 18th, and early 19th century
        Modern: 1870-1980
        Contemporary: 1980 to the present
    c) *The second qualifying examination* is a departmental oral with three faculty members, at least two from the Department of Drama. This oral is based on a 40-page review of the literature for the dissertation that the student creates in conjunction with the dissertation reading committee.
5. *Satisfactory Progress, Annual Review* —The program and progress of each student must be evaluated by the Graduate Studies Committee at the end of each academic year. At the end of the first year, the departmental graduate studies committee evaluates the work of each student in classes, seminars, examinations, and performance. Production planning in the Spring of each year for the following season is contingent upon students making satisfactory progress. Continuation in the program depends upon the recommendation of this faculty group. At the end of the second year, the committee reviews the student's work in consideration of advancement to candidacy. At the end of the third year, students are expected to have developed an approved dissertation prospectus. Funding is contingent upon satisfactory progress. Any student not making satisfactory progress is subject to having funding suspended.
6. *Application for Candidacy*—By the end of the second year of residence, the following requirements or appropriate equivalents must be completed:
    a) the core seminars: 300A, 300B, 301, 302, 303, 304
    b) The directing workshop series (DRAMA 370-374), including the successful production of at least one work in public performance and three graduate colloquia in directing (DRAMA 380)
    c) A foreign language
    d) At least two examinations

    Based on its evaluation of the student's progress, the graduate studies committee certifies the student's qualifications for candidacy. Upon favorable action, the student files a formal application for candidacy, as prescribed by the University, by the end of Summer Quarter of the second year.
7. *Research Assistantship*—Generally, the third year is devoted to graduate study and research assistantships with faculty members.
8. *Dissertation Prospectus*—The dissertation prospectus must be approved by the candidate's adviser and by the departmental graduate studies committee by the end of Spring Quarter of the third year. Within 30 days of approval, a student should schedule a prospectus colloquium with the proposed reading committee.
9. *University Oral Examination*—The University oral examination is a defense of the dissertation based on a full draft submitted at least 75 days before the proposed degree conferral. The examining committee consists of four faculty members, at least two of whom must be from the Department of Drama, as well as one faculty chair from outside the department who does not share an appointment with the department of any of the examiners.

10. *Dissertation*—Normally, the Ph.D. program is completed in five years. The first two years should be devoted to full-time graduate study, and the third, fourth, and fifth years to research, teaching, and writing the dissertation. Following formal admission to candidacy (typically at the end of the second year), the dissertation must be completed and approved within five years from the quarter in which candidacy is granted. A candidate taking more than five years is required to reinstate candidacy by repassing the written examinations on dramatic literature.

APPLICATION AND FELLOWSHIPS

Applicants for the Ph.D. program may write directly to the Department of Drama for information. Online graduate applications are available at http://gradadmissions.stanford.edu/. In addition to the required statement of purpose, all applicants must submit a statement detailing their practical theater experience, a sample of their written critical work, and a statement on directing. An invitation to interview may be extended by the end of January. Graduate students in the Department of Drama begin study in the Autumn Quarter of each academic year; there are no mid-year admissions. Graduate students must be degree candidates. Admissions materials must be submitted to the Department of Drama, Memorial Auditorium, Room 144, 551 Serra Mall, Stanford, CA 94305-5010 by December 11.

The Department of Drama awards a number of fellowships to students in the Ph.D. program.

For more information, write to the address above, telephone (650) 723-2576, fax (650) 723-0843, email dramainfo@stanford.edu, or see http://www.stanford.edu/dept/drama/ to download the latest information in .pdf format.

JOINT PH.D. IN DRAMA AND HUMANITIES

The Department of Drama participates in the Graduate Program in Humanities (GPH) leading to a joint Ph.D. degree in Drama and Humanities. For a description of that program, see the “Interdisciplinary Studies in Humanities” section of this bulletin.

INSTITUTE FOR DIVERSITY IN THE ARTS AND BLACK PERFORMING ARTS DIVISION

The Institute for Diversity in the Arts (IDA) is an interdisciplinary program in the humanities that involves students in the study of culture, identity and diversity through artistic expression..

The Committee on Black Performing Arts (CBPA) and the Institute for Diversity in the Arts (IDA) merged in Autumn 2005. The mission of IDA/CBPA is to engage artists, students, and the local community collaboratively to create performance and visual art that examines the intersections among race, diversity, and social action through programming that includes artist residencies, classes, workshops, public performances, a lecture series, symposia, and a literary journal, the *Black Arts Quarterly*. The division produces annual student productions, and is a resource for student organizations promoting artistic expression through the exploration of the impact of ethnic representation in the arts, literature, media, and pop culture.

The programs prepare students for work in areas including the arts and community development. Students have gone on to graduate-level critical studies, M.F.A. programs, public service, arts administration, and teaching.

Students can pursue an IDA concentration through the Comparative Studies in Race and Ethnicity major. Students can emphasize Black performance through the African and African American Studies major.

DANCE DIVISION

The Dance Division aims to develop trained bodies, inquiring minds, and aesthetic imaginations through movement as well as dance scholarship. The program emphasizes informed and active engagement in dance by stimulating a range of intelligences that honor somatic wisdom.

Since its inception in 1920, dance at Stanford University has positioned itself responsively to the changing needs of the University and society. It offers a range of studio and lecture courses aimed at enhancing the understanding of dance as a way to create and communicate knowledge and meaning. The program encourages students to make connections between dance, other disciplines, culture, and society.

UNDERGRADUATE PROGRAMS

Students who wish to major in Drama with a specialization in Drama with a concentration in Dance, should see the undergraduate adviser, Susan Cashion, in the Dance Division.

MINORS

For students wishing to minor in Drama with a concentration in Dance, see the “Minor” section under Drama above.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

INTRODUCTION TO THE HUMANITIES (IHUM)

The following Introduction to the Humanities courses are taught by Drama department faculty members. IHUM courses are typically available only to freshmen seeking to fulfill IHUM requirements; see the “Introduction to the Humanities” section of this bulletin for further information. Prospective majors in Drama are advised to consider satisfying their IHUM requirements by registering for the following courses.

IHUM 25A,B. Art and Ideas: Performance and Practice—Two quarter sequence. Issues in aesthetics and performance through examples from the classical age to the present. Concepts of art and practice intersecting with topics such as imitation, instruction through pleasure, the creative process, perception, social analysis, and embodiment as a form of knowledge. Texts and performances from drama, dance, music, visual arts, and performance art practices that reflect aesthetic ideas. GER:IHUM-2,3

IHUM 25A: *4 units, Win (Ross, J)*

IHUM 25B: *4 units, Spr (Rayner, A)*

DRAMA DIVISION

Registration for most drama classes takes place at the first class meeting; further registration information is printed in the *Time Schedule* each quarter. Some class sizes are limited and require advance registration in the Department of Drama, Room 144, Memorial Auditorium.

INTRODUCTORY

DRAMA 4. Creating Lighting and Sound in Performance—(Graduate students register for 204.) Concepts of lighting and sound in addressing storytelling in performative projects.

3 units, Aut (Ramsaur, M; Duxbury, A)

DRAMA 11N. Dramatic Tensions: Theater and the Marketplace—Stanford Introductory Seminar. Preference to freshmen. Tension between artistic and commercial forces in modern theater; the conflicted state of the art form. Sources include major and emerging contemporary figures in commercial, fringe, and nonprofit theater in the U.S. and UK. Visits with writers, directors, and dramaturges. GER:DB-Hum

4 units, Aut (Freed, A)

DRAMA 14N. Shakespeare from Stage to Screen—Stanford Introductory Seminar. Preference to freshmen. The texts, stage practices, and filmic transformations for Shakespearean plays, including *Henry V*, *Hamlet*, *Midsummer Night's Dream*, and *Macbeth*. Close readings of texts and films; the relationship of film technologies to the texts in the production of political and social space; and the cultural assumptions carried by images and characters. GER:DB-Hum

4 units, Aut (Rayner, A)

DRAMA 16N. Beauty or the Beast? Kitsch and Contemporary Culture—Stanford Introductory Seminar. Preference to freshmen. What kind of esthetic experience does kitsch describe? Is it a matter of taste? Kitsch through disciplines such as visual arts, theater, literature, music, advertising, fashion, celebrity culture, and food. GER:DB-Hum

4 units, Win (Jakovljevic, B)

DRAMA 17N. *Del Otro Lado:* Latina/o Performance Art in the U.S.—(Same as SPANLIT 178N.) Stanford Introductory Seminar. Preference to freshmen. Works by U.S. Latina/o performance artists from the margins of the mainstream Euro-American theater world. How performance art serves as a dramatized essay, producing transgressive explorations of queer and national and ethnic identities. Artists: Luis Alfaro, Nao Bustamante, the Coatlicue Theater Company, Guillermo Gómez-Peña, Celia Herrera Rodríguez, Ana Mendieta, and Carmelita Tropicana. Creation and performance of a short original piece; performance viewings. GER:DB-Hum, EC-AmerCul

3 units, Win (Moraga, C)

DRAMA 20. Introduction to Acting—Theater games, vocal and physical exercises, stage terminology, characterization, and rehearsal techniques. Goals is to develop an acting vocabulary and technique appropriate for any role, and a vocal and physical warm-up for relaxation and range. Limited enrollment.

2 units, Aut, Win (Kostopoulos, K), Spr (Freed, A), Sum (Staff)

DRAMA 22. Scene Work—For actors who complete substantial scene work with graduate directors in the graduate workshop.

1-2 units, Aut, Win, Spr (Staff)

DRAMA 28. Makeup for the Stage—Techniques of makeup application for the artist and actor: aging, prosthetics, stylization, characterization, animals, and fantasy make-up.

2 units, Aut (Strayer, C)

DRAMA 29. Theater Performance: Acting—Students cast in department productions receive credit for their participation as actors; 1-2 units for graduate directing workshop projects and 1-3 units for major productions (units determined by instructor). May be repeated for credit. Prerequisite: consent of instructor.

1-3 units, Aut, Win, Spr (Staff)

DRAMA 30. Introduction to Theatrical Design—Lecture/lab. Visual communication skills used in stage productions. Design and construction methods for stage scenery, costumes, and lighting.

4 units, Aut (Flatmo, E)

DRAMA 31. Introduction to Lighting and Production—The technical and aesthetic aspects of lighting and the production process.

4 units, Win (Ramsaur, M)

DRAMA 32. Textiles—Introduction to fabric techniques and processes for stage costumes.

2-3 units, Win (Strayer, C)

DRAMA 34. Stage Management Techniques—The production process, duties, and responsibilities of a stage manager. Skills needed to stage manage a production.

2-3 units, Aut (Duxbury, A)

DRAMA 39A. Theater Performance: Scenery and/or Property

1-3 units, Aut, Win, Spr (Staff)

DRAMA 39B. Theater Performance: Lighting/Sound

1-3 units, Aut, Win, Spr (Staff)

DRAMA 39C. Theater Performance: Costumes/Makeup

1-3 units, Aut, Win, Spr (Staff)

DRAMA 39D. Theater Performance: Prosser Stage Management

1-3 units, Aut, Win, Spr (Duxbury, A)

INTERMEDIATE

Primarily for the major, but open to all undergraduates who have the necessary prerequisites.

DRAMA 103. Improvising—The improvisational theater techniques that teach spontaneity, cooperation, team building, and rapid problem solving, emphasizing common sense, attention to reality, and helping your partner. Based on *TheatreSports* by Keith Johnstone. Readings, papers, and attendance at performances of improvisational theater. Limited enrollment.

3 units, Aut, Win (Klein, D)

DRAMA 104. Introduction to Sketch Comedy—Writing, directing, and performing original comic scenes, live and on video. Emphasis is on collaborative ensemble process and product. Topics include character, premise, satire, parody, joke writing, and comic timing. Prerequisite: 103 or 121C, or consent of instructor.

3 units, Win (Klein, D)

DRAMA 120A,B. Acting: The Fundamentals—For students who intend to begin serious actor training. First quarter: the basic vocabulary of objective and action. Theater games and improvisation develop the ability to act with focus, intention, and energy. Basics of characterization and transformation. Second quarter: the actor's spontaneity and imagination are used to reveal the life of a play, working with dramatic texts. Approaches to the actor's craft include character biography and moment-to-moment truthful playing. Exercises including from Strasberg, Meisner, Chaikin, and Linklater. Scene and monologue work from primarily naturalistic plays. Outside rehearsal time required. Must be taken in sequence. Prerequisite: 120A or consent of instructor.

3 units, **A:** *Aut (Freed, A), Win (Kostopoulos, K),*
B: *Spr (Kostopoulos, K)*

DRAMA 121M. Movement and Character—Kinesthetic awareness and physical presence of the performer in relationship to others through techniques of focus, spatial intent, task, and choreographic improvisation.

3 units, Win (Bihr, J)

DRAMA 121P. Acting: Period and Style—Expanding the acting range through heightened language. Scenes from non-contemporary dramatic literature including texts from Shakespeare, Shaw, Turgenev, Ibsen, and Strindberg.

3 units, Spr (Freed, A)

DRAMA 121V. Voice and Speech for the Stage—Goal is to strengthen, support, and vary the voice through breath, resonance, articulation, and projection. Speech work includes phonetics, text analysis, and verbal action as it relates to dramatic material.

2 units, Spr (Bassham, C)

DRAMA 123. Building a Character—Creating characters for performance in dramaturgical sources such as realism and the 20th-century avant garde. Directors and playwrights including Stanislavski and Brecht. Textual analysis, research, and physical and vocal methods.

3 units, Aut (Joseph, R)

DRAMA 125. Acting Shakespeare—Formal training in skills needed to perform Shakespeare.

3 units, Aut (Bihr, J)

DRAMA 127. Alternative Acting Methods—Acting methods from practitioners such as Augusto Boal, Anne Bogart, Jerzy Grotowski, and Jacques LeCoq applied to a single text culminating in a final presentation implementing different styles and possibilities.

3 units, Aut (Anderson, R)

DRAMA 131. Lighting Design—Lecture/lab. Practical and aesthetic aspects of lighting: electricity, light sources, color instrumentation, control, drafting, plotting, and the aesthetic principles of lighting design, interpretation, and concept. Prerequisites: 30, 31, or consent of instructor.
4 units, Spr (Ramsaur. M)

DRAMA 132. Costume Design—A visual analysis of the historical styles of costume design, interpreted for the modern theater and developed by the student in various presentational media. Prerequisite: 30 or consent of instructor.
4 units, Spr (Strayer, C)

DRAMA 133. Stage Scenery Design—Creations of increasing complexity involve text analysis, historical and artistic style, visual research, spatial organization, drafting, sketching, model building, and director-designer collaboration. Prerequisite: 30, or consent of instructor.
4 units, Win (Flatmo, E)

DRAMA 133P. Scenic Painting—Techniques of painting for the stage.
2-3 units, Spr (Samonte, L)

DRAMA 134. Stage Management Project—For students stage managing a Department of Drama production.
2-9 units, Aut, Win, Spr (Duxbury, A), Sum (Staff)

DRAMA 135. Sound Design—All aspects of sound for the theater from equipment, acoustics, and editing to the creation of theatrical sound effects, live and recorded.
4 units, Win (Duxbury, A)

DRAMA 137. Drafting and Construction—Creation of working scenery drawings for departmental productions in preparation for construction in departmental scene shop.
2-3 units, Spr (Flatmo, E)

DRAMA 140. Projects in Theatrical Production—Assistant directing; stage, costume, lighting, and sound design; technical production, stage managing, or other work in connection with Department of Drama productions. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

DRAMA 151. Adaptation: Turning into Drama—(Graduate students register for 251.) Adaptation in theater: from script to production, from book to stage and screen, from one period and culture to another. The adaptations that a single author, Chekhov, has undergone: different productions of his plays and different dramatizations of his prose.
4 units, Win (Arad, M)

DRAMA 153T. Irish Drama—(Graduate students register for 253T.) Focus is on the second half of the 20th century and Brendan Behan's *The Hostage*.
4 units, Win (Rehm, R)

DRAMA 155T. Drama of the Holocaust—(Graduate students register for 255T.) The Holocaust as a recurrent theme in American, Israeli, and German drama; issues at the heart of the theatrical experience such as the role of theater as witness, representation of memories, and performance of real-life events on stage. Possible texts: *Ghetto*, *The Investigation*, *Arbeit macht Frei*, *The Kastner Trial*, and *Bent*.
5 units, Spr (Arad, M)

DRAMA 156H. History of Performance Art and Live Art—(Graduate students register for 256H.) From 1950 to the present, emphasizing the U.S. Precedents in visual arts, modern dance, and experimental theater. Modes include happenings, fluxus, body art, everyday performance, solo monologue, and bio art. Sources include surveys, essays, and artists' writings, and visual documentation.
4 units, Win (Sack, D)

DRAMA 157T. Performance and Ethnography—(Graduate students register for 257T.) Focus is on performance as a mode of engagement in fieldwork, as conceptual framework, and as mode of representing cultural data. Readings from Clifford Geertz, Smadar Lavie, Dwight Conquergood, Victor Turner, Richard Schechner, Barbara Meyerhoff, Diana Taylor, Ruth Wilson Gilmore, Antonin Artaud, Soyini Madison, E. Patrick Johnson, Renato Rosaldo, Jon van Maanan, Diane Wolfe.
5 units, Win (Anderson, P)

DRAMA 158T. Performance and Resistance—(Graduate students register for 258T.) Theories of cultural domination and performed resistance; readings from Foucault, Angela Davis, James Scott, Joy James, Kimberle Crenshaw, Dwight Conquergood as well as live performance, film, and other visual arts from Teatro Campesino, Guillermo Gómez-Peña, Coco Fusco, Adrian Piper, William Pope.L, Christian Boltanski, Marina Abramovic, and others.
5 units, Aut (Anderson, P)

DRAMA 161H. Dance and Live Art in the 20th and 21st Centuries—(Graduate students register for 261H; same as DANCE 161H.) History and development of postmodern dance and performance art. Topics include the body as art medium, performance art, experimental dance, and redefinitions of gender in live art. GER:DB-Hum, WIM
4 units, Aut (Ross, J; Thomas, A)

DRAMA 164T. Queer Performance—(Same as FEMST 140P.) History of 20th-century forms of performance including examples from drama, avant-garde theater, cabaret, musical theater and performance art; contemporary critical gender and queer theories. Modes of performance such as Dada and Weimar cabaret, the postdramatic theater of Robert Wilson and the Wooster Group, and self-consciously critical performances such as body and performance art of the 70s and 80s.
5 units, Spr (Hunter, M)

DRAMA 168H. Art and Life: The Second Avant Garde—(Graduate students register for 268H.) Experiments in the second half of the 20th century that produced new genres such as happenings and performance art, and theoretical debates that attempted to reformulate relations between art forms and their changed role in society. How these fundamentals of performance were challenged and reshaped. GER: DB-Hum, WIM
5 units, Win (Jakovljevic, B)

DRAMA 170A. Introduction to Directing—Practices of stage composition, work with the actor, approaches to character, and techniques of storytelling. Prerequisite: consent of instructor.
4 units, Aut (Salata, K)

DRAMA 170B. Advanced Directing—Deconstructing and constructing. Tools for analyzing text and developing directorial concepts, and putting them into practice. Class exercises culminate in a short theater piece written and directed by the student. Prerequisite: 170A or consent of instructor.
4 units, Win (Salata, K)

DRAMA 171. Undergraduate Theater Workshop—Undergraduate directors present one act plays in workshop performances. Credit available for actors and directors. Prerequisite: 170A/170B or consent of instructor.
1-4 units, Spr (Duxbury, A; Salata, K)

DRAMA 174. Workshop on Black Performance—Recent critical work. Course culminates in a weekend workshop with guest instructors February 29-March 2, 2008.
1-2 units, Win (Phelan, P)

DRAMA 175. Bay Area Performance Platform—Year-long workshop. Guidance and a venue for works in progress that challenge ideas about performance in a minimal tech setting. May be repeated for credit.
1-2 units, Aut, Win, Spr (Salata, K; Phelan, P)

DRAMA 176. Dramaturgy Project—(Graduate students register for 276.) Serve as a dramaturg on any department production. Research the production's text source, the writing of program notes, the compilation and editing of the playbill, and possible adapting/editing of the performance text or translating text from a foreign language.
2 units, Aut, Win, Spr, Sum (Staff)

DRAMA 177. Playwriting—(Graduate students register for 277.) The autobiographical monologic and poetic possibilities in performance art explored to learn the elements of playwriting. GER:DB-Hum
5 units, Win (Moraga, C)

DRAMA 179G. Indigenous Identity in Diaspora: People of Color Art Practice in North America—(Graduate students register for 279G.) Gateway course for Institute for Diversity in Arts concentration. People of color aesthetics from contemporary art works in conversation with native (American, African, Asian) origins, gender, and sexuality; the formation of cultural identity. Final project.
4 units, Spr (Moraga, C)

DRAMA 180Q. Noam Chomsky: The Drama of Resistance—Stanford Introductory Seminar. Preference to sophomores. Chomsky's ideas and work which challenge the political and economic paradigms governing the U.S. Topics include his model for linguistics; cold war U.S. involvements in S.E. Asia, the Middle East, Central and S. America, the Caribbean, and Indonesia and E. Timor; the media, terrorism, ideology, and culture; student and popular movements; and the role of resistance. GER:DB-Hum
3 units, Spr (Rehm, R)

DRAMA 185Q. Law and Drama—Stanford Introductory Seminar. Preference to sophomores. The intersection between legal and theater/performance studies, emphasizing overlaps between jurisprudence and drama such as the reconstitution of the past that takes place in drama and in legal procedures, positioning of the audience in relation to the legal/dramatic action, and the importance of witnessing in drama and court trials. Plays include the *Oresteia*, *The Broken Jug*, *The Investigation*, *The Deputy*, and *The Three Trials of Oscar Wilde*.
1-2 units, Spr (Jakovljevic, B)

DRAMA 186Q. The Emergence of the Director—Stanford Introductory Seminar. Preference to sophomores. The role of the director as it emerged in the late 19th century together with modern theater. Those who established the paradigm of the new profession including Antoine, Stanislavski, Eisenstein, and Brecht; their writings, stagings, and documentation.
4 units, Win (Jakovljevic, B)

DRAMA 187Q. The Stage in Dialogue with History—Stanford Introductory Seminar. Preference to sophomores. The practice and ideological positions of European and American theater from the end of WW II to the implosion of the Soviet empire as seen in major playwrights and practitioners who shaped the European theater. Focus is on how plays and their staging responded to and tried to influence history. Plays by Brecht, Miller, Williams, Sartre, Beckett, Müller, Osborne, Bond, Pinter, Weiss, Kipphardt, Mrozek, Havel, Handke, Strauss, and Seidel.
3 units, Aut (Weber, C)

DRAMA 189Q. Mapping and Wrapping the Body—Stanford Introductory Seminar. Preference to sophomores. The concepts behind gender boundaries and clothing systems. GER:DB-Hum, EC-Gender
3 units, Aut (Eddelman, W)

DRAMA 190. Special Research—Individual project on the work of a playwright, period, or genre. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

DRAMA 191. Independent Study—Individual supervision of off-campus internship. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

ADVANCED COURSES

Courses numbered 200 through 299 are designed for advanced undergraduates and graduates.

DRAMA 200. Senior Project—See "Undergraduate Programs" for description.
2-9 units, Aut, Win, Spr, Sum (Staff)

DRAMA 201A,B,C,D. Honors Colloquium—See "Undergraduate Programs" for description.
1 unit, Aut, Win, Spr (Jakovljevic, B), Sum (Staff)

DRAMA 202. Honors Thesis—See "Undergraduate Programs" for description. May be repeated for credit.
2-9 units, Aut, Win, Spr, Sum (Staff)

DRAMA 204. Creating Lighting and Sound in Performance—(Same as 4; see 4.)
3-5 units, Aut (Ramsaur, M; Duxbury, A)

DRAMA 205. Senior Project: Acting—Collaborative work on a project culminating in a production.
2-5 units, Aut, Spr (Kostopoulos, K)

DRAMA 213. Stanford Improv Ensemble—By audition only, for members of the improvisation troupe. Special project work. Prerequisite: 103.
1-2 units, Aut, Win, Spr (Klein, D)

DRAMA 231. Advanced Stage Lighting Design—Individually structured class in lighting mechanics and design through experimentation, discussions, and written reports. Prerequisite: 131 or consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

DRAMA 232. Advanced Costume Design—Individually structured tutorial for costume designers. May be repeated for credit. Prerequisite: 132 or consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

DRAMA 233. Advanced Scene Design—Individually structured workshop. May be repeated for credit. Prerequisite: 133 or consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

DRAMA 234. Advanced Stage Management Project—For students stage managing a Department of Drama production. Prerequisite: 134.
2-9 units, Aut, Win, Spr, Sum (Staff)

DRAMA 235. Advanced Sound Design—Individually structured tutorial for sound designers. May be repeated for credit. Prerequisite: 135 or consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

DRAMA 251. Adaptation: Turning into Drama—(Same as 151; see 151.)
4 units, Win (Arad, M)

DRAMA 253T. Irish Drama—(Same as 153T; see 153T.)
4 units, Win (Rehm, R)

DRAMA 255T. Drama of the Holocaust—(Same as 155T; see 155T.)
5 units, Spr (Arad, M)

DRAMA 256H. History of Performance Art and Live Art—(Same as 156H; see 156H)
4 units, Win (Sack, D)

DRAMA 257T. Performance and Ethnography—(Same as 157T; see 157T.)
5 units, Win (Anderson, P)

DRAMA 261H. Dance and Live Art in the 20th and 21st Centuries—(Same as 161H, DANCE 161H; see 161H.)
4 units, Aut (Ross, J; Thomas, A)

DRAMA 264T. Queer Performance—(Same as 164T; see 164T.)
5 units, Spr (Hunter, M)

DRAMA 268H. Art and Life: The Second Avant Garde—(Same as 168H; see 168H.)
5 units, Win (Jakovljevic, B)

DRAMA 274. Workshop on Black Performance—(Same as 174; see 174.)
1-2 units, Win (Phelan, P)

DRAMA 276. Dramaturgy Project—(Same as 176; see 176.)
2 units, Aut, Win, Spr, Sum (Staff)

DRAMA 277. Playwriting—(Same as 177; see 177.)
5 units, Win (Moraga, C)

DRAMA 279G. Indigenous Identity in Diaspora: People of Color Art Practice in North America—(Same as 179G; see 179G.)
4 units, Spr (Moraga, C)

DRAMA 290. Special Research—Individual project on the work of a playwright, period, or genre.
1-5 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

Open to advanced undergraduates with consent of instructor.

DRAMA 300A. Critical Styles I—Literary criticism and theory, emphasizing style as evidence of historical, cultural, and ideological concerns. Assumptions about written texts by authors such as Coleridge, Bradley, and Burke. How style reveals context. Students write in the style of authors discussed.
3-5 units, Aut (Rayner, A)

DRAMA 300B. Critical Styles II—Notions of performance as they relate to gender, race, and globalization in critics such as Derrida, Butler, and Phelan. How style reveals context. Students write in the style of authors discussed.
3-5 units, Win (Rayner, A)

DRAMA 301. Performance and Performativity—Performance theory through topics including: affect/trauma, embodiment, empathy, theatricality/performativity, specularity/visibility, liveness/disappearance, belonging/abjection, and utopias and dystopias. Readings from Schechner, Phelan, Austin, Butler, Conquergood, Roach, Schneider, Silverman, Caruth, Fanon, Moten, Anzaldúa, Agamben, Freud, and Lacan. May be repeated for credit.
3-5 units, Win (Anderson, P)

DRAMA 302. Engendering the Nation—Issues in postcolonial studies; the shifting erotics of race and nation; and the management of sexuality within geopolitical contexts in colonialism, nationalism, and globalization. The historicity of these categories; how race, gender, and nation continue to shape the world.
3-5 units, Aut (Menon, J)

DRAMA 303. Race and Performance—How and if race is performed. Readings from W.E.B. DuBois, Michael Rogin, Paul Gilroy, Lisa Lowe, and Richard Dyer.
3-5 units, Spr (Elam, H)

DRAMA 304. Historiography of Theater—Goal is to design an undergraduate theater history class. Standard theater history textbooks, alternative models of theater history scholarship, and critical literature engaging historiography in general.
3-5 units, Spr (Jakovljevic, B)

DRAMA 320. Basic Approaches to Teaching Acting—Workshop. The pedagogy of acting to prepare graduate student teachers for introductory classes in acting.
1-3 units, alternate years, not given this year

DRAMA 343. Guy Debord: His Life and His Work—(Same as FRENGEN 343.) How Debord's intellectual and artistic productions can be connected to their concrete historical context; their contemporary pertinence. Increased academic visibility for his work and ideas.
5 units, Aut (Apostolidès, J)

DRAMA 358C. Beckett—(Same as ENGLISH 389B.) Beckett's plays and late writing, which have been described as proto-performance art. Recent Beckett scholarship, including new work about his analysis with Bion.
3-5 units, Spr (Phelan, M)

DRAMA 370. Concepts of Directing—Directorial definitions of time, space, movement, and the performer/spectator relationship. Experimentation with texts from literary and other sources, including works from the realistic tradition in drama, using a multi-form performance space.
5 units, Aut (Weber, C)

DRAMA 372. Projects in Directing—Theatrical text and its transformation into performance. Textual analysis, research, evolution of a directorial concept, and its investigation in scene-work with actors. Students design and stage the production of a short play in a multi-form space. Public performance. May be repeated once for credit.
3-5 units, Win (Ramsaur, M; Weber, C)

DRAMA 373. Directing and Dramaturgy—Dramaturgy, directorial methods, and visual concepts in the production of plays from the Elizabethan tradition to postmodernist texts. Work on the text is tested in the staging of scenes.
3-5 units, Aut (Weber, C)

DRAMA 374. Graduate Directors Performance Project—Production of a full-length play, selected in consultation with faculty. Project is designed by graduate students, sometimes in collaboration with undergraduate design students, under the supervision of design faculty. Four to five weeks rehearsal. Public performance.
3-5 units, Aut, Win (Ramsaur, M; Weber, C), Spr (Ramsaur, M; Rehm, R)

DRAMA 376. Graduate Directors Dramaturgy Project—Serve as a dramaturg on any department production. Work includes research on the production's text source, the writing of program notes, and the compilation and editing of the play bill. Possible adapting/editing of the performance text, and translating text from a foreign language.
2 units, Aut, Win, Spr, Sum (Staff)

DRAMA 377. Graduate Directors Staged Reading Project—Presentation of a new or newly adapted work for the stage, in a mode employed in professional theater for the development of new plays. Two to four rehearsals. Public performance.
2 units, Aut, Win, Spr, Sum (Staff)

DRAMA 380. Graduate Colloquium in Directing—Topics concerning theory and practice in the theater such as the relationship between the director and other collaborators. May be repeated for credit. Autumn: directing and scene design; the design process from the director's point of view. Winter: directing and choreography; meeting the needs of contemporary live art. Spring: directing and lighting design; the creative possibilities of stage lighting.
2-3 units, Aut (Flatmo, E), Win (Weber, C; Hayes, A), Spr (Ramsaur, M)

DRAMA 390. Tutorial
1-9 units, Aut, Win, Spr, Sum (Staff)

DRAMA 399. Dissertation Research
1-9 units, Aut, Win, Spr, Sum (Staff)

INSTITUTE FOR THE ARTS AND BLACK PERFORMING ARTS DIVISION

The following is the core course. See also course listings in the "Comparative Studies in Race and Ethnicity" and "African and African American Studies" sections of this bulletin.

DRAMA 110. Identity, Diversity, and Aesthetics: The Institute for Diversity in the Arts—Students work with a visiting artist on art projects concerning diversity, culture, and race. Workshop. Service learning within a community population to probe diversity and social change through the arts. GER:DB-Hum
5 units, Win (Elam, H)

DANCE DIVISION

Registration for most dance classes takes place at the first class meeting; further registration information is printed in the *Time Schedule* each quarter. Some class sizes are limited and require advanced registration on Axess. Series classes (I, II, III) should be taken in order or by consent of instructor.

INTRODUCTORY

Open to all students. No previous dance experience needed.

DANCE 40. Introduction to Dance and Movement—Body expression, articulation, and anatomical basics through contemporary art dance. Emphasis is on development of awareness of the body in space. Exploration of improvisation and creativity. May be repeated for credit.
2 units, Aut (Kramer, A), Win, Spr (Hayes, A)

DANCE 41. Mexican Dance—Technique and repertory. May be repeated for credit.
2 units, Aut (Cashion, S)

DANCE 42. Dances of Latin America—Dances of Argentina, Brazil, Chile, Colombia, Cuba, Mexico, Peru, and Puerto Rico. May be repeated for credit.
2 units, Aut, Spr (Cashion, S)

DANCE 43. Afro-Peruvian and Afro-Brazilian Dance—Dances include festejo and zamacueca. May be repeated for credit.
1 unit, Win (Cashion, S)

DANCE 44. Jazz Dance I—Basic techniques emphasizing current jazz style. Historical jazz steps enhance understanding of contemporary jazz forms. May be repeated for credit.
2 units, Win, Spr (Kramer, A)

DANCE 45. Improvisation Plus Contact—The development of improvisation skills as a creative performance practice and as a basis for choreography; techniques of contact improvisation. May be repeated for credit.
2 units, Spr (Kramer, A)

DANCE 46. Social Dances of North America I—Introduction to the partner dances found in American popular culture: waltz, swing, tango, club two step, cha cha, merengue, and salsa. Fee. May be repeated for credit. (AU)
1 unit, Aut, Win, Spr (Powers, R)

DANCE 48. Beginning Ballet—Fundamentals of ballet technique including posture, placement, and the foundation steps of classical ballet. Emphasis is on the development of coordination, strength, and flexibility. May be repeated for credit.
2 units, Aut (Elliott, K), Spr (Onizuka, R)

DANCE 51. Congolese Dance—Open to all levels of dancers. Movements and choreography from Congo and W. African countries. Elements unique to African dance movement: body isolation, polyrhythmic movement, and body posture. Live drumming. May be repeated for credit.
2 units, Aut (Malonga, M)

DANCE 58. Beginning Hip-Hop—Steps and styling in one of America's 21st-century vernacular dance forms. May be repeated for credit.
1 unit, Aut (Reddick, R)

DANCE 59. Intermediate-Advanced Hip-Hop—Steps and styling in one of America's 21st-century vernacular dance forms. May be repeated for credit.
1 unit, Aut (Reddick, R)

INTERMEDIATE

Open to all undergraduates with dance experience.

DANCE 133. History of the Waltz—From Vienna in 1800, Redowa and mazurka, waltz variations, the 20th-century hesitation waltz, Parisian valse musette, and 30s Boston and waltz swing. Studio technique with performance practice for stage.
2 units, Spr (Powers, R)

DANCE 140. Intermediate Modern Dance—Intermediate technique. Improvisation and composition in directed studies. May be repeated for credit.
2 units, Aut (Kramer, A), Win (Moses, R), Spr (Kramer, A)

DANCE 144. Intermediate/Advanced Jazz Dance—Emphasis is on alignment, control, rhythmic coordination, and contemporary mixture of styles. May be repeated for credit.
2 units, Win (Moses, R)

DANCE 146. Social Dances of North America II—Intermediate survey of dances in American popular culture: Lindy hop, Viennese waltz, cross-step waltz, foxtrot, and hustle. May be repeated for credit.
2 units, Aut, Spr (Powers, R)

DANCE 147. Living Traditions of Swing—Swing dancing: the early Lindy of the 20s; 6- and 8-count Lindy hop, shag, Big Apple. Partnering and improvisation. Swing's crosscultural influences and personal creativity. May be repeated for credit.
2 units, Win (Powers, R)

DANCE 148. Intermediate Ballet—Continuation of 48, repeating the fundamentals with increased complexity and introducing additional movement vocabulary. May be repeated for credit.
2 units, Aut, Win, Spr (Onizuka, R)

ADVANCED

Open to all undergraduates with dance experience.

DANCE 141. Advanced Modern Dance—Intermediate/advanced technique. Complex movement combinations emphasizing performance demands. May be repeated for credit.
2 units, Aut, Win, Spr (Frank, D)

DANCE 149. Advanced Ballet—Professional-level class in a supportive environment. Comprehensive classical ballet technique including pointe work if the student desires. May be repeated for credit.
2 units, Aut, Win, Spr (Elliott, K)

DANCE 156. Social Dances of North America III—Advanced survey of the partner dances found in American popular culture: hustle, waltz, redowa, tango, cha cha, salsa, samba. May be repeated for credit. Prerequisite: 146 or equivalent experience.
2 units, Win (Powers, R)

PERFORMANCE

DANCE 23. Public Performance—For students participating in Dance Division performances. May be repeated for credit.
1 unit, Aut, Win, Spr (Kramer, A)

DANCE 27. Faculty Choreography—Rehearsal and performance of faculty choreography. Selection by audition. May be repeated for credit.
2 units, Aut, Win (Cashion, S; Frank, D), Spr (Kramer, A)

DANCE 57. Guest Artist—Students perform the work of visiting artist Amy Seiwert. Audition required. May be repeated for credit.
2 units, Aut, Win, Spr (Elliott, K)

DANCE 100. Student Choreography: Studio to Stage—Student choreography is mentored to develop composition and performance skills. Required for participation in certain faculty- and student-directed productions. May be repeated for credit.
2 units, Aut (Kramer, A), Win (Frank, D; Kramer, A)

DANCE 105. Contemporary Afro Styles and Dancemaking: Technique, Rhythm, Architecture—Current and traditional African diaspora styles. African polyrhythms, body percussion, and geometric forms, fused with postmodern concepts of composition and space. May be repeated for credit.
2 units, Win (Hayes, A)

DANCE 106. Essence of Contemporary Dance Performance: African Styles on Stage—Contemporary dance technique and repertory based on African diaspora movement styles. Focus is on articulation of expression, enhancement of stage presence, and awareness of individual movement strengths. May be repeated for credit.
2 units, Spr (Hayes, A)

DANCE 112. Collaborative Processes and Choreography—Practical approaches to problem solving in creative situations for the concert stage. May be repeated for credit.
2 units, Aut (Moses, R)

DANCE 113. Dual Processing: Movement and Choreography—The creation of work by and from individuals of different levels of expertise and skill sets and its effect in creation. Movement in collaboration with Robert Moses Kin Dancers. May be repeated for credit.
2 units, Spr (Moses, R)

DANCE 169. Choreography: Creation, Staging, and Reconstruction—Skills and criteria for the choreographic process. Invention, staging, and reconstruction. The creative process and practical considerations in making a dance work.
2 units, Aut (Kramer, A)

THEORY

Classroom or classroom/studio combination courses on topics in Dance and Performance.

DANCE 116. Figure and Ground: Site-Specific Performance in Outdoor Environments—Theory and practice, emphasizing historic and aesthetic context, critical analysis, and exploration of creative processes. May be repeated for credit.
2-3 units, Spr (Frank, D)

DANCE 134. Ballet Folklórico—The history of Ballet Folkórico including its roots in Mexican folk and N. American modern dance, Guadalajara choreographic narratives, and U.S. performance ensembles. GER:EC-GlobalCom
3 units, Win (Cashion, S)

DANCE 161H. Dance and Live Art in the 20th and 21st Centuries—History and development of postmodern dance and performance art. Topics include the body as art medium, performance art, experimental dance, and redefinitions of gender in live art. GER:DB-Hum, WIM
4 units, Aut (Ross, J; Thomas, A)

DANCE 166. History of Social Dance in Western Culture—Movement and historic social dance from the past five centuries, including studio technique and history. Performance practices for stage, including deportment, body language, and demeanor distinctive to each era.
2 units, alternate years, not given this year

DANCE 168. Dance and Culture in Latin America—Dance forms of Latin America as aspects of human behavior. Emphasis is on cultural influences (European, African, and indigenous) that have shaped the ritual and social dance forms of Argentina, Brazil, Chile, Cuba, Mexico, and Puerto Rico. May be repeated for credit. GER:DB-Hum, EC-GlobalCom
4 units, Spr (Cashion, S)

DANCE 190. Special Research—Topics related to the discipline of dance. May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

DANCE 191. Independent Research—Individual supervision of off-campus internship. Prerequisite: consent of instructor. (Staff)
1-18 units, Aut, Win, Spr (Staff)

ADVANCED THEORY

Courses numbered 200 through 299 are designed for advanced undergraduates and graduate students.

DANCE 290. Special Research—Individual project on the work of any choreographer, period, genre, or dance-related topic. May be repeated for credit.
1-18 units, Aut, Win, Spr, Sum (Staff)

OVERSEAS STUDIES

Courses approved for the Drama major and taught overseas can be found in the "Overseas Studies" section of this bulletin, in the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu.

BERLIN

OSPBER 23. Opera in Berlin
3-5 units, Aut (Rehm, R)

OSPBER 24. Greek Tragedy and German Culture: An Artistic Symbiosis
3-5 units, Aut (Rehm, R)

OSPBER 28. Art and Body Culture: Dance in Germany from Modernism to Fascism and Beyond
4 units, Spr (Ross, J)

OSPBER 29. The Performance of Memory: Tourism of the Third Reich and Holocaust
4 units, Spr (Ross, J)

OSPBER 101A. Contemporary Theater
5 units, Spr (Kramer, K)

EAST ASIAN STUDIES

Director: Chaofen Sun

Affiliated Faculty and Staff:

Anthropological Sciences: Arthur P. Wolf

Anthropology: Harumi Befu (emeritus), Melissa Brown, Miyako Inoue, Matthew Kohrman

Art and Art History: Jean Ma, Melinda Takeuchi, Richard Vinograd (on leave Autumn, Winter)

Asian Languages: Fumiko Arao, Kazuko M. Busbin, Steven Carter, Yin Chuang, Marina Chung, Robert Clark, Richard Dasher, Sik Lee Dennig, Michelle DiBello, Albert E. Dien (emeritus), Momoe Saito Fu, Hee-sun Kim, Indra Levy, Mark E. Lewis, Nina Lin, Hisayo O. Lipton, Momoyo Kubo Lowdermilk, Yoshiko Matsumoto, Kiyomi Nakamura, James Reichert, Yu-hwa Liao Rozelle, Stuart Sargent, Chaofen Sun, Melinda Takeuchi, Yoshiko Tomiyama, Ban Wang, Huazhi Wang, John C. Y. Wang, Hong Zeng, Youping Zhang, Yiqun Zhou, Qi Zhu

Business: Hau Lee, Bruce McKern, Kenneth Singleton

Comparative Literature: David Palumbo-Liu (on leave)

East Asian Studies: Robert Carlin, Scott Rozelle, David Straub, Hiroaki Yoshihara, Ayelet Zohar

Economics: Masahiko Aoki (emeritus), Ronald McKinnon

Education: Jennifer Adams

Electrical Engineering: Richard Dasher

History: Gordon Chang, Peter Duus (emeritus), Harold L. Kahn (emeritus), Mark E. Lewis, Mark Mancall, Yumi Moon, Thomas Mullaney, Matthew Sommer, Jun Uchida, Kären Wigen

Political Science: John W. Lewis (emeritus), Phillip Lipscy, Alice Lyman Miller, Daniel Okimoto (emeritus), Jean C. Oi

Religious Studies: Carl Bielefeldt, Paul Harrison, Fabrizio Pregadio (Acting Associate Professor), Lee H. Yearley

Sociology: Gi-Wook Shin, Andrew Walder, Xueguang Zhou, Qiang Li

Center Offices: 100 Encina Commons
Mail Code: 94305-6006
Phone: (650) 736-1759, 723-3362; fax: (650) 725-3350
Web Site: http://ceas.stanford.edu

The Center for East Asian Studies (CEAS) coordinates University instructional, research, and special activities related to China, Japan, and Korea. Faculty and students who share a common interest in the study of East Asia are brought together by the center from a broad range of academic concerns covering nearly every discipline and historical period. CEAS belongs to the Division of International Comparative and Area Studies in the School of Humanities and Sciences, and collaborates with the Walter H. Shorenstein Asia-Pacific Research Center (http://aparc.stanford.edu/).

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The undergraduate major in East Asian Studies enables students to obtain a comprehensive understanding of East Asia broadly conceived, which is the vast area stretching from Japan through Korea and China to the contiguous areas of the Central Asian land mass. Majors in East Asian Studies begin or continue the mastery of Chinese, Japanese, or Korean. Within the humanities or social sciences, they may focus on a particular sub-region, for example, Japan; South China, Hong Kong, and Taiwan; or western China and Central Asia; or a substantive issue involving the region as a whole, such as environmental protection, public health, rural development, historiography, cultural expression, or religious beliefs. The major seeks to reduce the complexity of a region to intellectually manageable proportions and illuminate the interrelationships among the various facets of a society.

Potential majors must submit a Student Proposal for a Major in East Asian Studies form not later than the end of the first quarter of the junior year for approval by the East Asian Studies undergraduate committee.

Majors must complete at least 75 units of course work on China, Japan, and/or Korea. Courses to be credited toward major requirements must be completed with a grade of 'C' or better. Requirements are:

1. *Language:* proficiency in Chinese, Japanese, or Korean language at the second-year level or above, to be met either by course work or examination. Students who meet the requirement through examination are still expected to take an additional 15 units of language at a higher level, or literature courses taught in the language, or the first year in an additional Asian language. No more than 30 units of language courses are counted toward the major.
2. *Gateway Courses:* a minimum of three gateway courses, one in each area. The gateway courses are:
   a) Art, Literature and Religion
      - ARTHIST 2. Asian Art and Culture
      - CHINGEN 91. Traditional East Asian Civilization: China
      - JAPANGEN 92. Traditional East Asian Civilization: Japan
      - JAPANGEN 149. Screening Japan: Issues in Crosscultural Interpretation
      - RELIGST 14. Introduction to Buddhism

   b) History
      - HISTORY 92A. Historical Roots of Modern East Asia
      - HISTORY 192. China: The Early Empires
      - HISTORY 256. U.S.-China Relations: From the Opium War to Tiananmen
      - HISTORY 291C. Chinese Science, Technology, and Medicine through the Ages
      - HISTORY 292D. Japan in Asia, Asia in Japan

   c) Contemporary Social Sciences
      - ANTHSCI 128B. Globalization and Japan
      - EASTASN 185C. Economic Development of Greater China
      - HUMBIO 148. Kinship and Marriage
      - POLISCI 148R. Chinese Politics
      - SOC 117A. China Under Mao
      - SOC 167A. Asia-Pacific Transformation
3. *Substantive Concentration:* additional courses on East Asia, one of which must be a seminar.
4. *Capstone Essay:* completion of a paper of approximately 7,500 words, written either in a directed reading course or for one of the courses in item 3 above, which should be built upon the student's thematic interest. EASTASN 198, Senior Colloquium (1 unit), is required of majors.
5. At least one quarter overseas in the country of focus.

Majors are encouraged to distribute their course work among at least three disciplines and two subregions in Asia. The subregions need not be traditionally defined. Examples include China, Japan, or Korea; or, in recognition of the new subregions which are emerging, South China and Taiwan, or Central Asia. At least four courses must have a thematic coherence built around a topic such as:

East Asian religions and philosophies
Culture and society of modern Japan
Ethnic identities in East Asia
Arts and literature in late imperial China
Foreign policy in East Asia
Social transformation of modern Korea
China's political economy

An East Asian Studies course that satisfies the University Writing in the Major requirement (WIM) should be completed before beginning the senior essay. This year, CHINGEN 133, JAPANGEN 138, and HISTORY 256 satisfy the WIM requirement.

The courses for the major must add up to at least 75 units and all must be taken for a letter grade.

MINORS

The goal of the minor in East Asian Studies is to provide the student with a broad background in East Asian culture as a whole, while allowing the student to focus on a geographical or temporal aspect of East Asia. The minor may be designed from the following, for a total of six courses. All courses should be taken for a letter grade.

1. Three gateway courses, one in each area (see above for listing of gateway courses).
2. One undergraduate seminar and two other courses from among those listed each quarter as approved for East Asian Studies majors, including literature courses but excluding language courses.

Applications for the minor are due no later than the second quarter of the junior year.

HONORS PROGRAM

Majors with a grade point average (GPA) of 3.25 or better in all courses related to East Asia may apply for the honors program no later than the final quarter of the junior year. Application entails submitting an honors prospectus to the student's adviser for approval. Admission is granted by the CEAS undergraduate committee, acting on the adviser's recommendation.

Honors requirements are satisfactory completion of:

1. An honors thesis of high quality of approximately 10,000 words to be submitted in lieu of the senior capstone essay.
2. 5 to 10 units of directed individual study in connection with the thesis project.
3. One advanced level colloquium or seminar dealing with China, Japan, or Korea.

COTERMINAL BACHELOR'S AND MASTER'S PROGRAM

The center admits a limited number of Stanford undergraduates to work for a coterminal M.A. degree in East Asian Studies. Applications must be submitted by the M.A. application deadline in the junior year. Applicants are expected to meet the same standards as those seeking admission to the M.A. program: they must submit a written statement of purpose; a Stanford transcript; three letters of recommendation, at least two of which should be from members of the department of concentration; and scores from the General Test of the Graduate Record Exam. In addition, applicants must provide a list of courses they intend to take to fulfill degree requirements. The decision on admission rests with the M.A. admissions committee of the Center for East Asian Studies. Students must meet all requirements for both B.A. and M.A. degrees. They must complete a total of 15 full-time quarters or the equivalent, or three full quarters after completing 180 units for a total of 225 units.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

OVERSEAS PROGRAMS

Language Study—CEAS provides undergraduate fellowships for language study in China, Japan, or Korea; students must simultaneously apply to a pre-approved language program abroad. Applications are due in February.

Internships—Undergraduates of any major may apply for summer internship opportunities in China, Japan, and Korea through the Bing Overseas Studies Program office.

Beijing—Stanford undergraduates may live and study at Peking University through the Overseas Studies Program in Beijing. Classes are taught in English by Stanford faculty-in-residence and Peking University professors. Students are considered enrolled in Peking University and may participate in athletic and musical activities on campus, including Chinese art and calligraphy, tai-chi, and wu shu. See http://osp.stanford.edu/beijing/.

Kyoto—Students interested in the study of Japanese language, history, culture, and social organization may attend one or two quarters at the Kyoto Center for Japanese Studies which is supported by a consortium of 13 American universities including Stanford. The Bing Overseas Studies Program also offers a Spring Quarter program focused on Japanese organizations and the political economy of research, development, and production of high technology and advanced industries at the Stanford Center in Technology and Innovation (SCTI). An internship in a Japanese firm, laboratory, or agency follows the SCTI training program. See http://osp.stanford.edu/kyoto/.

Overseas Seminars—Three-week seminars led by Stanford faculty are offered in late summer before the beginning of Autumn Quarter, with destinations and study topics changing each year. For more information about Bing Overseas Studies programs, visit their office at Sweet Hall, or see http://osp.stanford.edu.

DISTINGUISHED PRACTITIONERS

Eminent professionals whose work in East Asia brings real-life knowledge to the classroom serve as visiting lecturers through the CEAS Distinguished Practitioners from East Asia program. Teaching this year are: Robert Carlin, EASTASN 187K/287K, Media in Korea: Window to Decisions; David Straub, EASTASN 188K/288K, Anti-Americanism in U.S.-Korea Relations; and Hiroaki Yoshihara, EASTASN 182J/282J, Why Businesses Succeed in the Asian and Global Arenas.

ACADEMIC THEME HOUSE

The East Asian Studies Theme House, or EAST House, is an undergraduate residence that houses 60 students and offers them opportunities to expand their knowledge, understanding, and appreciation of Asia. EAST House is located on campus at Governor's Corner. Assignment is made through the regular undergraduate housing draw.

GRADUATE PROGRAMS

MASTER OF ARTS

University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin.

The M.A. program in East Asian Studies is designed both for students who plan to complete a Ph.D. but who have not yet decided on the particular discipline in which they prefer to work, and for students who wish to gain a strong background in East Asian Studies in connection with a career in nonacademic fields such as business, law, education, journalism, or government service. Students interested in pursuing professional careers are encouraged to plan for additional training through internships or graduate professional programs, in conjunction with obtaining an M.A. in East Asian Studies

The master's degree program allows a great deal of flexibility in combining language training, interdisciplinary area studies, and a disciplinary concentration. The director of the center assigns faculty advisers to all students. Members of the staff and faculty are available for academic and career planning. The M.A. program is normally completed in two academic years, but students can shorten this time by receiving credit for prior language work or by attending summer sessions. Students are urged to complete the degree requirements within one year if their background makes it possible.

Applicants must submit scores for the General Test of the Graduate Record Examination. Foreign applicants are also required to take the Test of English as a Foreign Language. Applications for admission and financial aid should be made online; see http://gradadmissions.stanford.edu/.

The requirements for the M.A. in East Asian Studies are as follows:

Language Requirement—Students must complete the equivalent of Stanford's first three years of language training in Chinese, Japanese, or Korean. Students entering the program without any language preparation should complete first- and second-year Chinese, Japanese, or Korean within the first year of residence at Stanford. This necessitates completing a summer language program. Language courses taken at Stanford must be for letter grades.

The language requirement may be satisfied in part or in full by placing into an appropriate Stanford language class through the language proficiency exam given by the Language Center. Students who fulfill this minimum three-year language requirement before completing other requirements are encouraged to continue language study, or take courses in which Chinese or Japanese are used, for as long as they are in the program. Language courses beyond the third-year level may be applied to the Area Studies requirement discussed below.

Students in the M.A. program are eligible to apply for the Inter-University language programs in Beijing and Yokohama. Work completed in one of these programs may be counted toward the M.A. degree's language requirement.

Area Studies Requirement—Students must complete the 1-unit core course, EASTASN 330, and an additional nine courses numbered 100 or above related to East Asia. Chinese and Japanese language courses numbered 100-199 are considered to be at the third-year level and do not count toward the courses required for the degree. The nine courses must be 3 or more units, taken for a letter grade. At least 23 units must be designated primarily for graduate students, typically at the 200-300 levels.

An integral part of the program is training in research and a demonstration of research ability in a discipline. Three courses, one of which must be a seminar, colloquium, or advanced course in which a research paper on China, Korea, or Japan is written, must be within a single department. The six additional area courses may be taken in departments of the student's choosing. Some theory-oriented or methodological courses may be used to meet part of these requirements provided they are demonstrably useful for understanding East Asian problems. Credit toward the area studies requirement is not given for courses taken before entering the M.A. program. Students in this program may, however, take courses for exchange credit at the University of California, Berkeley, with the approval of their adviser and the Office of the Registrar.

M.A. Thesis Requirement—A master's thesis, representing a substantial piece of original research, should be filed with the center's program office as part of the graduation requirements. With the adviser's approval, the master's thesis requirement may be satisfied by expanding a research paper written for an advanced course.

DUAL DEGREE PROGRAMS

EAST ASIAN STUDIES AND LAW

This program grants an M.A. degree in East Asian Studies and a Doctor of Jurisprudence (J.D.) degree. It is designed to train students interested in a career in teaching, research, or the practice of law related to East Asian legal affairs. Students must apply separately to the East Asian Studies M.A. program and to the Stanford School of Law and be accepted by both. Completing this combined course of study requires approximately four academic years, depending on the student's background and level of training in Chinese, Japanese, or Korean.

EAST ASIAN STUDIES AND EDUCATION

This program grants an M.A. degree in East Asian Studies and a secondary school teaching credential in social studies. To be eligible for this program, students should apply to the M.A. program in East Asian Studies and then apply to the Stanford Teacher Education Program during the first year at Stanford. Completing the dual program requires at least two years, including one summer session when beginning the education component of the program.

EAST ASIAN STUDIES AND BUSINESS

This program grants an M.A. degree in East Asian Studies and a Master of Business Administration degree. Students must apply separately to the East Asian Studies M.A. program and the Graduate School of Business and be accepted by both. Completing this combined course of study requires approximately three academic years (perhaps including summer sessions), depending on the student's background and level of training in Chinese, Japanese, or Korean language.

DOCTORAL PROGRAMS

Stanford does not offer a Ph.D. in East Asian Studies. However, there are more than 100 doctoral students with a specialization on China, Korea, or Japan within various departments and schools of the University. The departments that offer an East Asian concentration are: Anthropology, Art and Art History, Asian Languages, Comparative Literature, History, Linguistics, Political Science, Religious Studies, and Sociology. It is also possible to specialize in East Asia within some of the doctoral programs of the professional schools of Business, Education, and Law. Inquiries should be directed to the individual department or school concerned.

POSTDOCTORAL PROGRAMS

The Center for East Asian Studies offers two postdoctoral fellowships in Chinese Studies each year. Postdoctoral fellowships in Japanese Studies are available from the Freeman-Spogli Institute of International Studies. The Walter H. Shorenstein Asia-Pacific Research Center has a postdoctoral program in contemporary Korean Studies.

FINANCIAL AID

Students in graduate programs who plan to do work in Chinese, Japanese, or Korean language, and area studies courses, may be eligible for Foreign Language and Area Studies (FLAS) fellowships and are encouraged to apply for them at the time of application to Stanford. Recipients of FLAS fellowships must be American citizens or permanent residents. For further information, see http://ceas.stanford.edu.

COURSES

The courses listed below deal primarily with China, Japan, and/or Korea. Many other theoretical and methodological courses within the departments at Stanford are taught by faculty who are East Asian specialists; these courses often have a substantial East Asian component and may be found under the department listings in this bulletin.

EAST ASIAN LANGUAGES

For courses in Chinese, Japanese, and Korean language instruction with the subject codes CHINLANG, JAPANLNG, and KORLANG, see the "Language Center" section of this bulletin. For courses in Classical Chinese with the subject code CHINLIT, see the "Asian Languages" section of this bulletin.

UNDERGRADUATE

EASTASN 5. East House Seminar—May be repeated for credit.
1 unit, Aut, Spr (Sun, C)

EASTASN 116. Understanding Social Changes in China: A Global Perspective—(Same as 216, SOC 116/216.) Since 1949. Mao's accession to power. Deng Xiaoping's economic reforms that started the transformation of Chinese society. New policies to address increasing social problems and rapid urbanization. Employment and labor market reform, urban housing, urban health care, and pension reform. Focus is on changing patterns of social structures and groups, family and marriage, education, and social welfare programs.
5 units, Win (Li, Q)

EASTASN 182J. Why Businesses Succeed in the Asian and Global Arenas—(Same as 282J.) Distinguished practitioner course. Attributes of successful global companies. Business issues that affect global competition: vision, strategy, organizational structure, key processes, people development and diversity, cultures and values, corporate governance, and merger and acquisition. How to build trusted relationships in the Asian and global arena. Case studies include global companies based in Japan, China, Korea, and the U.S.
4 units, Aut (Yoshihara, H)

EASTASN 185C. Economic Development of Greater China: Past, Present, and Future—(Same as 285C.) Historical stages, economic and political rationales, and effectiveness of the policies and institutional changes that have shaped China's economic emergence. China's economic reform and transition during the past 20 years. Application of economic theories of incentives, institutions, markets, and economic development. No previous knowledge of economics required.
3-5 units, Aut (Rozelle, S)

EASTASN 187K. Media in North Korea: A Window to Plans, Perceptions, and Decisions—(Same as 287K.) Distinguished practitioner course. Decision making in Pyongyang and patterns of N. Korean behavior through case studies based on official N. Korean statements or media comment. How evidence can be mined and combined to understand N. Korean plans, perceptions, and decisions. History, politics, economics, and foreign policy. Media analysis, cultural variables, and bureaucratic realities.
5 units, Win (Carlin, R)

EASTASN 188J. Desire and Void: The Visual Culture of Contemporary Japanese Photography—(Same as 288J.) Cultural, social, and aesthetic issues. Relationship to traditional Japanese arts and Western trends of contemporary art. Photographic histories, theoretical ideas about the photographic image, value of photography in contemporary culture, gender issues, aesthetics of black and white, video art, and styles.
2-4 units, Spr (Zohar, A)

EASTASN 188K. Anti-Americanism in U.S.-Korean Relations—(Same as 288K.) Distinguished practitioner course. The nature and extent of anti-American sentiment in S. Korea; implications for U.S.-Korean relations and regional security. Lessons for U.S. foreign policy makers; historical, ideological, political, cultural, and geostrategic dimensions of U.S.-Korean relations. Students conduct case studies of incidents in the 1999-2002 anti-American wave in Korea.
5 units, Spr (Straub, D)

ADVANCED

EASTASN 191. Journal of East Asian Studies
1 unit, Aut, Win, Spr (Sun, C)

EASTASN 198. Senior Colloquium in East Asian Studies—Paper writing and presentation.
1 unit, Spr (Sun, C)

EASTASN 199. Directed Reading
1-9 units, Aut, Win, Spr, Sum (Staff)

EASTASN 216. Understanding Social Changes in China: A Global Perspective—(Same as 116, SOC 116/216; see 116.)
5 units, Win (Li, Q)

EASTASN 282J. Why Businesses Succeed in the Asian and Global Arena—(Same as 182J; see 182J.)
4 units, Aut (Yoshihara, H)

EASTASN 285C. Economic Development of Greater China: Past, Present, and Future—(Same as 185C; see 185C.)
3-5 units, Aut (Rozelle, S)

EASTASN 287K. Media in North Korea: A Window to Plans, Perceptions, and Decisions—(Same as 187K; see 187K.)
5 units, Win (Carlin, R)

EASTASN 288J. Desire and Void: The Visual Culture of Contemporary Japanese Photography—(Same as 188J; see 188J.)
2-4 units, Spr (Zohar, A)

EASTASN 288K. Anti-Americanism in U.S.-Korean Relations—(Same as 188K; see 188K.)
5 units, Spr (Straub, D)

EASTASN 330. Core Seminar: Issues and Approaches in East Asian Studies—For East Asian Studies M.A. students only.
1 unit, Aut (Sun, C)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ASIAN LANGUAGES

See the "Asian Languages" section of this Bulletin for courses in Chinese General Studies (CHINGEN), Chinese Literature (CHINLIT), Japanese General Studies (JAPANGEN), Japanese Literature (JAPANLIT), and Korean Studies (KORGEN).

OTHER COGNATE COURSES

ANTHSCI 128B/228B. Globalization and Japan—(Same as CASA 128B.)
3-5 units, Win (Befu, H)

ARTHIST 184/384. Aristocrats, Warriors, Sex Workers, and Barbarians: Lived Life in Early Modern Japanese Painting
4 units, Aut (Takeuchi, M)

ARTHIST 283A. Paris and Shanghai, 1880-1940: Mediating the City
5 units, Spr (Vinograd, R)

CASA 173/273. Nomads of Eurasia: Culture in Transition
4-5 units, Win (Kunanbaeva, A)

EDUC 309X. Educational Issues in Contemporary China
3-4 units, Spr (Adams, J)

EE 402A. Topics in International Technology Management
1 unit, Aut (Dasher, R)

HISTORY 54S. America's Cold War in Asia from Korea to Vietnam, 1945-1975
5 units, Aut (Kim, K)

HISTORY 62N. The Atomic Bomb in Policy and History
5 units, Spr (Bernstein, B)

HISTORY 90Q. Buddhist Political and Social Theory
4-5 units, Aut (Mancall, M)

HISTORY 91Q. Mao Zedong: The Man Who Would Become China
5 units, Spr (Mullaney, T)

HISTORY 92A. The Historical Roots of Modern East Asia
5 units, Win (Sommer, M; Wigen, K)

HISTORY 94N. Colonialism and Collaboration
4-5 units, Win (Moon, Y)

HISTORY 97N. Modernizing Women in Japan
5 units, Aut (Wigen, K)

HISTORY 103E. History of Nuclear Weapons—(Same as POLISCI 116.)
5 units, Spr (Holloway, D)

HISTORY 106A. Global Human Geography: Asia and Africa—(Same as INTNLREL 161A.)
5 units, Aut (Lewis, M)

HISTORY 192. China: The Early Empires
3-5 units, Spr (Lewis, M)

HISTORY 195. Modern Korean History
5 units, Aut (Moon, Y)

HISTORY 195C. Modern Japanese History
5 units, Spr (Uchida, J)

HISTORY 198. The History of Modern China
5 units, Win (Mullaney, T)

HISTORY 252. Decision Making in International Crises: The A-Bomb, the Korean War, and the Cuban Missile Crisis—(Same as HISTORY 355.)
4-5 units, Aut (Bernstein, B)

HISTORY 256/356. U.S.-China Relations: From the Opium War to Tiananmen
4-5 units, Win (Chang, G)

HISTORY 291B. The City in Imperial China—(Same as HISTORY 391B.)
3-5 units, Win (Lewis, M)

HISTORY 291C. Chinese Science, Technology, and Medicine through the Ages
5 units, Spr (Mullaney, T)

HISTORY 292D/392D. Japan in Asia, Asia in Japan
4-5 units, Win (Uchida, J)

HISTORY 295J. Chinese Women's History
5 units, Spr (Sommer, M)

HISTORY 299X/399A. Design and Methodology for International Field Research
1 unit, Spr (Kollmann, N; Roberts, R)

HISTORY 309F. Historical Geography Colloquium: Maps in the Early Modern World
3-5 units, Aut (Wigen, K)

HISTORY 390A. Major Topics in Modern Chinese History
4-5 units, Win (Mullaney, T)

HISTORY 393. Frontier Expansion and Ethnic Statecraft in the Qing Empire
4-5 units, Spr (Sommer, M)

HISTORY 396D. Modern Japan
4-5 units, Spr (Uchida, J)

HISTORY 495A,B. Qing Legal Documents
4-5 units, **A:** *Win,* **B:** *Spr (Sommer, M)*

HUMBIO 147. Population and Family History in Europe and China
4 units, Aut (Wolf, A)

HUMBIO 148. Kinship and Marriage
4 units, Spr (Wolf, A)

INTNLREL 125. Japanese Postwar Politics
5 units, Win (Mcelwain, K)

MUSIC 13Q. Classical Music and Politics: Western Music in Modern China
3 units, Spr (Cai, J)

POLISCI 148/348. Chinese Politics: The Transformation and the Era of Reform
5 units, Spr (Oi, J)

POLISCI 211. Political Economy of East Asia
5 units, Spr (Lipscy, P)

POLISCI 318R. State and Nation Building in Central Asia
5 units, Spr (Lapidus, G)

POLISCI 348S. Contemporary Chinese Foreign Relations
5 units, Spr (Miller, L)

POLISCI 443S. Political Economy of Reform in China
5 units, Aut (Oi, J)

RELIGST 14. Introduction to Buddhism
4 units, Win (Harrison, P)

RELIGST 35. Introduction to Chinese Religions
4 units, Win (Pregadio, F)

RELIGST 113A. Sacred Space and the Supernatural in Japanese Religion
4 units, Aut (Klonos, G)

RELIGST 114A. Sacred Journeys in Chinese Religion
4 units, Spr (Cook, T)

RELIGST 116. Daoist Thought, Daoist Religion
4 units, Spr (Pregadio, F)

RELIGST 135. Daoist Ideals of Sainthood
4 units, Win (Pregadio, F)

RELIGST 136. Buddhist Yoga
4 units, Win (Bielefeldt, C)

RELIGST 210. Translating the *Daode Jing*
4 units, Win (Staff)

RELIGST 212. *Chuang Tzu*
5 units, Win (Yearley, L)

RELIGST 216. Japanese Buddhism
4 units, Spr (Bielefeldt, C)

RELIGST 217/317. Japanese Studies of Religion in China
3 units, Aut (Kumada, N)

RELIGST 247. Chinese Buddhist Texts
4 units, Spr (Harrison, P)

RELIGST 250. Classics of Indian Buddhism
4 units, Spr (Harrison, P)

RELIGST 254. Recent Contributions to Buddhist Studies
4 units, Win (Harrison, P)

RELIGST 257/357. Readings in Daoist Texts
4 units, Spr (Pregadio, F)

RELIGST 258. Japanese Buddhist Texts
4 units, Win (Bielefeldt, C)

RELIGST 370. Comparative Religious Ethics
4 units, Win (Yearley, L)

SOC 117A/217A. China Under Mao
5 units, Aut (Walder, A)

SOC 217B/317B. Chinese Society and Politics
3-5 units, Spr (Walder, A)

SOC 167A267A. Asia-Pacific Transformation
5 units, Win (Shin, G)

SOC 316. Historical and Comparative Sociology
3-5 units, Win (Shin, G)

ECONOMICS

Emeriti: (Professors) Takeshi Amemiya, Masahiko Aoki, Kenneth J. Arrow, Paul A. David, Victor R. Fuchs, John G. Gurley, Peter J. Hammond, Donald Harris, Bert G. Hickman, Lawrence J. Lau, Ronald I. McKinnon, Roger G. Noll, Nathan Rosenberg, Thomas Sargent, David A. Starrett, Joseph E. Stiglitz

Honorary Emerita (Professor): Anne O. Krueger

Chair: Timothy F. Bresnahan

Professors: B. Douglas Bernheim, Michael J. Boskin, Timothy F. Bresnahan, Lawrence Goulder, Avner Greif, Robert E. Hall, Han Hong, Caroline Hoxby, Matthew O. Jackson, Peter Klenow, Mordecai Kurz, Thomas E. MaCurdy, Paul R. Milgrom, John H. Pencavel, Joseph Romano, Ilya Segal, John B. Shoven, Robert Staiger, John B. Taylor, Frank Wolak, Gavin Wright

Associate Professors: Liran Einav, Jonathan Levin, Luigi Pistaferri

Assistant Professors: Ran Abramitzky, Manuel Amador, Nicholas A. Bloom, Giacomo DeGiorgi, Doireann Fitzgerald, Peter Hansen, Matthew Harding, Nir Jaimovich, Seema Jayachandran, Jakub Kastl, Aprajit Mahajan, Kalina Manova, Petra Moser, Muriel Niederle, Michele Tertilt

Senior Lecturer: Geoffrey Rothwell

Lecturers: Doru Cojoc, Ward Hanson, Michael Lovenheim, Gregory Rosston, Faye Steiner

Courtesy Professors: Anat Admati, David Baron, Jay Bhattacharya, Jeremy Bulow, John Ferejohn, Alan Garber, Ilan Guttman, Stephen Haber, Peter Blair Henry, David Kreps, Rosamond Naylor, Bruce Owen, A. Mitchell Polinsky, Peter C. Reiss, D. John Roberts, James Strnad, Barry Weingast, Robert Wilson

Visiting Professors: Edward Miguel, Ernesto Shargrodsky, Jurgen Schroeder

Visiting Assistant Professor: Manuela Angelucci

Acting Instructors: Marcelo Clerici-Arias, Alex Gould, Mark Tendall

Fellow: Latika Chaudhary

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Phone: (650) 725-3266
Web Site: http://www-econ.stanford.edu/

Courses given in Economics have the subject code ECON. For a complete list of subject codes, see Appendix B.

The department's purpose is to acquaint students with the economic aspects of modern society, to familiarize them with techniques for the analysis of contemporary economic problems, and to develop in them an ability to exercise judgment in evaluating public policy. There is training for the general student as well as for those who plan careers as economists in civil service, private enterprise, teaching, or research.

The undergraduate program provides an excellent background for those going on to graduate work in the professional schools (for example, business and law) and may also be structured to prepare students for a Ph.D. program in economics. The department's curriculum is an integral part of Stanford's programs in International Relations, Public Policy, and Urban Studies.

The primary objective of the graduate program is to educate students as research economists. In the process, students also acquire the background and skills necessary for careers as university teachers and as practitioners of economics. The curriculum includes a comprehensive treatment of modern theory and empirical techniques. Currently, 20 to 25 students are admitted each year.

The faculty represent a wide spectrum of interests and conduct research on a broad range of topics. Most fields of economics are covered, including behavioral economics, comparative institutional analysis, econometrics, economic development, economic history, experimental economics, industrial organization, international trade, labor, macro- and microeconomic theory, mathematical economics, and public finance.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The total number of units required for the major is 80. Students are encouraged to complete the core courses 1-6 below, as early as possible. Ideally, students should complete the core during the sophomore year, before taking upper division courses. Courses may not be taken before the prerequisites are completed. The required number of field courses is four. There is great flexibility in the choice of electives, including upper-division math and statistics.

Of the 80 units required for the major, at least 55 must be taken at Stanford in California. Students cannot declare Economics as their major or minor until they have completed ECON 50 with a grade of 'B' or better.

REQUIREMENTS FOR THE ECONOMICS MAJOR (80 UNITS)

1. ECON 1A (5 units): micro and elementary economics.
2. ECON 1B (5 units): macroeconomics. Prerequisite: ECON 1A.
3. ECON 102A (5 units): introduction to statistical methods. It is recommended that students satisfy this basic statistics requirement before proceeding with the rest of the program. Prerequisite: MATH 41 or equivalent.
4. ECON 50 (5 units, grade of 'B' or better): basic price theory. Prerequisites: ECON 1A and MATH 51 (letter grade required).
5. ECON 51 (5 units): intermediate microeconomics. Prerequisite: ECON 50.
6. ECON 52 (5 units): intermediate macroeconomics. Prerequisites: ECON 50 and 1B
7. ECON 102B (5 units): econometrics. Prerequisites: ECON 50 and 102A. Material in ECON 102B is used in a number of field courses. Students are advised to design their program of study so that ECON 102B is not taken in their senior year but early in their program.

Field Courses (must be taken at Stanford in California; 20 units)—Four courses must be chosen from among ECON 111, 115, 118, 121, 126, 140,* 141, 145, 149, 157, 160, 164, 165 (5 units each).

Writing in the Major Course (5 units)—This requirement is fulfilled by ECON 101. This course should be taken only after completing ECON 51 and 52, 102B, and at least two field courses.

Electives (20 units)—Choose from Economics courses numbered from 100 through 198, excluding 190 and 191. Up to 10 units may be satisfied by MATH 113, 114, 115, 136, 151, 171, 175; or STATS 200, 206, 207, 217, 218, 237.

A maximum of 10 units of transfer credit or of ECON 139D, Directed Reading, may be taken under this section. Suitable transfer credit must be approved in writing by the Associate Director of Undergraduate Studies. Advanced undergraduate majors with strong quantitative preparation may enroll in graduate (200-level) courses with permission of the Director of Undergraduate Studies and the course instructor. Some courses offered by Overseas Studies may be counted towards this requirement. The department does not give credit for internships.

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* Students may not count units from both ECON 135 and 140 towards their major as the courses are too similar in content.

OTHER REQUIREMENTS

No courses receiving Department of Economics credit under the preceding requirements may be taken credit/no credit, and 55 of the 80 units required for the major must be taken at Stanford in California.

Advanced placement credit cannot be used to substitute for ECON 1A,B. Students who plan to declare Economics as a major or a minor may petition to the Director of Undergraduate Studies to waive the ECON 1A,B requirement for graduation and for prerequisites to other Economics courses.

A grade point average (GPA) of 2.0 (C) or better must be received for all units applied toward the preceding requirements.

To use transfer credit in partial satisfaction of the requirements, the student must obtain written consent from the department's Associate Director of Undergraduate Study, who establishes the amount of credit to be granted toward the department requirements (see the *Information Book for Economics Majors)*. Students must have completed all Stanford prerequisites for approved transfer credit courses in order to use those courses towards the Economics major.

Course prerequisites are enforced. Students taking courses to satisfy prerequisites in another department or institution must petition for transfer credit approval in order to satisfy course prerequisites.

The time limit for satisfactory completion of a course is one year from the date an incomplete is given, although instructors may set a shorter time limit. Students are responsible for seeing that all grades of 'incomplete' are cleared within the time limit.

SAMPLE PROGRAMS

Sample listings of upper-division economics electives may be examined in the department's *Information Book for Economics Majors,* available at http://www-econ.stanford.edu/academics/degrees-ugrad.html. Sample programs are provided for the following areas of emphasis: (1) liberal arts, (2) pre-business, (3) quantitative, (4) international, (5) political economy and regulation, and (6) preparation for graduate school in economics.

MINORS (35 UNITS)

The minor in Economics has two main goals: to acquaint students with the rudiments of micro- and macroeconomic theory that are required of all majors; and to allow students to build competence in the application of this theory to two fields of economics of their choosing, and the opportunity to specialize further in any one of these fields by taking one additional advanced course in the Department of Economics.

COURSE WORK

1. ECON 1A (5 units): micro and elementary economics.
2. ECON 1B (5 units): macroeconomics. Prerequisite: ECON 1A.
4. ECON 50 (5 units, grade of 'B' or better): basic price theory. Prerequisites: ECON 1A and MATH 51 (letter grade required).
3. ECON 51 (5 units): intermediate microeconomics. Prerequisite: ECON 50.
5. ECON 52 (5 units): intermediate macroeconomics. Prerequisites: ECON 50 and 1B.
6. Two field courses (10 units; must be taken at Stanford in California) may be chosen from the following list: ECON 102A, 102B, 111, 115, 118, 121, 126, 140,* 141, 145, 149, 157, 160, 165.

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* Students may not count units from both ECON 135 and 140 towards their minor as the courses are too similar in content.

OTHER REQUIREMENTS

If the candidate's major requires basic economics courses (items 1 through 3), then only half of the units from those courses apply toward the economics minor. To attain the overall 35 units required by the minor, the student must take additional economics courses under items 4 and 5.

At least 20 out of the 35 units for the minor must be taken at Stanford. Students must have completed all Stanford prerequisites for approved transfer credit courses in order to use those courses towards the Economics minor.

No courses receiving Department of Economics credit under the preceding requirements may be taken credit/no credit. A grade point average (GPA) of 2.0 or better must be received for all units applied toward the minor.

Students must complete their declaration of the minor no later than the last day of the preceding quarter before their degree conferral.

HONORS PROGRAM

The honors program offers an opportunity for independent research, creativity, and achievement. It is designed to encourage a more intensive study of economics than is required for the normal major, with course and research work of exceptional quality. Honors students may participate in an Honors Research Symposium during Spring Quarter, with those nominated for prizes making oral presentations. The honors program requires:

1. Completing all requirements for the major.
2. Achieving a grade point average (GPA) of at least 3.5 for the 80 units required of the Economics major. See details in the *Information Book for Economics Majors.*
3. Complete ECON 102B and at least two lecture courses most relevant for the proposed topic of the honors thesis by the end of the junior year. (These can be included in the basic 80 units.)
4. Candidates must write an honors thesis in their senior year for at least one unit and up to 10 units of credit (ECON 199D). The thesis must be of very high quality and written under the direction of a member of the department or its affiliated faculty. Units of 199D do not count toward the course work requirements for the basic economics major, or in the computation of the GPA requirement for honors. Students who take ECON 199D for 10 units may apply 5 of those units to meet the Writing in the Major (WIM) requirement. Such students complete the major with at least 85 units overall.

Juniors interested in the honors program should attend an informational meeting scheduled by the honors program director during the first week of each quarter. At this meeting, students receive information on organizing an honors project and are given details on honors programs. Prospective candidates for the honors program should submit an application to the director no later than the end of the first month of the third quarter before graduation (typically Autumn Quarter of the senior year). Also required, later in the same quarter, is a three-page thesis proposal that must be approved by the thesis adviser.

GRADUATE PROGRAMS

Graduate programs in economics are designed to ensure that students receive a thorough grounding in the methodology of theoretical and empirical economics, while at the same time providing specialized training in a wide variety of subfields and a broad understanding of associated institutional structures. Toward these ends, the program is arranged so that the student has little choice in the curriculum at the outset but considerable latitude later on.

Students admitted to graduate standing in the department are expected to have a strong background in college-level economics, mathematics, and statistics. Preparation ordinarily consists of a college major in economics, a year-long calculus sequence that includes multivariate analysis, a course in linear algebra, and a rigorous course in probability and statistics.

MASTER OF ARTS

University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin.

The department does not admit students who plan to terminate their graduate study with the M.A. degree. Students may, but need not, elect this degree in preparation for the Ph.D. degree. A master's option is also available to Ph.D. candidates from other departments.

Admission—Prospective students must have completed the Stanford requirements for a B.A. in Economics or approximately equivalent training. Since students are required to take some of the same courses as Ph.D. candidates, similar preparation in mathematics and statistics generally is expected. Prospective applicants should submit their credentials together with a plan of study to the Director of Graduate Study for approval.

Requirements—A master's program must satisfy these criteria:

1. Completing, at Stanford, at least 45 units of credit beyond those required for the bachelor's degree, of which at least 40 units must be in the Department of Economics. Students must complete ECON 202 and at least three other 200-level courses. They must receive a grade of 'B-' or better in ECON 202. Undergraduate courses must be numbered 105 or higher. No seminar courses numbered 300 or above can be counted.
2. Demonstrating competence in empirical methodology by receiving a grade of 'B-' or better in both ECON 270 and 271, or by receiving a grade of 'B-' or above in each of ECON 102A, B, and C.
3. Submitting two term papers (or a thesis of sufficient quality). At least one of these papers must be deemed to represent graduate-level work. Normally, this means that it is written in connection with a 200-level course. A maximum of 10 units of credit can be earned for a thesis toward the 45-unit degree requirement.
4. A grade point average (GPA) of 3.0 must be maintained for all master's level work. All courses must be taken for a letter grade.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

Admitted students must be adequately prepared in calculus, linear algebra, and statistics (see above). When deemed appropriate, a student may be required to complete the necessary background preparation at Stanford. All students take a common core curriculum at the outset and later branch out into the desired fields of specialization. Well-prepared students should anticipate spending, with some overlap, approximately two years in course work and another two years in seminars, independent study, and dissertation research. The goal is to complete the program in four years, although some types of research programs may require at least five years to complete. The department has a strong commitment to guiding students through the program expeditiously.

Questions and petitions concerning the program and the admissions process should be addressed to the Director of Graduate Study, who has responsibility for administering the graduate program.

Specific requirements are best discussed in two stages, the first consisting of requirements for admission to candidacy and the second involving further requirements for earning the degree.

Admission to Candidacy for Ph.D.—A student may apply for admission to candidacy when the following minimal requirements are met:

1. Successful results on comprehensive examinations in core economics (the examinations based on material from ECON 202, 203, 204; and 210, 211, 212), and econometrics (the examination based on material from ECON 270, 271, 272).
2. Completing the requirements in two additional fields of specialization from the list below or, if approved in advance by the Director of Graduate Study, in one such field together with a substantial amount of work toward a second field taught in a related department. Advanced fields include econometrics, economic development, economic history, industrial organization, international economics, labor economics, microeconomic theory, monetary theory and advanced macroeconomics, and public finance.

   Each field listed above can be satisfied by completing two courses, although students in some fields may be advised to add a third course, which can then be counted toward the distribution requirement discussed later. All courses (or comprehensive exams, when offered) must be passed with a grade 'B' or better.
3. Completing a candidacy paper, normally written in conjunction with one of the special fields selected above.

It is expected that the student meet, and indeed exceed, the above standards by the beginning of the third year of residency. When this is not possible for any reason, the Director of Graduate Study should be consulted as early as possible during the second year. Once it is deemed that the above standards have been met, the student should complete the Application for Candidacy for Degree of Doctor of Philosophy. After approval, candidacy remains valid for five years (although it can be terminated earlier by the department if progress is deficient); it can be renewed or extended beyond this period only under unusual circumstances.

Further Requirements for the Ph.D. Degree—

1. *Distribution Requirement*: Students must complete four other graduate-level courses meeting the following requirements:
   a) at least one course from the area of economic history, unless history is one of the two fields of specialization.
   b) courses in at least two fields other than the two fields of specialization. Distribution courses cannot be crosslisted in those fields.
   c) with advance approval of the Director of Graduate Study, some of these distribution courses may be drawn from related fields taught in other departments. However, including courses taken to meet either the specialization or distribution requirements, no more than two courses in total may be taken outside the Economics department.
2. *Teaching Experience:* each student must serve as a teaching assistant for at least one quarter. It is strongly recommended that this requirement be satisfied before the final year of residence.
3. *Seminar Participation:* each student is expected to participate in at least two all-year research seminars by the end of the fourth year of residence. Normally, participation in a seminar requires one or more oral presentations and the submission of a research paper (which, however, need not be completely separate from dissertation research).
4. *Ph.D. Dissertation:* the process involves selecting a topic, choosing an appropriate adviser, submitting a prospectus (signed by the adviser) outlining the proposed research, selecting a three-member reading committee (usually all from the Department of Economics, although exceptions can be made under certain circumstances), passing the University oral examination at which these three faculty (and two other members of the Academic Council) ask questions about the completed research, and submitting a final draft of the work signed by all members of the reading committee. The student is advised to initiate this process as early as possible.

PH.D MINOR

To be recommended for the Ph.D. degree with Economics as a minor subject, a student must qualify in three fields of economics, at least one of which must be in the core economics sequence. The standard of achievement in these fields is the same for minor as for major candidates, including the department's comprehensive examinations where appropriate.

JOINT DEGREE PROGRAMS WITH THE SCHOOL OF LAW

J.D./M.A. AND J.D./PH.D.

The Department of Economics and the School of Law offer a joint program leading to either a J.D. degree combined with an M.A. degree in Economics, or to a J.D. degree combined with a Ph.D. in Economics.

The J.D./M.A. and J.D./Ph.D. degree programs are designed for students who wish to prepare themselves for careers in areas relating to both law and economics. Students interested in either joint degree program must apply and gain entrance separately to the School of Law and the Department of Economics and, as an additional step, must secure permission from both academic units to pursue degrees in those units as part of a joint degree program. Interest in either joint degree program should be noted on the student's admission applications and may be considered by the admission committee of each program. Alternatively, an enrolled student in either the Law School or the Economics department may apply for admission to the other program and for joint degree status in both academic units after commencing study in either program.

Joint degree students may elect to begin their course of study in either the School of Law or the Department of Economics. Faculty advisers from each academic unit participate in the planning and supervising of the student's joint program. Students must be enrolled full time in the Law School for the first year of law school, and, at some point during the joint program, may be required to devote one or more quarters largely or exclusively to studies in the Economics program regardless of whether enrollment at that time is in the Law School or in the Department of Economics. At all other times, enrollment may be in the graduate school or the Law School, and students may choose courses from either program regardless of where enrolled. Students must satisfy the requirements for both the J.D. and the M.A. or Ph.D. degrees as specified in this bulletin or by the School of Law.

The Law School approves courses from the Economics Department that may count toward the J.D. degree, and the Economics department approves courses from the Law School that may count toward the M.A. or Ph.D. degree in Economics. In either case, approval may consist of a list applicable to all joint degree students or may be tailored to each individual student's program. The list may differ depending on whether the student is pursuing an M.A. or a Ph.D. in Economics.

In the case of a J.D./M.A. program, no more than 30 semester (45 quarter) hours of approved courses may be counted toward both degrees. In the case of a J.D./Ph.D. program, no more than 36 semester (54 quarter) hours of approved courses may be counted toward both degrees. In either case, no more than 24 semester (36 quarter) hours of courses that originate outside the Law School may count toward the Law degree. To the extent that courses under this joint degree program originate outside the Law School but count toward the Law degree, the Law School credits permitted under Section 17(1) of the Law School Regulations shall be reduced on a unit-per-unit basis, but not below zero. The maximum number of Law School credits that may be counted toward the M.A. or the Ph.D. in Economics is the greater of: (a) 3 $^{1}/_{3}$ semester (5 quarter) hours in the case of the M.A. and 6 $^{2}/_{3}$ semester (10 quarter) hours in the case of the Ph.D.; or (b) the maximum number of hours from courses outside of the department that M.A. or Ph.D. candidates in Economics are permitted to count toward the applicable degree under general departmental guidelines or in the case of a particular student's individual program.

Tuition and financial aid arrangements are normally made through the school in which the student is then enrolled.

For more information, see http://www.law.stanford.edu/program/degrees/.

OTHER PROGRAMS

Other programs leading to dual degrees may be arranged. For example, the Ph.D. in Economics combined with one or two years of study in the School of Law, leading to the nonprofessional Master of Legal Studies (M.L.S.) degree. A dual degree program does not permit counting any courses toward both the Economics and the Law degrees. For more information, see http://www.law.stanford.edu/program/degrees/.

FELLOWSHIPS AND ASSISTANTSHIPS

The department awards a number of fellowships for graduate study. Many first-year and a few second- or third-year students are awarded full fellowships, including a stipend and tuition. All students whose records justify continuation in the program may be assured support for the second through fourth years in the form of employment as a teaching or research assistant. These half-time appointments provide a stipend and tuition allowance. Entering students are not normally eligible for research or teaching assistantships.

Applications should be submitted before January 1 to the department admissions committee.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

ECON 1A. Introductory Economics A—The economic way of thinking and the functioning of a market economy. The behavior of consumers and firms, markets for goods and inputs, and principles of international exchange. Applications and policy issues in economics. GER:DB-SocSci

5 units, Aut (Clerici-Arias, M), Win (Makler, C), Sum (Staff)

ECON 1B. Introductory Economics B—Aggregate economic relationships, including output, employment, inflation, interest rates, and exchange rates. Short-run fluctuations and long-run growth. Issues in monetary and fiscal policy. Prerequisite: 1A. GER:DB-SocSci

5 units, Win (Amador, M), Spr (Cojoc, D), Sum (Staff)

ECON 11N. Understanding the Welfare System—Stanford Introductory Seminar. Preference to freshmen. Welfare reform legislation and the devolution revolution. The transfer of responsibility for antipoverty programs to the states. How recent reforms change the welfare system and who is likely to be affected. Food stamps, AFDC, TANF, SSI, and Medicaid. Income transfer programs such as earned income tax credit and income taxes, and labor market regulations such as minimum wages and overtime rules. Economic principles to understand the effectiveness of these programs and their consequences on the behavior of families. Pre- or corequisite: ECON 1. Recommended: basic understanding of labor markets, taxes, and transfers.

2 units, Aut (MaCurdy, T)

ECON 17N. Energy, the Environment, and the Economy—Stanford Introductory Seminar. Preference to freshmen. The relationship between environmental quality and production and consumption of energy. Can environmentally-friendly energy production and consumption compete with conventional sources? How to estimate and compare environmental impact costs of nonrenewable sources such as fossil fuels and nuclear power versus renewable sources such as solar and wind power. Implicit subsidies in conventional energy sources and the environmental costs of these subsidies. Regulatory and legal barriers to more environmentally friendly energy sources.

2 units, Spr (Wolak, F)

ECON 50. Economic Analysis I—Individual consumer and firm behavior under perfect competition. The role of markets and prices in a decentralized economy. Monopoly in partial equilibrium. Economic tools developed from multivariable calculus using partial differentiation and techniques for constrained and unconstrained optimization. Prerequisites: 1 or 1A and MATH 51. GER:DB-Math

5 units, Aut (Abramitzky, R), Spr (Tendall, M), Sum (Staff)

ECON 51. Economic Analysis II—Neoclassical analysis of general equilibrium, welfare economics, imperfect competition, externalities and public goods, intertemporal choice and asset markets, risk and uncertainty, game theory, adverse selection, and moral hazard. Multivariable calculus is used. Prerequisite: 50.

5 units, Aut (Tendall, M), Win (Einav, L), Sum (Staff)

ECON 52. Economic Analysis III—Growth and fluctuations in the economic system as a whole. National income accounts and aggregate relationships among stocks and flows in markets for goods, labor, and financial assets. Economic growth, inflation, and unemployment. The role of macroeconomic policies in the short and long run. Prerequisites: 1B, 50.

5 units, Win (Jaimovich, N), Spr (Klenow, P), Sum (Staff)

ECON 90. Introduction to Financial Accounting—(Graduate students register for 190.) How to read, understand, and use corporate financial statements. Oriented towards the use of financial accounting information (rather than the preparer), and emphasizes the reconstruction of economic events from published accounting reports.

5 units, Aut (Beyer, A), Win (Stanton, F)

ECON 91. Introduction to Cost Accounting—(Graduate students register for 191.) The use of internal financial data for managerial decision making.

5 units, Spr (Stanton, F)

ECON 93Q. Global Capital Markets—Stanford Introductory Seminar. Preference to sophomores. Focus is on the operation of stock markets in the U.S.: the New York and American stock exchanges, and the over-the-counter NASDAQ market, on which high-tech companies are traded. Financial institutions in the U.S. (stock markets, mutual funds) and how they relate to international markets. Inflation, interest-rate trends, U.S. government agencies, and the impact of the Federal Reserve Bank on capital markets and capital flows. Macroeconomic factors that drive capital flows.

3 units, Win (Marotta, G)

ECON 101. Economic Policy Analysis—Economic policy analysis, writing, and oral presentation. Topics vary with instructor. Limited enrollment. Prerequisites: 51 and 52, 102B, and two field courses. Some sections require additional prerequisites. WIM

5 units, Aut (Cojoc, D; Angelucci, M), Win (Steiner, F; Rothwell, G; Cojoc, D), Spr (Rosston, G; Clerici-Arias, M; Steiner, F)

ECON 102A. Introduction to Statistical Methods (Postcalculus) for Social Scientists—Description and examples of the use of statistical techniques relevant to economics. Basic rules of probability, conditional probability, discrete and continuous probability distributions. Point estimation, tests of hypotheses, confidence intervals, and linear regression model. Prerequisite: MATH 41 or equivalent. GER:DB-Math

5 units, Aut, Win (Steiner, F)

ECON 102B. Introduction to Econometrics—Descriptive statistics. Regression analysis. Hypothesis testing. Analysis of variance. Heteroskedasticity, serial correlation, errors in variables, simultaneous equations. Prerequisites: 50, 102A or equivalent. Recommended: computer experience.
5 units, Win (Mahajan, A), Spr (Harding, M)

ECON 102C. Advanced Topics in Econometrics—Identification and estimation of the effect of human capital variables on earnings (such as the return to education, tenure), and identification and estimation of labor supply models, focusing on microeconomic data. Topics: instrumental variable estimation, limited dependent variable models (probit, logit, and Tobit models), and panel data techniques (fixed effect and random effect models, dynamic panel data models).
5 units, Spr (Pistaferri, L)

ECON 103. Applied Econometrics—The construction and use of econometric models for analyzing economic phenomena. Students complete individual projects and core material. Topics vary with the instructor. Limited enrollment. Prerequisites: 52, 102B.
5 units, Win (Bloom, N)

ECON 105. Economic Forecasting—Theory and econometric techniques for forecasting macroeconomic and financial time series. Topics include: objectives for forecasting; optimal forecast with economic loss functions; forecast evaluation and comparison; optimal combination of multiple forecasts; time-series models including ARMA and ADL; and empirical applications with macroeconomic and financial time series. Linear algebra and multivariate calculus are used. Prerequisites: 50, 102B.
5 units, Spr (Hansen, P)

ECON 106. World Food Economy—The interrelationships among food, populations, resources, and economic development. The role of agricultural and rural development in achieving economic and social progress in low-income nations. Emphasis is on public sector decision making as it relates to food policy.
5 units, not given this year

ECON 111. Money and Banking—Money, interest rates, banks and other financial institutions at both micro and macro levels. Micro: alternative financial instruments, the determination of interest rates, the yield curve, and the role of banks and other capital market institutions in the intermediation process. Supply of money, regulation, and supervision. Macro: the choice of monetary policy by the central bank, the impact of monetary policy making institutions on this choice and the various channels through which monetary policy affects inflation and real variables in the economy. Emphasis is on the institutional structure of Federal Reserve System and the conduct of monetary policy in the U.S. Prerequisites: 50, 52.
5 units, Aut (Gould, A), Sum (Staff)

ECON 113. Technology and Economic Change—The economic causes and consequences of technological change. The historical experience of advanced industrial countries and the more recent experience of less developed economies. Topics: the origins of modern industry in the U.S. and Europe, technology and the growth of large-scale organizations, late-comers to industrialization (Japan and newly industrializing countries), economic growth and slowdown in mature industrial countries, and present concerns and future prospects (the influence of technology on employment, civilian spillover from military R&D, and coping with rapid technological change).
5 units, not given this year

ECON 114. Economy and Economics of Ancient Greece—Introduction to the history of Greek civilization from the Mycenaean period to the 4th century B.C. The formalist-substantivist controversy: what behavioral assumptions should be made in order to understand the working of the Athenian economy. The economics and ethical thoughts of Plato and Aristotle in contrast to utilitarianism, which became a foundation of modern economics. Prerequisite: 1. GER:EC-GlobalCom
5 units, Win (Amemiya, T)

ECON 115. European Economic History—Economic changes and growth in W. Europe from antiquity to the present. The transformation of Europe from an economically and culturally backward part of the world to the center of the pre-WW I world economy. Topics: the role of techniques and sciences, variations of the extent of market activities, institutional changes, international politics, demography. Prerequisite: 51. GER:DB-SocSci
5 units, Win (Chaudhary, L)

ECON 116. American Economic History—From colonial times to the present. The application of economic analysis to historical issues, and the role of historical context in economics. Topics: American economic growth in international perspective; the economics of slavery and regional divergence; the origins and consequence of the American system of technology and business organization; recent U.S. economic performance in historical perspective. Prerequisite: 1A. GER:DB-SocSci, EC-AmerCul
5 units, Spr (Wright, G)

ECON 117. Economic History and Modernization of the Islamic Middle East—From the rise of Islam to the present. Transformation of region from economically advanced to underdeveloped. Role of religion in economic successes and failures. Current obstacles to development. Topics: Islamic economic institutions; innovation and change; political economy of modernization; interactions with other regions; and economic consequences of Islamism.
5 units, not given this year

ECON 118. Development Economics—The economic problems and policy concerns of developing countries. Theories of growth and development; inequality and poverty; credit and labor markets; health and education; politics and corruption. Emphasis is on economic models rather than case studies. Prerequisites: 50, 52, 102B. GER:EC-GlobalCom
5 units, Aut (Jayachandran, S)

ECON 120. Socialist Economies in Transition—Privatization, restructuring, and institutional change in E. Europe and the former Soviet Union. Analysis of property rights, corporate governance, incentives, and resource allocation in socialist and transitional economies. Emphasis is on liberalization and privatization policies (including mass and voucher programs) as the primary instruments to induce changes in behavior. Prerequisite: 50. Recommended: 51.
5 units, not given this year

ECON 122. Economic Development of Latin America—High crime levels as consequence and cause of underdevelopment in Latin America. Worldwide theory and evidence on the economics of criminal behavior and public enforcement. Emphasis is on economic determinants of crime, impact of public interventions, methodological issues to assess causality, and evidence from Latin America.
5 units, Win (Schargrodsky, E)

ECON 123. Regulation and Competition in Latin America—The economics and workings of public intervention and control of markets in Latin America. Topics: natural monopoly regulation; institutions and regulatory commitment; infrastructure concessions; regulation and competition in network industries such as telecoms and electricity; liberalization of markets and competition policy; and antitrust with a weak judiciary.
5 units, not given this year

ECON 124. Contemporary Japanese Economy—Comparative and historical perspective. Micro and institutional aspects, such as firms, the employment system, corporate governance and financial institutions, and the macro economy. Elementary applications of macro- and microeconomics. Prerequisite: 50. GER:EC-GlobalCom
5 units, not given this year

ECON 126. Economics of Health and Medical Care—(Same as BIOMEDIN 156/256.) Graduate students with research interests should take ECON 248. Institutional, theoretical, and empirical analysis of the problems of health and medical care. Topics: institutions in the health sector; measurement and valuation of health; nonmedical determinants of health;

medical technology and technology assessment; demand for medical care and medical insurance; physicians, hospitals, and managed care; international comparisons. Prerequisite: ECON 50 and ECON 102A or equivalent statistics, or consent of instructor. Recommended: ECON 51.
5 units, Aut (Bhattacharya, J)

ECON 127. Economics of Health Improvement in Developing Countries—(Same as HUMBIO 121, MED 262.) Application of economic paradigms and empirical methods to health improvement in developing countries. Emphasis is on unifying analytic frameworks and evaluation of empirical evidence. How economic views differ from public health, medicine, and epidemiology; analytic paradigms for health and population change; the demand for health; the role of health in international development. Prerequisites: background in economics and statistics, and consent of instructor.
5 units, not given this year

ECON 135. Finance for Non-MBAs—(Same as FINANCE 221, MS&E 245G.) For graduate students and advanced undergraduates. The foundations of finance; applications in corporate finance and investment management. Financial decisions made by corporate managers and investors with focus on process valuation. Topics include criteria for investment decisions, valuation of financial assets and liabilities, relationships between risk and return, market efficiency, and the valuation of derivative securities. Major corporate financial instruments including debt, equity, and convertible securities. Equivalent to core MBA finance course, FINANCE 220. Prerequisites: 51, or ENGR 60, or equivalent; ability to use spreadsheets, and basic probability and statistics concepts including random variables, expected value, variance, covariance, and simple estimation and regression.
4 units, Aut (Admati, A)

ECON 136. Auctions and Market Design—Competitive bidding for asset purchases and procurement of industrial needs; bidder entry decisions; design of mechanisms for complicated resource allocation problems. Prerequisites: 51, 160.
5 units, Win (Milgrom, P)

ECON 137. Information and Incentives—Incentives in situations where one part has more information than another. A part may have better information about things that it controls (moral hazard), or about things that are outside of its control (adverse selection). The general structure of incentive problems and the design of contracts and institutions to deal with such problems. Applications: executive and employee compensation, sharecropping, financial contracts and credit rationing, insurance, markets with unobservable quality, monopolistic price discrimination, regulation of natural monopolies, income taxation and redistribution, the provision of public goods, and auctions. Prerequisite: 51.
5 units, not given this year

ECON 138. Risk and Insurance—Nature of economic risk and its effect on allocation of resources. Preferences among risky prospects: expected utility theory and the theory of risk aversion. Subjective versus objective probabilities. Market allocation of risk and the role of insurance markets under complete information. Insurance under asymmetric information, moral hazard, and adverse selection. Can insurance markets function well in a competitive equilibrium? Role of asset markets in allocating risk. How some risks corporations face are associated with price fluctuations and can be hedged in financial markets. Hedging strategies using futures markets, and options and other derivative assets. Hedging credit risks. Prerequisites: 51, 102A.
5 units, not given this year

ECON 139D. Directed Reading—May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

ECON 140. Introduction to Financial Economics—Modern portfolio theory and corporate finance. Topics: properties of various financial instruments including financial futures, mutual funds, the capital asset pricing model, and models for pricing options and other contingent claims. Prerequisites: 51, 102A.
5 units, Win (Kurz, M), Spr (Shoven, J), Sum (Staff)

ECON 141. Public Finance and Fiscal Policy—What role should and does government play in the economy? What are the effects of government expenditure, borrowing, and taxation? Policy topics: budget surpluses/deficits; tax reform; social security, public goods, and externalities; fiscal federalism; public investment; and cost-benefit analysis. Prerequisites: 51, 52.
5 units, Aut (Cojoc, D)

ECON 142. Public Economics Seminar—Topics vary annually; examples include social security, tax reform, and economic policy reforms. Students prepare a memorandum to a senior economic policy official on the class topic. Limited enrollment. Prerequisites: 141 and consent of instructor.
5 units, Win (Boskin, M)

ECON 143. Ethics in Economics Policy—Ethical decision theory from an economist's viewpoint. Formulating objectives for economic policy. The role of markets in an economic system. Concepts of equity, efficiency, and rights. Measuring economic performance. The benefits and costs of market liberalization. Prerequisites: 50, 51, and 102A.
5 units, not given next year

ECON 145. Labor Economics—Analysis and description of labor markets. Determination of employment, unemployment, hours of work, wages. Welfare programs and work effort. Wage differentials by schooling, experience, gender, and race. Economics of discrimination. Earnings inequality and changes in inequality. Employment contracts, labor unions, and bargaining. International comparisons. Prerequisites: 50, 51, 102B. GER:EC-Gender
5 units, Aut (DeGiorgi, G)

ECON 146. Economics of Education—Topics may include theories on school choice, the rise in costs of higher education, and the use of incentives to improve student achievement.
5 units, Spr (Hoxby, C)

ECON 147. Economics of Human Resources—Investments in human capital including education, on-the-job training, government training, and health. The effects of human capital accumulation on wages and wage growth and on wage differentials by gender and race. Sample selections and experimental data. Poverty and inequality. Optional research project for public policy organization on labor market/human resources issues. Prerequisite: 51.
5 units, not given this year

ECON 149. Modern Firm in Theory and Practice—Theoretical and institutional analysis of modern corporate firms: industrial relational, motivational, financial, information structural, managerial, and legal. The role of various hybrid institutional forms between the market and the integrated firm: subcontracting, franchising, R&D cooperatives, and consortia. Practices in American, W. European, and Japanese firms. Prerequisite: 51.
5 units, not given this year

ECON 150. Economic Policy Analysis—(Same as PUBLPOL 104.) The relationship between microeconomic analysis and public policy making. How economic policy analysis is done and why political leaders regard it as useful but not definitive in making policy decisions. Economic rationales for policy interventions, methods of policy evaluation and the role of benefit-cost analysis, economic models of politics and their application to policy making, and the relationship of income distribution to policy choice. Theoretical foundations of policy making and analysis, and applications to program adoption and implementation. Prerequisite: ECON 50.
5 units, Spr (Staff)

ECON 153. Economics of the Internet—Applications of microeconomic theory to Internet businesses: auctions, online transactions, entry barriers, valuation, pricing of facilities, policy for broadband communications, network economics, standards, economics of information. Prerequisites: 51 and one of 102B, 103, 104, 113, 135, 137, 140, 149, 157, or 160.
5 units, Aut (Hanson, W)

ECON 154. Economics of Legal Rules and Institutions—(Same as PUBLPOL 106.) The design and consequences of legal rules. Common ideas that run through law including individual rationality, economic efficiency, conventional and Coasian analyses of externalities, enforcement, costs, and market consequences of legal restrictions on contract terms. Private versus public enforcement of law; the tradeoff between certainty and severity of punishment; the choice between ex post and ex ante sanctions; and the choice between property and liability rules. Applications to property, intellectual property, contract, criminal, tort, family, and environmental law. Prerequisite: ECON 50.

5 units, Aut (Owen, B)

ECON 155. Environmental Economics and Policy—(Same as EARTHSYS 112.) Economic sources of environmental problems and alternative policies for dealing with them (technology standards, emissions taxes, and marketable pollution permits). Evaluation of policies addressing regional air pollution, global climate change, water allocation in the western U.S., and the use of renewable resources. Connections between population growth, economic output, environmental quality, and human welfare. Prerequisite: ECON 50. GER: DB-NatSci

5 units, Win (Goulder, L)

ECON 157. Imperfect Competition—The interaction between firms and consumers in markets that fall outside the benchmark competitive model. How firms acquire and exploit market power. Game theory and information economics to analyze how firms interact strategically. Topics include monopoly, price discrimination, oligopoly, collusion and cartel behavior, anti-competitive practices, the role of information in markets, anti-trust policy, and e-commerce. Sources include theoretical models, real-world examples, and empirical papers. Prerequisite: 51.

5 units, Win (Staff)

ECON 158. Antitrust and Regulation—The history, economics, and legal background of the institutions under which U.S. industry is subject to government control. Topics: antitrust law and economics; the economics and practice of public utility regulation in the communications, transportation, and energy sectors; and the effects of licensing. Emphasis is on the application of economic concepts in evaluating the performance and policies of government agencies. Prerequisite: 51.

5 units, Spr (Steiner, F)

ECON 160. Game Theory and Economic Applications—Mathematical introduction to game theory and its applications to economics. Topics: strategic and extensive form games, Nash equilibrium, subgame-perfect equilibrium, Bayesian equilibrium, and perfect Bayesian equilibrium. The theory is applied to repeated games, auctions, and bargaining. Examples from economics and political science. Prerequisites: 51 and course in calculus, or consent of instructor.

5 units, Win (Cojoc, D)

ECON 162. Monetary Economics—Dynamic analysis of the role of money and monetary policy in the macro economy, using calculus. Topics: the exchange process and the role of money; inside and outside money; inflation and the inflation tax; international monetary systems; the indeterminacy of floating exchange rates; policies to fix the exchange rate and inflationary incentives; currency crises and speculative attacks; money and interest-bearing government debt; the government's budget constraint and the coordination of monetary and fiscal policies; hyperinflations and stabilizations; the effect of the national debt on consumption, savings, investment and output; time consistency of government policies. Prerequisite: 52.

5 units, not given next year

ECON 164. Current Issues in International Economics Law and Policy—(Same as LAW 357.) Legal architecture of the World Trade Organization system; questions about its design and wisdom. Economics and politics of international cooperation on trade. The WTO as an institution and its core obligations. Topics may include: choice between regional and global approaches to trade cooperation; interface between international trade obligations and domestic regulation of health, safety, and environment; regulation of subsidies; design and operation of dispute settlement system; and special and differential treatment of developing countries. Prerequisite: 51 or equivalent.

5 units, Win (Staiger, R)

ECON 165. International Trade and Finance—Comparative advantage in production and trade among nations; trade policy; increasing returns, imperfect competition and trade; the international monetary mechanism; domestic monetary, fiscal, and exchange rate policies and their relationship to foreign trade; global financial crises and trade. Prerequisites: ECON 1A,B or 1, and 51, 52.

5 units, Aut (Fitzgerald, D), Win (Staiger, R), Sum (Desmet, K)

ECON 166. International Trade—Comparative advantage in production and trade among nations; increasing returns, imperfect competition, and trade; the nature of the gains from trade; winners and losers; trade policy; international trade agreements; theory and evidence.

5 units, Spr (Staff)

ECON 167. European Monetary and Economic Integration—The economics of the European Community and the internal market. Analysis of current competition, transportation, and factor market policies, including the problems of agriculture and unemployment. Fiscal harmonization and mercantilist rivalry. European Monetary Union (EMU): genesis, implementation, and consequences of a common currency and central bank. Foreign exchange and foreign trade. Prerequisites: 51, 52, or equivalents.

5 units, Win (Staff)

ECON 168. International Finance and Exchange Rates—(Graduate students register for 268.) Monetary foundations of international exchange; the rules of the game since Bretton Woods. Foreign exchange risk under the world dollar standard. Hedging, forward covering, and interest parity relationships. International capital flows and the current account. Global trade imbalances; China and Japan versus the U.S. Inflation versus exchange rate targeting in developing countries. Prerequisite for undergraduates: 52; recommended: 165.

5 units, Aut (McKinnon, R)

ECON 169. International Financial Markets and Monetary Institutions—(Graduate students register for 269.) How nations are linked financially through money, capital, and exchange markets, emphasizing policy issues including the role of the International Monetary Fund, monetary and exchange rate policy, prevention and resolution of financial crises in emerging markets, current account imbalances, and capital mobility. Development and use of macroeconomic models of international financial linkages and microeconomic models of hedging, optimal selection of currencies for invoice and trade credit, and parity relationships in futures, swaps, and options markets. Prerequisite: 165.

5 units, Spr (Taylor, J)

ECON 170. Intermediate Econometrics I—(Graduate students register for 270.) Probability, random variables, and distributions; large sample theory, theory of estimation and hypothesis testing. Limited enrollment.

5 units, Aut (Hansen, P; Mahajan, A)

ECON 171. Intermediate Econometrics II—(Graduate students register for 271.) Linear regression model, relaxation of classical-regression assumptions, simultaneous equation models, linear time series analysis. Limited enrollment. Prerequisite: 270.

5 units, Aut (Wolak, F)

ECON 172. Intermediate Econometrics III—(Graduate students register for 272.) Continuation of 271. Nonlinear estimation, qualitative response models, limited dependent variable (Tobit) models. Limited enrollment. Prerequisite: 271.

2-5 units, Win (MaCurdy, T)

ECON 179. Experimental Economics—Methods and major subject areas that have been addressed by laboratory experiments. Focus is on a series of experiments that build on one another. Topics include decision making, two player games, auctions, and market institutions. How experiments are used to learn about preferences and behavior, trust, fairness, and learning. Final presentation of group projects. Prerequisites: 50, 51, 102A.

5 units, Spr (Niederle, M)

ECON 181. Optimization and Economic Analysis—The development of optimization techniques, including calculus, linear and nonlinear programming, the calculus of variations, and control theory. Emphasis is on concepts and results rather than techniques and proofs. Examples: static and dynamic theories of the household and the firm, and problems in aggregative planning and control. Prerequisites: 51 and 102A, and MATH 51 or equivalent.
5 units, not given next year

ECON 190. Introduction to Financial Accounting—(Same as 90; see 90.)
5 units, Aut (Beyer, A), Win (Stanton, F)

ECON 191. Introduction to Cost Accounting—(Same as 91; see 91.)
5 units, Spr (Stanton, F)

ECON 198. Junior Honors Seminar—(Same as PUBLPOL 197.) Primarily for students who expect to write an honors thesis. Weekly sessions discuss writing an honors thesis proposal (prospectus), submitting grant applications, and completing the honors thesis. Readings focus on writing skills and research design. Students select an adviser, outline a program of study for their senior year, and complete a prospectus by the end of the quarter. Seniors working on their theses also may enroll and present their research to the seminar participants. Seniors are required to make substantial progress on their thesis by the end of the quarter. Enrollment limited to 25.
5 units, Win, Spr (Rothwell, G)

ECON 199D. Honors Thesis Research—In-depth study of an appropriate question and completion of a thesis of very high quality. Normally written under the direction of a member of the Department of Economics (or some closely related department). See description of honors program. Register for at least 1 unit for at least one quarter. Meets first week of Autumn Quarter (see Stanford Daily for details).
1-10 units, Aut, Win (Rothwell, G), Spr, Sum (Staff)

PRIMARILY FOR GRADUATE STUDENTS

ECON 239D. Directed Reading—May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

ECON 299. Practical Training—Students obtain employment in a relevant research or industrial activity to enhance their professional experience consistent with their degree programs. At the start of the quarter, students must submit a one page statement showing the relevance of the employment to the degree program along with an offer letter. At the end of the quarter, a three page final report must be supplied documenting work done and relevance to degree program.
1-10 units, Aut, Win, Spr, Sum (Staff)

ECON 400. Ph.D. Dissertation
1-15 units, Spr (Staff)

A. CORE ECONOMICS

ECON 202. Core Economics: Modules 1 and 2—(Non-Economics graduate students register for 202N.) Open to advanced undergraduates with consent of instructors. Theory of the consumer and the implications of constrained maximization; uses of indirect utility and expenditure functions; theory of the producer, profit maximization, and cost minimization; behavior under uncertainty; partial equilibrium analysis and introduction to models of general equilibrium. Limited enrollment. Prerequisite: thorough understanding of the elements of multivariate calculus and linear algebra.
2-5 units, Aut (Bresnahan, T; Segal, I)

ECON 202N. 202 For Non-Economics Ph.D. Students—Core Economics modules 1 and 2 for non-Economics Ph.D. students.
2-5 units, Aut (Staff)

ECON 203. Core Economics: Modules 5 and 6—(Non-Economics graduate students register for 203N.) Non-cooperative game theory including normal and extensive forms, solution concepts, games with incomplete information, and repeated games. Externalities and public goods. The theory of imperfect competition: static Bertrand and Cournot competition, dynamic oligopoly, entry decisions, entry deterrence, strategic behavior to alter market conditions. Limited enrollment. Prerequisite: 202.
2-5 units, Win (Milgrom, P)

ECON 203N. 203 For Non-Economics Ph.D. Students
2-5 units, Win (Staff)

ECON 204. Core Economics: Modules 9 and 10—The theory of contracts, emphasizing contractual incompleteness and the problem of moral hazard. Incentive regulation. Competition with imperfect information, including signaling and adverse selection. The theory of resource allocation over time, competitive equilibrium, and intertemporal efficiency. Limited enrollment. Prerequisite: 203.
2-5 units, Spr (Jackson, M)

ECON 210. Core Economics: Modules 3 and 7—Dynamic economics applied to aggregate economic fluctuations and economic growth. Solving dynamic, stochastic rational expectation models using discrete time dynamic programming. Growth theory (neoclassical models, growth accounting, technical change, endogenous growth) using optimal control theory. Limited enrollment.
2-5 units, Aut (Jaimovich, N)

ECON 211. Core Economics: Modules 11 and 12—Capital asset pricing models, equilibrium with securities, pricing of securities, and arbitrage. Overlapping generations models with incomplete market structure and sunspots. Foundations of Bayesian dynamic learning. Investment theory and empirics, including adjustment costs and the q theory; consumption theory and empirics, focusing on the life-cycle model; and the labor market. Limited enrollment. Prerequisite: 210.
2-5 units, Win (Amador, M)

ECON 212. Core Economics: Modules 4 and 8—Monetary theory: economic fluctuations, the role of money (overlapping generations, cash in advance, money in the utility function), dynamic impact of changes in money on the economy, natural rate of unemployment and job creation/destruction, exchange rate determination, international transmission of money, dynamic stochastic general equilibrium models. Macroeconomic policy: rationale for central bank independence, time inconsistency, the impact of public debt, rules versus discretion, interest rate versus money rules, international monetary policy coordination, rational expectations, econometric policy evaluation. Limited enrollment. Prerequisites: 203, 211.
2-5 units, Spr (Taylor, J)

ECON 301. Microeconomic Workshop
1-10 units, not given this year

ECON 305. Economic Applications Workshop
1-10 units, Aut, Win, Spr (MaCurdy, T; Pencavel, J; Pistaferri, L; Wolak, F; McClellan, M; Bloom, N)

ECON 310. Macroeconomic Workshop
1-10 units, Aut (Hall, R; Klenow, P; Taylor, J; Kurz, M; Amador, M; Jaimovich, N), Win (Hall, R; Klenow, P; Taylor, J; Jaimovich, N; Tertilt, M; Amador, M; Kurz, M), Spr (Hall, R; Klenow, P; Taylor, J; Kurz, M; Amador, M; Jaimovich, N)

B. ECONOMIC DEVELOPMENT

To receive credit for this field, students must complete 214 and 217, and submit a paper from one of these courses. Students wishing to do research in the field are advised to take courses in international economics, such as 266, and in comparative institutional analysis.

ECON 214. Development Economics I—Microeconomic analysis of markets and institutions in developing countries. Topics: the role of the household; models of savings, credit, and risk; adjustment to aggregate shocks; occupational choice, credit constraints, and credit market imperfections; health and nutrition; new technology; and education. Emphasis is on empirical tests of and evidence for theoretical models. Prerequisites: 202 or 202N, 270.
2-5 units, Aut (Jayachandran, S)

ECON 216. Development Economics II—The historical experience of economic development; patterns of economic growth; sources of economic growth; models of economic development (two-gap models, dual economy models, open economy models, new growth models), savings and capital accumulation; the role of money and finance; inflation; taxation; stabilization in closed and open economies with incomplete and/or imperfect markets; human and other forms of intangible capital; infrastructural capital and externalities; income distribution; numerical general equilibrium models.
2-5 units, Win (DeGiorgi, G)

ECON 217. Development Economics III—Banking systems, interest rates, regulatory policies, and productivity of capital in developing countries. Controlling inflation: fiscal and monetary policies for macroeconomic stability. Currency crises, exchange rates, and liberalization of foreign trade. Applications to transitional socialist economies in Asia and E. Europe.
2-5 units, not given this year

ECON 220. Political Economy I—Positive and normative theories of political economy. Positive topics include direct democracy, electoral competition, legislative policy making, agenda setting, lobbying, comparative constitutions, and intergenerational politics, with applications to income taxation, redistribution, and the size of government. Normative topics include social choice theory with and without interpersonal comparisons, Pareto efficiency with public goods, potential Pareto improvements, welfare measurement, cost benefit analysis, and analysis of economic policy reform.
2-5 units, Win (Jackson, M)

ECON 221. Political Economy II—Continuation of 220. Positive and normative theories of political economy. Focus is on how the structure of political institutions affect societal welfare and economic outcomes. Topics include: measurement of the welfare of a society; constitutional design; models of strategic voting behavior; asymmetries of information and voting behavior; lobbying, vote buying, and political influence; the politics of federations of states; and political decision making regarding economic policies such as taxes, redistribution, and public good provision. Prerequisite: 220.
2-5 units, Spr (Harding, M)

ECON 315. Development Workshop
1-10 units, Aut (Mahajan, A; Jayachandran, S),
Win (Jayachandran, S; Mahajan, A; DeGiorgi, G),
Spr (DeGiorgi, G; Mahajan, A; Jayachandran, S)

C. ECONOMIC HISTORY/INSTITUTIONS

The requirement for the field is one research paper on a subject approved by one of the faculty teaching any of the following courses.

ECON 224. Science, Technology, and Economic Growth—Upper-division undergraduates may enroll with consent of instructor. The roles played by the growth of scientific knowledge and technical progress in the development of industrial societies. Emphasis is on the interactions between science and technology, and the organizational factors which have influenced their effectiveness in contributing to productivity growth.
2-5 units, Win (David, P)

ECON 225. Economics of Technology and Innovation—The feedback structure of how technological change affects economic transformations and how scientific progress and economic change shape technological progress; conceptual and formal approaches for analyzing these relationships. Forecasting, economic history, and current techno-economic developments.
2-5 units, not given this year

ECON 226. U.S. Economic History—The American economy from colonial times to the present. The role of economic history as a distinctive intellectual approach to the study of economics. Topics: American growth record and its determinants, the origins and character of U.S. technology, slavery, the Great Depression, recent U.S. performance in historical perspective.
2-5 units, Spr (Wright, G)

ECON 227. European Economic History—Economic growth and development in W. Europe from the 11th-20th centuries, emphasizing the formative period up to the 19th century. Emphasis is on the experiences of Britain, France, Germany, and Italy. The interrelations between the growth and distribution of output, demographic trends, technological and organizational changes in trade and industry, and the changing formal and informal institutions governing political and economic activity.
2-5 units, not given this year

ECON 228. Institutions and Organizations in Historical Perspective—Emphasis is on the formative period from the 11th to 18th centuries. Formation, function, and evolution of institutions; alternative conceptual frameworks such as neoclassical, transaction cost economics, institutionalism, and Marxism and neo-Marxism; game theory, mechanism design, and contract theory. Institutions related to trade organization, the organization of production, feudalism, mercantilism, and the state.
2-5 units, Aut (Greif, A)

ECON 229. Topics in Economic History—Emphasis is on institutions and organizations, such as risk-sharing organizations, and property rights, such as patent laws and their effects on technological change and economic growth. Topics include: competing hypotheses for cross-country differences in long-term growth; the importance of institutions to economic growth; formation, function, and persistence of institutions and organizations; role of patent laws in creating incentives for innovation; informal networks as a mechanism to trade property rights; causes and effects of institutional change; tests of contract theory in history; and long-term migration and its effect on economic development.
2-5 units, Win (Abramitzky, R; Moser, P)

ECON 325A,B,C. Economic History Workshop
1-10 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Greif, A; Wright, G; Abramitzky, R; David, P; Moser, P)*

D. MONETARY THEORY AND ADVANCED MACROECONOMICS

Requirements for this field are completion of 233 and 234.

ECON 233,234,235. Advanced Macroeconomics—Topics in the theory of fluctuations and growth.
2-5 units, **233:** *Aut (Amador, M; Jaimovich, N),* **234:** *Win (Klenow, P),* **235:** *Spr (Bloom, N)*

E. PUBLIC FINANCE

To receive credit for the field, students must complete 241 and 242 by passing the final examinations, and submit an acceptable research paper on a topic approved by the instructor for either course. Students may take Public Finance as a field and still count 243 and/or 244 toward satisfying their distribution requirements.

ECON 241. Public Economics and Political Economy I: Public Policy—Welfare economics. Effects of tax policy, including incidence and efficiency costs. Design of tax systems. Externalities, public goods, and clubs. Cost-benefit analysis. Prerequisites: 202-204, 210, 270, 271, or equivalent with consent of instructor.
2-5 units, Win (Hoxby, C)

ECON 242. Public Finance and Taxation II—Social insurance, comparative political institutions, and federalism. Prerequisites: 202, 203, 204, 210, 270, 271, or equivalent with consent of instructor. Recommended: 241.
2-5 units, Spr (Lovenheim, M)

ECON 243. Economics of Environment—Sources of environmental problems in market economies and policy options for addressing these problems. Topics: choice of policy instruments (taxes, standards, tradeable permits), environmental risk assessment, valuation of non-marketed commodities (environmental amenities, biodiversity), environmental policy making under uncertainty, the optimal mix of corrective and distortionary tax instruments, and the dynamics of economic growth in the presence of non-reproducible natural resources. Upper-division undergraduates require consent of instructor.
2-5 units, not given this year

ECON 244. Psychology and Economics—Experimental and field evidence related to the psychological mechanisms behind static choice, intertemporal choice, choice under risk and uncertainty, choice in social situations, and hedonics. Models of economic choice based on these findings, and how they improve the explanatory and predictive value of standard theories. Prerequisites: 204, 271, or consent of instructor.
2-5 units, not given this year

ECON 341. Public Economics and Environmental Economics Seminar—Issues in measuring and evaluating the economic performance of government tax, expenditure, debt, and regulatory policies; their effects on levels and distribution of income, wealth, and environmental quality; alternative policies and methods of evaluation. Workshop format combines student research, faculty presentations, and guest speakers. Prerequisite: 241 or consent of instructor.
1-10 units, Aut (Boskin, M; Shoven, J; Goulder, L), Win, Spr (Boskin, M; Shoven, J)

F. ECONOMICS OF LABOR

To receive credit for this field, students must complete two from 246, 247, and 248.

ECON 246. Labor Economics I—The demand for workers and hours of work, substitution among different types of labor in production, technological change, adjustment costs, restrictions on layoffs. The supply of labor, hours of work, participation, life-cycle models of behavior, welfare programs. Wage differentials by schooling, age, cohort, gender, and race. Changes in these wage differentials and differences across countries. Economics of discrimination. Employment contracts and turnover. Models of labor union behavior. Bargaining. Worker-owned enterprises. Unemployment and mobility. International comparisons.
2-5 units, Aut (Pencavel, J)

ECON 247. Labor Economics II—The economics and econometrics of program evaluation. The impact of public policies on labor demand, labor supply, human capital, and wage determination. Social, natural, and quasi-experiments. Intertemporal consumption and labor supply decisions. Intra-family allocation models.
2-5 units, Spr (Pistaferri, L; Bloom, N)

ECON 345. Applications Workshop
1-10 units, Aut, Win, Spr (MaCurdy, T; Pencavel, J; Pistaferri, L; Wolak, F; Bloom, N; McClellan, M)

G. ECONOMICS OF INDUSTRY

To receive credit for the field, students must complete 257 and 258 and submit one research paper, the subject of which has been approved in advance by one of the faculty teaching 257, 258, or 260.

ECON 250A. Natural Resource and Energy Economics—First part of two course sequence. Issues in provision and management of non-renewable and renewable natural resources, and energy products and services. Theory and empirical methods related to: market structure, pricing, and performance of important energy and resource industries; sources of market failure in these industries; and alternative regulatory approaches. Prerequisites: 202, 203, 204, 270, 271, and 272, or equivalents with consent of instructor.
2-5 units, not given this year

ECON 250B. Environmental Economics—Second of two course sequence. Sources of environmental problems in market economies; policy options for addressing these problems. Topics include: alternative environmental policy instruments such as taxes, standards, and tradable permits; valuation of non-marketed commodities such as environmental amenities and biodiversity; and environmental policy making under uncertainty. Applications include global climate change and green tax reform. Prerequisites: 202, 203, 204, 270, and 271, or equivalents with consent of the instructor.
2-5 units, not given this year

ECON 257,258. Economics of Industry—Theoretical and empirical analyses of the determinants of market structure; firm behavior and market efficiency in oligopolies; price discrimination; price dispersion and consumer search; differentiated products; the role of information in markets, including insurance and adverse selection; auctions; collusion and cartel behavior; advertising; entry and market structure; market dynamics; strategic behavior.
2-5 units, **257:** *Aut (Einav, L; Kastl, J),* **258:** *Win (Kastl, J; Wolak, F)*

ECON 260. Topics in Industrial Organization—Current research and policy interest. Topics may include: empirical tests of oligopoly theories; non-price competition; entry and market structure; the role of information in markets; auctions; e-commerce; dynamics of change in regulatory policy; theory of economics institutions; antitrust status of joint ventures; and use of capacity, innovation, and product variety as a barrier to entry. Significant unresolved research issues and promising ways to attack them. Prerequisite: 257. Recommended: 258.
2-5 units, Spr (Bresnahan, T; Einav, L)

ECON 355. Industrial Organization Workshop—Current research in the field by visitors, presentations by students, and discussion of recent papers. Students write an original research paper, make a formal presentation, and lead a structured discussion.
1-10 units, Aut, Win, Spr (Bresnahan, T; Einav, L)

H. INTERNATIONAL ECONOMICS

To receive credit for this field, students must complete 265 and 266. Taking one or more of 267, 268, or 269 is recommended. A research paper from any of these courses must also be submitted.

ECON 265. International Economics I—International macroeconomics and finance, emphasizing current research. Prerequisites: 202, 203, 204, 210, 211, 212.
2-5 units, Aut (Fitzgerald, D)

ECON 266. International Economics II—Determinants of trade and comparative advantage. Trade with imperfectly competitive markets. Income distribution and gains from trade. Commercial policies, tariffs, and quotas. Dynamic comparative advantage. Economic geography and trade. Political economy of trade.
2-5 units, Win (Staiger, R)

ECON 267. Topics in International Trade—Firm-level approach to the decision to export focusing on firm heterogeneity. Firms' decision to invest abroad, and causes and effects of horizontal, vertical, and export-platform foreign direct investment. Trade and the organization of the firm: multi-product and multinational firms, and outsourcing. Trade patterns and institutional frictions, including credit constraints and labor market rigidities. Multilateralism versus preferential trade liberalization. Recent theoretical and empirical developments.
2-5 units, Spr (Manova, K)

ECON 268. International Finance and Exchange Rates—(Same as 168; see 168.)
5 units, Aut (McKinnon, R)

ECON 269. International Financial Markets and Monetary Institutions—(Same as 169; see 169.)
5 units, Spr (Taylor, J)

ECON 365. International Trade Workshop
1-10 units, Aut, Win, Spr (Lau, L; Wright, M; Fitzgerald, D; Staiger, R)

I. ECONOMETRICS

A student may satisfy the requirements for the econometrics field by completing the requirements of one of two subfields:

I-1: Theoretical Econometrics: To receive credit in the theoretical econometrics subfield, students must complete 273A and 273B.

I-2: Applied Econometrics: To receive credit in the applied econometrics subfield, students must complete 273A and either 274 or 275. Students must also complete a course or set of courses that is empirically oriented. The last requirements must be approved by the Director of Graduate Study in consultation with the instructor of 274 or 275.

ECON 270. Intermediate Econometrics I—(Same as 170 see 170.)
5 units, Aut (Hansen, P; Mahajan, A)

ECON 271. Intermediate Econometrics II—(Same as 171; see 171.)
5 units, Aut (Wolak, F)

ECON 272. Intermediate Econometrics III—(Same as 172; see 172.)
2-5 units, Win (MaCurdy, T)

ECON 273. Advanced Econometrics I—Possible topics: parametric asymptotic theory. M and Z estimators. General large sample results for maximum likelihood; nonlinear least squares; and nonlinear instrumental variables estimators including the generalized method of moments estimator under general conditions. Model selection test. Consistent model selection criteria. Nonnested hypothesis testing. Markov chain Monte Carlo methods. Asymptotic hypothesis testing procedures derived for each estimation framework.
2-5 units, Aut (Hong, H)

ECON 274. Advanced Econometrics II—(Formerly 273B.) Possible topics: nonparametric density estimation and regression analysis; sieve approximation; local polynomial regression; spline regression; cross validation; indirect inference; resampling methods: bootstrap and subsampling; quantile regression; nonstandard asymptotic distribution theory; empirical processes; set identification and inference.
3-4 units, Win (Romano, J)

ECON 275. Time Series Econometrics—Stochastic processes and concepts such as stationarity, ergodicity, and mixing. Inference with heteroskedastic and autocorrelated time series; autoregressive and moving average models; unit root processes and asymptotic analysis of such; tests for structural change; vector autoregressive models; cointegration; impulse response analysis; forecasting; ARCH and GARCH volatility models. Prerequisites: 270, 271.
2-5 units, Spr (Hansen, P)

ECON 276. Limited Dependent Variables—(Formerly 274.) Possible topics: discrete choice models; Tobit models; duration models; semiparametric methods; single index models; rank regression; U-statistics; bounds and incomplete models; linear and nonlinear static and dynamic treatment effects; local instrumental variables; matching; propensity score; inverse probability weighting; models with measurement errors and unobserved heterogeneity; stratified sampling. Discrete endogenous variables. Information theoretic alternative to gmm estimation. Nonlinear panel data. Prerequisite: 273 or consent of instructor.
2-5 units, Spr (Hong, H)

ECON 370. Econometrics Workshop
1-10 units, Aut (Hong, H; Hansen, P; Mahajan, A), Win (Hansen, P; Mahajan, A; Han, L), Spr (Hansen, P; Mahajan, A; Hong, H)

J. MICROECONOMIC THEORY

To receive credit for this field, students must complete two courses in one of the following two subfields:

J-1: General Theory: 280, 281, 284, 286, 287, 291

J-2: Decisions, Contracts and Incentives: 282, 283, 286, 289

Note: taking one course from each track does not satisfy the microeconomic theory field requirement.

ECON 279. Experimental Economics—An introduction to experimental economics, its methods, and major subject areas that have been addressed by laboratory experiments. Focus is on a series of experiments that build on one another, and allow researchers with different theoretical dispositions to narrow the range of potential disagreement. Prerequisites: 202, 203, 204, or consent of instructor.
2-5 units, Win (Niederle, M)

ECON 281. Normative Decision Theory and Social Choice—Normative principles of behavior, especially in single-person decision trees. Objective and subjective expected utility. Savage, Anscombe-Aumann, and consequentialist axioms. State dependence. Multi-person extensions: social choice, ethics, opinion pooling, and rationalizability in non-cooperative games. Prerequisite: 202 or equivalent.
2-5 units, not given this year

ECON 282. Contracts, Information, and Incentives—Issues and recent developments in mechanism design and the theory of contracts. Topics include: hidden characteristics and hidden action models with one and many agents, role of commitment and renegotiation in long-term relationships, incomplete contracts and applications to the theory of the firm.
2-5 units, Win (Segal, I)

ECON 283. Advanced Topics in Contracts and Organization—Recent developments and promising research. Topics change from year to year, and may include: reputational concerns and implicit contracts in long-term relationships, property rights and the hold-up problem, multilateral contracting, communication requirements of allocation problems, communication without full commitment. Prerequisite: 282 or consent of instructors.
2-5 units, not given this year

ECON 285. Market Design—(Same as MGTECON 602.) Analysis of rules that govern the operation of markets with and without the assistance of prices. Emphasis is on markets in which complicated preferences and constraints, limitations on the use of cash, or variations in contract details among bidders decisively impair the performance of simple market rules. Matching markets such as the National Resident Matching Program and airline slot exchanges, asset auctions such as the spectrum auctions, electricity markets, and Internet procurement services.
4 units, Spr (Niederle, M; Milgrom, P)

ECON 286. Game Theory and Economic Application—Solution concepts for non-cooperative games, repeated games, games of incomplete information, reputation, and experiments. Standard results and current research topics. Prerequisite: 203 or consent of instructor.
2-5 units, not given next year

ECON 287. General Equilibrium Theory—Existence, efficiency, and Walrasian equilibrium in exchange economies. Production, financial markets, incomplete markets, sequence economies with infinitely-lived agents. Prerequisites: 204 or consent of instructor.
2-5 units, not given this year

ECON 290. Multiperson Decision Theory—(Same as MGTECON 608.) Recent research papers on theories and economic applications of decision theory, game theory, and mechanism design. Applications include market design and analyses of incentives and strategic behavior in markets, and topics such as auctions, bargaining, contracting, and computation.
4 units, Spr (Wilson, R)

ECON 291. Social and Economic Networks—Models and techniques for analyzing social and economic networks; how they are measured; and how to represent them. Models to understand how networks are formed; implications of network structure in social and economic behavior, including applications to labor markets, social mobility, crime, and consumer behavior.
2-5 units, Spr (Jackson, M)

ECON 385. Mathematical Economics Workshop
1-10 units, not given this year

ECON 391. Microeconomic Theory Seminar—Game theoretic (classic and evolutionary analysis of institutions as multiple equilibria). Norms, social embeddedness, organizations as conventions, contract enforcement and corporate governance mechanisms, and states. Institutional complementaries and diachronic institutional linkage. May be repeated for credit.
1-10 units, Aut (Segal, I; Levin, J; Milgrom, P; Niederle, M; Bernheim, D; Hammond, P; Kurz, M; Jackson, M; Athey, S), Win (Bernheim, D; Levin, J; Milgrom, P; Niederle, M; Segal, I; Jackson, M; Kurz, M), Spr (Bernheim, D; Levin, J; Milgrom, P; Niederle, M)

OVERSEAS STUDIES

Courses approved for the Economics major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

BERLIN

OSPBER 115X. The German Economy: Past and Present
4-5 units, Aut (Klein, I)

OSPBER 161X. The German Economy in the Age of Globalization
4-5 units, Win (Klein, I)

KYOTO

OSPKYOTO 215X. The Political Economy of Japan
4-5 units, Spr (Hayashi, T)

MOSCOW

OSPMOSC 62. Economic Reform and Economic Policy in Modern Russia
5 units, Aut (Mau, V)

PARIS

OSPPARIS 91. Globalization and Its Effect on France and the European Union
5 units, Spr (Le Cacheux, J; Laurent, E)

OSPPARIS 124X. Building the European Economy: Economic Policies and Challenges Ahead
5 units, Aut (Le Cacheux, J)

SANTIAGO

OSPSANTG 119X. The Chilean Economy: History, International Relations, and Development Strategies
5 units, Spr (Munoz, O)

OSPSANTG 130X. Latin American Economies in Transition
5 units, Aut (Di Filippo, A)

OSPSANTG 160X. Latin America in the International Economy
5 units, Win (Di Filippo, A)

ENGLISH

Emeriti: (Professors) George H. Brown, W. B. Carnochan, George G. Dekker, Charles N. Fifer, Albert J. Gelpi, Barbara C. Gelpi, David Halliburton, Shirley Heath, John L'Heureux, Herbert Lindenberger, John Loftis, Diane W. Middlebrook, Thomas C. Moser, Nancy H. Packer, Marjorie G. Perloff, Ronald A. Rebholz, Lawrence V. Ryan, Wilfred H. Stone, Elizabeth C. Traugott, Wesley Trimpi; *(Associate Professor)* Sandra Drake; *(Professor, Teaching)* Larry Friedlander; *(Senior Lecturer)* Helen B. Brooks
Chair: Ramón Saldívar
Director of Creative Writing Program: Eavan Boland
Director of Program in Writing and Rhetoric: Andrea A. Lunsford
Professors: John B. Bender (English, Comparative Literature), Eavan Boland, Terry Castle, W. S. Di Piero (on leave Autumn), J. Martin Evans, John Felstiner, Kenneth W. Fields, Shelley Fisher Fishkin, Jay W. Fliegelman (on leave), Roland Greene (English, Comparative Literature), Seth Lerer (English, Comparative Literature; on leave Autumn, Winter), Andrea A. Lunsford (on leave Autumn), Franco Moretti (English, Comparative Literature), Stephen Orgel, Patricia A. Parker (English, Comparative Literature), Peggy Phelan (English, Drama), Robert M. Polhemus, Arnold Rampersad, David R. Riggs, Ramón Saldívar (English, Comparative Literature), Elizabeth Tallent, Tobias Wolff
Associate Professors: Michele Elam, Denise Gigante, Ursula Heise, Blair Hoxby, Gavin Jones, Paula Moya, Jennifer Summit, Blakey Vermeule, Alex Woloch
Assistant Professors: Nicholas Jenkins, Saikat Majumdar, Judith Richardson, Christopher Rovee (on leave), Stephen Sohn
Senior Lecturer: Claude Reichard
Courtesy Professor: Bryan Wolf
Courtesy Associate Professor: Joshua Landy
Lecturers: Andrew Altschul, Rusty Dolleman, Keith Ekiss, Evan Horowitz, Maria Hummel, Scott Hutchins, Adam Johnson, Tom Kealey, David MacDonald, Sara Michas-Martin, Jeff O'Keefe, Angela Pneuman, Rita Mae Reese, Alice Staveley, Edward Steidle, Shimon Tanaka, Michael Wyatt
Acting Professor: Carol Shloss (on leave)
Consulting Professor: Valerie Miner
Consulting Assistant Professor: Matthew Jockers
Visiting Professors: Robert Bly, Gerald Bruns, Sean Shesgreen, Colm Toibin, Abigail Zuger

Department Offices: Building 460, Room 201
Mail Code: 94305-2087
Phone: (650) 723-2635
Web Site: http://english.stanford.edu

Courses given in English have the subject code ENGLISH. For a complete list of subject codes, see Appendix.

The Department of English seeks to teach and promote an understanding of the significance and history of British, American, and Anglophone literatures and to foster an appreciation of the richness and variety of texts in the language. In the undergraduate program, it offers rigorous training in interpretive thinking and precise expression, teaching students to invent ideas, organize them, draw deductions and make connections to new ideas, and articulate them in eloquent and convincing ways. The English graduate program features the study of imaginative language, rhetoric, and the poetic and narrative arts and it focuses on the roles that imaginative writing and representations play in almost every aspect of human experience. Completing the B.A., M.A., or Ph.D. curricula prepares students of English to adapt, to think, and communicate inventively, and to be cultured and humane in their approach to life.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The English Major is designed to provide students with both an understanding of the development of literatures in English and an appreciation of the variety and richness of literary texts. It offers a rigorous training in interpretive thinking and precise expression.

PREPARATION FOR THE MAJOR

The following departmental requirements are in addition to the University's basic requirements for the bachelor's degree. With the exception of the course in Poetry and Poetics or any other when taken to satisfy the Writing in the Major (WIM) requirement, any two of the requisite courses may be taken on a satisfactory/no credit basis at the discretion of the instructor.

MAJOR PROGRAMS OF STUDY

Because the Department of English recognizes that the needs and interests of literature students vary, it has approved several major programs of study. Each of these has different objectives and requirements; students should consider carefully which program of study corresponds most closely to their personal and intellectual objectives.

MAJOR IN ENGLISH LITERATURE

This program provides for the interests of students who wish to understand the range and historical development of British and American literatures and a variety of critical methods by which their texts can be interpreted. The major emphasizes the study of literary forms and genres and theories of textual analysis.

Students declaring a major in English Literature must choose a total of twelve 5-unit courses. At least one of these courses must be in American literature and at least one must be in British literature after 1750. The twelve courses must be chosen to fulfill the following six categories of requirements:

1. Two courses in British literature before 1750.
2. Two courses in British literature from 1750 to 1900 or American literature before 1900.
3. One course in Shakespeare.
4. ENGLISH 160. Poetry and Poetics
5. One course in critical methods.
6. Five additional elective courses, only one of which may be a creative writing course, chosen from among those offered by the Department of English. Students must choose three of these courses from one of the following concentrations:
   a) a specific genre: drama, film, lyric poetry, or prose fiction
   b) a specific historical period: literature before 1750, literature between 1750 and 1900, or literature after 1900
   c) one of the following areas of interest: gender and sexuality; language and rhetoric; literary theory; race and ethnicity; or single authors

Consult the English Department for a list of the courses under each of these concentrations for 2007-08. In lieu of one of these concentrations, students may take three courses from another well-defined area of interest with the approval of their adviser and the Director of Undergraduate Studies.

In place of one of these five elective courses, students may choose one upper-division course in a foreign literature read in the original language.

At least one of the courses satisfying the major must be a major's seminar, which is any of the 5-unit seminar courses offered in the English department or an English seminar offered in the Stanford in Oxford program at St. Catherine's College.

Students are urged not to postpone satisfying this requirement until late in their major career. Undue tardiness may result in a delay of degree conferral. Students are encouraged to take seminar format courses in both junior and senior years, and to take ENGLISH 160, Poetry and Poetics, and the critical methods requirements early in their major career.

Students may apply as many as four English courses taken at other approved universities towards the English major. Approval of such courses towards the major is at the discretion of the Director of Undergraduate Studies. Requests for transfer credit, including course syllabi and official transcript, should be submitted to the undergraduate student services coordinator, and to the Office of the University Registrar's external credit evaluation section.

Foreign Language Requirement—There is no foreign language requirement for English majors beyond the university requirement, but students who plan to study English at the graduate level should be aware that advanced reading skills in one or more foreign languages enhance their chances of admission to and success in most Ph.D. programs.

EMPHASIS IN THE ENGLISH MAJOR

English with a Creative Writing Emphasis—This program is designed for students who want a sound basic knowledge of the English literary tradition as a whole and at the same time want to develop skills in writing poetry or prose. Students declaring an English major with a Creative Writing Emphasis during Autumn Quarter 2006 and thereafter must take a total of thirteen 5-unit courses offered through the Department of English and the Program in Creative Writing and fulfill the seminar requirement. The thirteen courses must be chosen to fulfill the following requirements:

1. Two courses in British literature before 1750.
2. Two courses in British literature from 1750 to 1900 or American literature before 1900.
3. One course in Shakespeare.
4. ENGLISH 160. Poetry and Poetics
5. One course in critical methods.
6. One course in 20th-century literature.
7. Majors with the Creative Writing Emphasis must take five courses designed for the prose or poetry concentration. Prose writers must first take one beginning prose class (ENGLISH 90, Fiction Writing, or ENGLISH 91, Creative Nonfiction), then two intermediate or advanced prose classes (ENGLISH 190, 190F,G,P,R,V, 191, or 290). Prose writers must also take ENGLISH 146, Development of the Short Story, and ENGLISH 92, Reading and Writing Poetry. Poetry writers must first take ENGLISH 92, Reading and Writing Poetry, then two intermediate or advanced poetry classes (ENGLISH 192, 192P,V, or 292). In addition to the WIM course, ENGLISH 160, Poetry and Poetics, poetry writers must take one other literature course in poetry to be approved by a professor in the Creative Writing program, and one beginning prose class (ENGLISH 90, Fiction Writing, or ENGLISH 91, Creative Nonfiction). Courses taken to satisfy one of the six requirements above cannot also satisfy a Creative Writing requirement. ENGLISH 198 or tutorials taken elsewhere, such as tutorials in the Overseas Studies Program, may not be substituted for required courses.

English with Interdisciplinary Emphasis—This program is intended for students who wish to combine the study of one broadly defined literary topic, period, genre, theme or problem with an interdisciplinary program of courses relevant to that inquiry. Students are required to fulfill the language and seminar requirements listed under the major in English. Students declaring an English major with an interdisciplinary emphasis must choose a total of fourteen 5-unit courses. These courses must fulfill the following requirements:

1. Two courses in British literature before 1750.
2. Two courses in British literature from 1750 to 1900 or American literature before 1900.
3. One course in Shakespeare.
4. ENGLISH 160. Poetry and Poetics
5. One course in critical methods.
6. Three additional elective courses chosen from among those offered by the Department of English. Students must select two of these courses in relation to their interdisciplinary focus.
7. Four courses related to the area of inquiry from disciplines such as anthropology, the arts (including the practice of one of the arts), classics, comparative literature, European or other literature, feminist studies, history, modern thought and literature, political science, and African American studies. These courses should form a coherent program and must be relevant to the focus of the courses chosen by the student to meet the requirement. Each of these courses must be approved in advance by

the interdisciplinary program director. In addition, students in the interdisciplinary program must write at least one interdisciplinary paper. This may be a senior honors essay (197), a senior independent essay (199), an individual research paper (194 or 198), or a paper integrating the material in two courses the student is taking in two different disciplines.

ENGLISH AND PHILOSOPHY

This track is for students who wish to explore interdisciplinary studies at the intersection of literature and philosophy while acquiring knowledge of the English language literary tradition as a whole.

Students choosing the English and Philosophy track must complete sixteen courses for a minimum of 70 units, of which at least eight 5-unit courses must be within the English department. At least one course must be in each of American literature and British literature after 1750. At least one course must be an English department seminar. Students must fulfill the following requirements:

Literature—

1. Two courses in British literature before 1750.
2. Two courses in British literature from 1750 -1900 or American literature before 1900.
3. One course in Shakespeare.
4. English Writing in the Major: ENGLISH 160, Poetry and Poetics.
5. One course in critical methods.

Philosophy—

1. Philosophy Writing in the Major: PHIL 80. Prerequisite: introductory philosophy course.
2. Aesthetics, Ethics, Political Philosophy: a course from PHIL 170 series.
3. Language, Mind, Metaphysics, and Epistemology: one course from PHIL 180 series.
4. History of Philosophy: two courses in the history of philosophy, numbered above PHIL 100.

Literature and Philosophy—

1. Gateway course in philosophy and literature (ENGLISH 81). This course should be taken as early as possible in the student's career, normally in the sophomore year.
2. Two upper division courses of special relevance to the study of philosophy and literature. A list of approved courses is available from the Director of Undergraduate Studies in English.
3. Capstone seminar of relevance to the study of philosophy and literature, drawn from a list approved by the Director of Undergraduate Studies in English.

MINORS

Both the Department of English and the Creative Writing program offer a distinct minor.

English Literature—The minor in English Literature offers some flexibility for those students who want to pursue specific interests within British and American literature, while still requiring certain courses that ensure coverage of a variety of periods, genres, and methods of studying literature. In order to graduate with a minor in English, students must complete the following program of seven 5-unit courses, at least one of which must be a seminar:

1. ENGLISH 160. Poetry and Poetics
2. One course from each of the following historical periods:
    a) British literature to 1750
    b) British literature from 1750 to 1900 or American literature before 1900
    c) 20th-century British or American literature
3. One course in Shakespeare
4. Two elective courses

One of the two elective courses may be a course in Creative Writing.

Creative Writing—The minor in Creative Writing offers a structured environment in which students interested in writing prose or poetry develop their skills while receiving an introduction to literary forms. Students choose a concentration in either prose or poetry. All courses must be taken for a letter grade.

1. ENGLISH 94. Introduction to Creative Writing: Form and Structure
2. Four writing workshops, three in the chosen concentration, one outside.
    a) prose writers must first take one beginning prose class (ENGLISH 90, Fiction Writing, or ENGLISH 91, Creative Nonfiction), then two intermediate or advanced prose classes (ENGLISH 190, 190F,G,P,R,V, 191, or 290). Prose writers must also take ENGLISH 92, Poetry Writing.
    b) poetry writers must first take ENGLISH 92, Poetry Writing, then two intermediate or advanced poetry classes (ENGLISH 192, 192P,V, or 292). Poetry writers must also take one beginning prose class (ENGLISH 90 or 91).
3. One literature course: prose writers must take ENGLISH 146, The Development of the Short Story; poetry writers must take ENGLISH 160, Poetry and Poetics.

INTERDEPARTMENTAL MAJORS

English and French Literatures—This major provides a focus in British and American literature with additional work in French literature. The program of each student must be approved by the Director of Undergraduate Studies in English and by the Department of French and Italian.

Students declaring a major in English and French must choose a total of thirteen 5-unit courses, at least one of which must be a seminar. In addition, at least one of the courses must be in American literature and at least one must be in British literature after 1750. These courses are to be selected from the following categories.

1. Two courses in British literature before 1750.
2. Two courses in British literature from 1750 to 1900 or American literature before 1900.
3. One course in Shakespeare.
4. ENGLISH 160. Poetry and Poetics.
5. One course in critical methods.
6. Two elective courses.
7. A coherent program of four courses in French literature, read in the original.

English and German Literatures—Candidates for the B.A. in this major must complete a program exactly analogous to the preceding major, with nine courses in British and American literature, and a coherent program of four courses in German literature, read in the original, with approval by the departments involved as specified above.

English and Italian Literatures—Candidates for the B.A. in this major must complete a program exactly analogous to the preceding major, with nine courses in British and American literature, and a coherent program of four courses in Italian literature, read in the original, with approval by the departments involved as specified above.

English and Spanish or Spanish American Literatures—Candidates for the B.A. in this major must complete a program exactly analogous to the preceding major, with nine courses in British and American literature, and a coherent program of four courses in Spanish literature, read in the original, with approval by the departments involved as specified above.

ADVANCED WORK

INDIVIDUAL RESEARCH

Students taking 100- or 200-level courses may, with the consent of the instructor, write a follow-up 5-unit paper based on the course material and due no later than the end of the succeeding quarter (register for 194). The research paper is written under the direct supervision of the professor; it must be submitted first in a preliminary draft and subsequently in a final version.

SENIOR INDEPENDENT ESSAY

The senior independent essay gives senior English majors the opportunity to work throughout the year on a sustained piece of critical or scholarly work of around 10,000 words on a topic of their choice, with the close guidance of a faculty adviser. Each student is responsible for finding an adviser, who must approve the proposed topic before the end of the third quarter prior to expected graduation. The senior essay is read and graded by the adviser and one other member of the English faculty. Senior independent essay students register for ENGLISH 199.

HONORS PROGRAM

Students who wish to undertake a formal program of advanced literary criticism and scholarship, including the honors seminar and independent research, are invited to apply for the honors program in the Winter Quarter of the junior year. Any outstanding student is encouraged to engage in an honors thesis project.

Admission is selective. Provisional admission is announced in March. Permission to continue in the program is contingent upon submission, by May 15 of the junior year, of a Senior Honors Essay proposal with a bibliography. Honors students are encouraged to complete the following English major requirements before the start of their senior year: critical methods and ENGLISH 160. Poetry and Poetics.

In the Autumn Quarter of the senior year, students take a 5-unit honors seminar on critical approaches to literature. The senior-year seminar is designed to introduce students to the analysis and production of advanced literary scholarship. Students who are studying at Oxford or at other institutions may be exempted from this seminar on request and with the approval of the director of the honors program.

In Winter Quarter of the senior year, honors students take a 3-unit essay workshop focused on the process of researching and writing the essay.

In the senior year, honors students complete the senior honors essay for 10 units under supervision of a faculty adviser.

The deadline for submitting the honors essay is May 15. Essays that receive a grade of 'A-' or above are awarded honors.

Students in the honors program complete the requirements of the major and the following:

Senior seminar and workshop, 8 units total
Senior Honors Essay, 10 units

For other opportunities for extended essay projects, see "Senior Independent Essay" above and ENGLISH 194 and 199.

HONORS PROGRAM IN HUMANITIES

An honors program in Humanities is available for English Literature majors who wish to supplement the major with a related and carefully guided program of studies. See the "Interdisciplinary Studies in Humanities" section of this bulletin for a description of the program. Students wishing to take the Comparative Literature option within the honors program in Humanities should see the "Comparative Literature" section of this bulletin.

THE ENGLISH MAJOR AND THE OVERSEAS CAMPUSES

The flexibility of the English major permits students to attend an overseas campus in any quarter, but it is advisable, and in some cases essential, that students spend their senior year at Stanford if they wish to participate in the Honors Program or a special in-depth reading course. For more information on Stanford overseas programs, see the "Overseas Studies" section of this bulletin.

Students should consult their advisers and the undergraduate program officer to make sure that they can fulfill the requirements before graduation. The Stanford Program in Oxford usually offers courses which apply toward both University requirements and area requirements for the English major. In either case, students should save the syllabi from their courses if they wish to apply to use them to fulfill an English major requirement.

VISITING STUDENTS

Students who do not wish to become candidates for a graduate degree, but who are qualified to meet the standards of admission to a master's or Ph.D. program, may apply to Graduate Admissions for admission as nonmatriculated students for a period of not more than three consecutive quarters. Each quarter, they may take up to three English courses numbered 101 to 299, or two such courses and (with the consent of the instructor) one English course numbered above 300.

GRADUATE PROGRAMS

For University regulations governing advanced degrees, see the "Graduate Degrees" section of this bulletin.

Eligibility—Students with a bachelor's degree of acceptable quality may apply to pursue graduate work toward an advanced degree in English at Stanford. (Formal application for candidacy is a separate step taken somewhat later.) Students whose previous preparation is in a field other than English are expected to make up deficiencies. Credits for previous graduate work at Stanford or elsewhere more than five years old may be reevaluated or rejected.

Graduate students are admitted as candidates for only the Ph.D. or the M.A. in English and American Literature. The M.A. program is a terminal, one-year program without financial aid.

MASTER OF ARTS

Candidates may earn the master's degree in English and American Literature by satisfying the following requirements:

1. Successful completion with a 3.0 (B) grade point average (GPA) of at least nine courses (a minimum of 45 units), two of which must be 300-level courses. Ordinarily, graduate students enroll in courses numbered 200 and above. They may take no more than two courses numbered 101-199 without the consent of the Director of Graduate Studies. The master's student may take no more than 10 units of directed reading and research (ENGLISH 398). Interested students should consult their faculty adviser or the graduate program adviser for further details.

   During the first two weeks of the first quarter, candidates for the master's degree in English and American Literature should consult the adviser designated by the Director of Graduate Studies in order to draw up a three quarter study plan. The student's program consists of five required courses: ENGLISH 296; two courses in literature before 1800 and two courses in literature after 1800; plus four elective courses representing a mixture of survey and specialized courses chosen to guarantee familiarity with a reasonable proportion of the works on the reading list for doctoral candidates. Students whose undergraduate transcripts do not show courses in the following areas should take courses in these areas as part of their M.A. program: Medieval, Renaissance, 18th century, 19th century, 20th century (the latter two in either British or American literature). Normally, no more than two courses taken outside the department may count toward the degree, but the graduate studies committee considers exceptions. No creative writing courses may be used to fulfill the requirements.

   Candidates who can demonstrate unusually strong preparation in the history of English literature may undertake a 40 to 60-page master's thesis. Such candidates may register for up to 10 units of ENGLISH 399 with the faculty member who supervises the thesis work. Candidates who write a master's thesis may petition to be excused from up to 10 units of the requirements described above. The additional 35 units normally consist of the five required courses and two elective courses. These courses are chosen by the student and approved by the adviser and the Director of Graduate Studies.
2. Demonstration of a reading knowledge of one foreign language. (For ways of fulfilling this requirement, see the section below on language requirements for the Ph.D.)

COTERMINAL BACHELOR'S AND MASTER'S DEGREES IN ENGLISH LITERATURE

Students in the major who are interested in further postgraduate work in English may apply for Stanford's coterminal master's program. Candidates for a coterminal master's degree must fulfill all requirements for the M.A. in English (including the language requirement), as well as general and major requirements for the B.A. in English. A minimum GPA of 3.7 in the major is required of those applying for the coterminal master's degree. Students must also take the GRE exam in the year in which they apply. No courses used to satisfy the B.A. requirements (either as General Education Requirements or department requirements) may be applied toward the

M.A. No courses taken more than two quarters prior to admission to the coterminal master's program may be used to meet the 45-unit University minimum requirement for the master's degree.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

COTERMINAL PROGRAM WITH SCHOOL OF EDUCATION

Students interested in becoming middle school and high school teachers of English may apply for admission to the Coterminal Teaching Program (CTP) of the Stanford Teacher Education Program (STEP) in the School of Education. CTP students complete a special curriculum in English language, composition, and literature that combines a full English major with supplemental course work in subjects commonly taught in California public schools and a core program of foundational courses in educational theory and practice. They are then admitted to STEP for a fifth year of pedagogical study and practice teaching. Students who successfully complete the curriculum requirements are able to enter STEP without the necessity of taking either the GRE or the usual subject matter assessment tests. At the end of five years, CTP students receive a B.A. in English, an M.A. in Education, and a California Secondary Teaching Credential. Students normally apply to the Coterminal Teaching Program at the end of their sophomore year or at the beginning of their junior year. For complete program details and for information on how to apply, consult the Director of Undergraduate Studies in English or the CTP coordinator in the School of Education.

DOCTOR OF PHILOSOPHY

University regulations regarding the Ph.D. are discussed in the "Graduate Degrees" section of this bulletin.

The following department requirements, dealing with such matters as residence, dissertation, and examinations, are in addition to the University's basic requirements for the doctorate. (Students should consult the most recent edition of *The Ph.D. Handbook*; copies are available in the English graduate studies office.)

A candidate for the Ph.D. degree must complete three years (nine quarters) of full-time work, or the equivalent, in graduate study beyond the bachelor's degree. Candidates are required to complete at least 135 units of graduate work in addition to the doctoral dissertation. At least three consecutive quarters of graduate work, and the final course work in the doctoral program, must be taken at Stanford.

A student may count no more than 65 units of non-graded courses toward the 135 course units required for the Ph.D., without the written consent of the Director of Graduate Studies. A student takes at least 70 graded units (normally fourteen courses) of the 135 required total units (396L, 397A, 398, and 399 do not count toward the 70 graded units). No more than 10 units (normally two courses) may come from 100-level courses.

This program is designed to be completed in five years. Five quarters of supervised teaching, two as a teaching assistant in a literature course, one as a teaching apprentice, and two as the instructor of a Program in Writing and Rhetoric (PWR) course, are a requirement of the Ph.D. program.

In the first quarter of their first year, students take a 2-unit seminar in pedagogy as preparation for their initial teaching assistantship. In the first quarter of their second year, students take a pedagogy seminar and an apprentice teaching program. The seminar and apprentice teaching constitute a 50-percent teaching appointment. Apprentice teachers attend the classes and conferences of a senior mentor/instructor for two to three weeks. While teaching during the second and third quarters of the second year, students continue to participate in a series of PWR pedagogy workshops and visit one another's classrooms.

ENGLISH AND AMERICAN LITERATURE

All students are expected to do course work across the full range of English and American literature. Students would be required to fulfill the following requirements. Note: fulfillment of requirements 1, 2, and 3 must be through Stanford courses; students are not excused from these three requirements or granted credit for course work done elsewhere.

1. ENGLISH 396, Introduction to Graduate Study for Ph.D. Students (5 units), a course that introduces students to the methods of literary study, and ENGLISH 396L, Pedagogy Seminar I, for first year students (2 units).
2. Graduate-level (at least 200-level) course work in English literature before 1700, and English and American literature after 1700 (at least 5 units of each).
3. Graduate-level (at least 200-level) course work in some aspect of literary theory such as courses in literary theory itself, narrative theory, poetics, rhetoric, cultural studies, gender studies at least 5 units).
4. Students concentrating in British literature are expected to take at least one course (5 units) in American literature; students concentrating in American literature are expected to take at least one course (5 units) in British literature.
5. Of all courses taken, a minimum of six courses for a letter grade must be graduate colloquia and seminars, of which at least three must be graduate seminars. The colloquia and seminars should be from different genres and periods, as approved by the adviser.
6. Completion, in Autumn Quarter of the second year, of a pedagogy seminar which includes the Apprentice Teaching Program described above, and a series of pedagogy workshops during Winter and Spring quarters. There are no units associated with this work.
7. The remaining units of graded, graduate-level courses and seminars should be distributed according to the adviser's judgment and the candidate's needs. A student may receive graduate credit for no more than two 100-level courses in the Department of English.
8. Consent of the adviser if courses taken outside the Department of English are to count toward the requirement of 70 graded units of course work.
9. An oral qualifying examination based on a reading guide, to be taken at the end of the summer after the first year of graduate work. The final decision as to qualification is made by the graduate studies committee in consideration of the student's overall record for the first year's work in conjunction with performance on the examination. *Note:* A student coming to the doctoral program who has done graduate work at another university must petition in the first year at Stanford for transfer credit for course work completed elsewhere. The petition should list the courses and grades, and describe the nature and scope of course work, as well as the content, contact hours, and writing requirements. A syllabus must be included. The Director of Graduate Studies considers the petition in conjunction with the student's overall performance.
10. A University Oral Examination to be taken no later than the Spring Quarter of the student's third year in the Ph.D. program. This examination covers the field of concentration as defined by the student and the student's adviser.

ENGLISH AND COMPARATIVE LITERATURE

The Ph.D. program in English and Comparative Literature is designed for students wishing an extensive knowledge of the literature, thought, and history of England and of at least one foreign country, for one period. Approximately half of the student's course work and reading is devoted to this period, with the remainder of the time given to other periods of English and American literature since 1350.

This degree, administered by the Department of English, is to be distinguished from the Ph.D. in Comparative Literature. The latter program is intended for students unusually well prepared in foreign languages and involves advanced work in three literatures, one of which may be English. Interested students should consult a Department of English adviser, but faculty from Comparative Literature may also provide useful supplementary information.

The requirements are as follows:

1. Qualifications: see item 9 under requirements of the Ph.D. program in English literature. For qualifications in the doctoral program in English and Comparative Literature, candidates are not held responsible for literature before 1350, but instead include on their reading list a selection of works from a foreign literature read in the original language.
2. A knowledge of the basic structure of the English language and of Chaucer. This requirement may be met by examination, or by taking

10 units of courses chosen from among those offered in linguistics, English philology, and early and middle English literature including Chaucer. No particular courses are required of all students.

3. A 5-unit course, ENGLISH 396, Introduction to Graduate Study, and a 2-unit course, ENGLISH 396L, Seminar in Pedagogy I.
4. Completion, in Autumn Quarter of the second year, of a pedagogy seminar, which includes the Apprentice Teaching Program described above, and a series of pedagogy workshops during winter and spring quarter. There are no units associated with this work.
5. A knowledge of one foreign language sufficient to take graduate-level literature courses in a foreign-language department and an advanced reading knowledge of a second language.
6. A minimum of 45 units in the history, thought, and literature of one period, in two or more languages, one of which must be English and one foreign. Students normally include at least two courses in a foreign literature read in the original language and two courses listed under Comparative Literature or Modern Thought and Literature. As many as 20 units of this requirement may be satisfied through courses in reading and research. A student may receive graduate credit for no more than two 100-level courses in the Department of English.
7. A minimum of six courses for a letter grade from graduate colloquia and graduate seminars, of which three must be graduate seminars and of which at least four must be in the Department of English. Among these courses, students should take one in literary theory or criticism. These colloquia and seminars should be in different genres and periods as approved by the adviser.
8. A University oral examination covering the field of concentration (as defined by the student and the student's adviser). This examination, based on a reading list established by the candidate in consultation with his or her adviser, is normally taken no later than the Spring Quarter of the third year of graduate study. However, those who spend the third year studying abroad may take this examination after their return early in the fourth year.

LANGUAGE REQUIREMENTS

All candidates for the Ph.D. degree (except those in English and Comparative Literature, for whom special language requirements prevail) must demonstrate a reading knowledge of two foreign languages. Candidates in the earlier periods must offer Latin and one of the following languages: French, German, Greek, Italian, or Spanish. In some instances, they may be required to offer a third language. Candidates in the later period (that is, after the Renaissance) must offer either French, German, or Latin as one language and may choose the second language from the following: Greek, Latin, French, German, Italian, Spanish, Russian, or another language relevant to the student's field of study. In all cases, the choice of languages offered must have the approval of the candidate's adviser. Any substitution of another language must be approved by the Director of Graduate Studies.

The graduate studies committee does not accept courses taken as an undergraduate in satisfaction of the language requirement for doctoral candidates. For students coming to doctoral work at Stanford from graduate work done elsewhere, satisfaction of a foreign language requirement is determined by the Director of Graduate Studies based on the contact hours, syllabus, reading list, etc. Transfer is not automatic.

The candidate must satisfy one language requirement by the end of the first year (that is, before registration in the following year), and the other by the end of the third year.

Foreign language requirements for the Ph.D. may be fulfilled in any of the following ways:

1. A reading examination given each quarter by the various language departments, except for Latin and Greek.
2. For Latin and Greek, an examination given by one of the Department of English faculty.
3. Passage with a grade of 'B' or higher of a course in literature numbered 100 or higher in a foreign language department at Stanford. As an alternative for Latin, French, Italian, German, and Spanish, passage of CLASSLAT 51 and 52, FRENLANG 50, ITALLANG 50, GERLANG 52, and SPANLANG 50, respectively, with a grade of 'B' or higher.

CANDIDACY

Students are expected to file for candidacy after successful completion of qualifying procedures and, in any event, by the end of the second year of doctoral study. Candidacy is valid for five years, and may be extended, subject to satisfactory progress.

DISSERTATION

As early as possible during graduate study, a Ph.D. candidate is expected to find a topic requiring extensive original research and to seek out a member of the department as his or her adviser. The adviser works with the student to select a committee to supervise the dissertation. Candidates should take this crucial step as early in their graduate careers as possible. The committee may well advise extra preparation within or outside the department, and time should be allowed for such work.

Immediately after the dissertation topic has been approved by the adviser, the candidate should file a formal reading committee form as prescribed by the University.

The dissertation must be submitted to the adviser as a rough draft, but in substantially final form, at least four weeks before the University deadline in the quarter during which the candidate expects to receive the Ph.D. degree.

JOINT PH.D. IN ENGLISH AND HUMANITIES

The Department of English participates in the Graduate Program in Humanities leading to the joint Ph.D. degree in English and Humanities. For a description of that program, see the "Interdisciplinary Studies in Humanities" section of this bulletin.

PH.D. IN MODERN THOUGHT AND LITERATURE

Stanford also offers a Ph.D. degree in Modern Thought and Literature. Under this program, students devote approximately half of their time to a modern literature from the Enlightenment to the present, and the other half to interdisciplinary studies. Interested students should see the "Modern Thought and Literature" section of this bulletin and consult the chair of the program.

CREATIVE WRITING FELLOWSHIPS

The Creative Writing Program each year offers five two-year fellowships in poetry and five two-year fellowships in fiction. These are not degree-granting fellowships. Information is available in the Creative Writing office, (650) 725-1208.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Classics, Comparative Literature, French and Italian, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese, in the Program in Modern Thought and Literature, and in the Division of Literatures, Cultures, and Languages.

NUMBERING SYSTEM

Pre-1750:	
100-110	Lecture Courses
111-119	Seminar Courses
1750-1900:	
120-129	Lecture Courses
130-139	Seminar Courses
Post-1900:	
140-149	Lecture Courses
150-159	Seminar Courses
Required Courses:	
160-169	
Themes and Topics:	
170-179	Lecture Courses
180-189	Seminar Courses
Courses for Advanced Undergraduates and Graduate Students:	
200-289	
Graduate Colloquia:	
300-313	
Graduate Seminars:	
314-389	
Writing Courses, Workshops, Individual Study:	
90-99, 190-199, 290-299, 390-399	

INTRODUCTION TO THE HUMANITIES (IHUM)

The following Introduction to the Humanities courses are taught by English department faculty members. IHUM courses are typically available only to freshmen seeking to fulfill IHUM requirements; see the "Introduction to the Humanities" section of this bulletin for further information. Prospective majors in English are advised to consider satisfying their IHUM-2,3 requirements by registering for the following IHUM courses.

IHUM 34 A,B. A Life of Contemplation or Action? Debates in Western Literature and Philosophy—Literary treatments of the debate over the active versus the contemplative life from the classical to the modern era. Changing literary, historical and philosophical contexts. GER:IHUM-2,3

IHUM 34A: *4 units, Win (Summit, J)*

IHUM 34B: *4 units, Spr (Vermeule, B)*

INTRODUCTORY (FOR NON-MAJORS)

Classes for students whose major is undeclared, or who are not majoring in English.

ENGLISH 9. Masterpieces of English Literature I: Chaucer, Shakespeare, Milton, and their Contemporaries—(English majors and others taking 5 units, register for 109.) Survey. Major and minor English works from the end of the Middle Ages through the end of the Renaissance. GER:DB-Hum

3 units, Win (Riggs, D)

ENGLISH 14Q. John Donne: His Poetry, Prose, and the Early Modern World—Stanford Introductory Seminar. Preference to sophomores. Situating Donne's work within his historical and cultural milieu; how his writing reflects changes on the threshold of the modern era. The influence of his dramatic realism on modern poets such as Browning, Eliot, and Rich, and composers such as Benjamin Britten and Bob Dylan. GER:DB-Hum

4-5 units, Aut (Brooks, H)

ENGLISH 20. Masterpieces of English Literature II: From the Enlightenment to the Modern Period—(English majors and others taking 5 units, register for 120.) From the 18th to the 20th centuries. Topics include the rise of the novel, lyric and dramatic poetry, Romanticism, realism, Modernism, characterization, narrative voice, and the influence of history on literature. GER:DB-Hum

3 units, Spr (Gigante, D)

ENGLISH 21. Masterpieces of American Literature: American Nomads from the Frontier to Cyberspace—(English majors and others taking 5 units, register for 121.) How Americans from the first settlers to contemporary Internet users have defined their identity relation to different modes of mobility, travel, and rootedness. Early Puritan encounters with the wilderness; 19th-century romantic images of farm and forest; and 20th-century visions of the modern metropolis, international travel, and cyberspace. Readings include novels, short stories, poetry, and essays by Bradford, Rowlandson, Fenimore Cooper, de Tocqueville, Emerson, Thoreau, Whitman, Turner, Cather, Faulkner, Kerouac, Anzaldúa, Yamashita, and Gibson. GER:DB-Hum

3 units, Aut (Heise, U)

ENGLISH 43. Introduction to African American Literature—(English majors and others taking 5 units, register for 143.) The slave narrative and representative genres (poetry, short stories, essays, novels). Works by Douglass, Jacobs, Chesnutt, Du Bois, Dunbar, Toomer, Hurston, Wright, Baldwin, and Morrison. GER:DB-Hum

3 units, Aut (Elam, M)

ENGLISH 43A. American Indian Mythology, Legend, and Lore—(English majors and others taking 5 units, register for 143A.) GER:DB-Hum

3 units, Win (Fields, K)

ENGLISH 43B. Introduction to Chicana/o Literature and Culture—(English majors and others taking 5 units, register for 143B.) Introduction to the literature and culture of this nation's second largest ethnic minority. Works by Paredes, Gonzales, Alurista, Cervantes, Rivera, Cisneros, Viramontes, Moraga, Anzaldúa, Burciaga, Rodríguez, Gómez, Valdez, Serros. GER:DB-Hum

3 units, Aut (Moya, P)

ENGLISH 43C. Introduction to Asian American Literature—(English majors and others taking 5 units, register for 143C.) Asian American literature as an interdisciplinary field, combining history, politics, and literature to articulate changing group and individual identity. Themes include aesthetics, colonialism, immigration, transnationalism, globalization, gender, and sexuality. GER:DB-Hum, EC-AmerCul

3 units, Aut (Sohn, S)

ENGLISH 45F. American Detective Fiction: From Low Art to High Culture—(English majors and others taking 5 units, register for 145F.) Cultural and literary contexts. Topics include 18th-century criminals, Edgar Allan Poe's stories, Mark Twain's *Pudd'nhead Wilson*, the Lizzie Borden murder case, the influence of Sherlock Holmes, dime novels and pulp fiction, film noir including Hitchcock's *Strangers on a Train*, Raymond Chandler's *The Big Sleep*, and Walter Mosley's *Devil in a Blue Dress*. GER:DB-Hum

3 units, Aut (Moser, J)

ENGLISH 47. Masterpieces of Contemporary Literature—(English majors and others taking 5 units, register for 147.) Prose, poetic and dramatic works from the late 19th century to the present; focus is on British literature. Social, cultural, and historic contexts of writers such as Woolf, Eliot, Forster, and Joyce; how their experimentations with form and narrative voice reflected major technological, political, and aesthetic concerns such as WW I, suffrage debates, and empire. Questions of legacy: how writers in today's postcolonial Britain, such as Zadie Smith and Ian McEwan, are inheritors of literary movements as well as innovators. GER:DB-Hum

3 units, Spr (Staveley, A)

ENGLISH 60. Poetry and Poetics—(English majors and others taking 5 units, register for 160.) Introduction to the reading of poetry, with emphasis on how the sense of poems is shaped through diction, imagery, and technical elements of verse. GER:DB-Hum

3 units, Aut (Jenkins, N), Win (Felstiner, J), Spr (Boland, E)

ENGLISH 74. The Novel: Developments in Modern Prose Narrative Fiction—(English majors and others taking 5 units, register for 174.) The genre which has dominated modern literary culture, defined the shared social world, and offered influential models of human consciousness and interiority. Turning points in the history of the novel and how formal breakthroughs are embedded within and speak to history. Possible authors include Defoe, Austen, Dostoevsky, Dickens, Flaubert, Woolf, Beckett, Nabokov, Perec, and McCarthy. GER:DB-Hum

3 units, Aut (Woloch, A)

ENGLISH 81. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum

4 units, Win (Anderson, L; Landy, J)

INTRODUCTORY SEMINARS

ENGLISH 51N. Drama Queens: Powerful Women on Stage—Stanford Introductory Seminar. Preference to freshmen. Eight strong women at the center of works of Greek, Shakespearean, and modern theater in the context of social misogyny. How they enact the social and spiritual visions of their creators. Sources include film performances. Students perform simple scene work. No acting experience required. GER:DB-Hum

3 units, Aut (Friedlander, L)

ENGLISH 55N. American Sports, American Lives—Stanford Introductory Seminar. Preference to freshmen. The role of sports in American culture through sources such as autobiographies, biographies, and films. Readings include: an autobiography and biography of Jackie Robinson; the film *The Jackie Robinson Story* in which he played himself; Roger Kahn's *The Boys of Summer*; Bernard Malamud's *The Natural*; Frank DeFord's *Big Bill Tilden: The Triumphs and the Tragedy*; and Arthur Ashe's *Days of Grace: A Memoir*. GER:DB-Hum

3 units, Win (Rampersad, A)

ENGLISH 62N. Eros in Modern American Poetry—Stanford Introductory Seminar. Preference to freshmen. Anne Carson, treating love from Sappho to Socrates, shows how the Greeks derived their philosophy from the erotic poetic tradition. Readings include: Carson's poetry which locates erotic desire in the larger context of the desire for knowledge; classic Japanese haiku masters such as Basho; and William Carlos Williams, Louise Bogan, and C.K. Williams. GER:DB-Hum

3 units, Win (Fields, K)

ENGLISH 66N. Homage: The Art of Influence—Stanford Introductory Seminar. Preference to freshmen. Novels and short stories that illuminate the nature and significance of intertextuality. Emphasis is on playful and exploratory rather than theoretical representations of gender and sexual orientation. Works include Ian McEwan's *Saturday*, E. M. Forster's *Howard's End*, Zadie Smith's *On Beauty*, Virgina Woolf's *Mrs. Dalloway*, and Michael Cunningham's *The Hours*. No background in literary criticism required. GER:DB-Hum

3 units, Aut (Tallent, E)

ENGLISH 69Q. Sources of Global Challenges Today, Possibilities for Global Solutions: A Literary Exploration—Stanford Introductory Seminar. Preference to sophomores. Concerns central to literary study, comparative study in race and ethnicity, and African and African American Studies as expressed in fiction from Africa, the Caribbean, the U.S., and Hawai'i. Issues include: relations between the West and the Muslim world; class and race in the U.S.; the shift of world populations from rural society to the metropolis; international immigration and refugee situations; and how women's lives are impacted by society, and how they shape and change it. Opportunities for dialogue with members of local ethnic and religious communities. GER:DB-Hum

3-5 units, Spr (Drake, S)

ENGLISH 70N. Shakespeare on Film—Stanford Introductory Seminar. Preference to freshmen. Introduction to film studies. *A Midsummer Night's Dream* directed by Reinhardt and Hall; *Romeo and Juliet* by Zeffirelli and Luhrman; *Henry V* by Olivier and Branagh; *Hamlet* by Gade, Olivier, Kozintsev, Zeffirelli, Branagh, and Almeryda. GER:DB-Hum

3 units, Spr (Riggs, D)

ENGLISH 77N. Living in the Past: Italy in the Anglo-American Imagination—Stanford Introductory Seminar. Preference to freshmen. Italy as metaphor. English and American images of Italy, its people, and its culture from the Renaissance to the present. GER:DB-Hum

3 units, Aut (Evans, M)

ENGLISH 82Q. Shakespeare's Plays—Stanford Introductory Seminar. Preference to sophomores. Eight representative plays; sonnets. Student papers provide topics for discussion. Students direct and perform scenes from the plays studied. GER:DB-Hum

5 units, Aut (Rebholz, R)

ENGLISH 83Q. Playwriting: A Workshop in Craft—Stanford Introductory Seminar. Preference to sophomores. The fundamentals of crafting a stage play, including genre, dialogue, characterization, and plot. Professional models for such craft elements, and newer approaches. Students develop a dramatic idea into a more polished version of a scene or short one-act play to demonstrate the elements of stagecraft.

4 units, Aut (DiPirro, K)

ENGLISH 87N. The Graphic Novel: Literature Lite?—Stanford Introductory Seminar. Preference to sophomores. The evolution of funnies to comics and graphic novels. How definitions and representations of this genre have changed over the last century. The controversy over the status of the graphic novel. GER:DB-Hum

5 units, Win (Lunsford, A)

ENGLISH 88Q. Imagining Others: Cosmopolitanism in the Twenty-First Century—Stanford Introductory Seminar. Preference to sophomores. Cosmopolitanism as dealing with the consequences of increased social interactions across cultural, political and spatial boundaries, focusing questions related to globalization, nationalism, citizenship, cultural values, and identity. What is cosmopolitanism, and how can it be achieved? Dangers posed by modern cosmopolitan thought, and how these may be tempered. Relationship to the aspirations of liberal egalitarianism, distributive justice, and human rights.

4 units, Win (Savelson, K)

PRE 1750

Lecture courses: 100-109
Seminar courses: 110-119

ENGLISH 103. Crusades: Interdisciplinary Approaches—(Same as HISTORY 215, MEDVLST 165, RELIGST 140.) Causes, meanings, meaningfulness, and commemoration of the Christian expeditions against Muslims, pagans, and heretics. Primary and secondary sources. GER:DB-Hum

3-5 units, Spr (Buc, P; Summit, J; Gelber, H)

ENGLISH 105. The Renaissance—English literature from Sir Thomas More's *Utopia* to Milton's *Paradise Lost*. The good state, the good man, and the good poem. Major literary genres of the period: lyric, romance, comedy, tragedy, and epic. GER:DB-Hum

5 units, Aut (Evans, M)

ENGLISH 109. Masterpieces of English Literature I: Chaucer, Shakespeare, Milton, and their Contemporaries—(Same as 9; see 9.) GER:DB-Hum

5 units, Win (Riggs, D)

ENGLISH 112A. Wicked Witches of the West: Dangerous Women in Greek and Shakespearean Tragedy—Workshop. Women who fascinate, control, and frighten men in classical and Elizabethan drama. The presentation of women in three pairs of Greek and Elizabethan plays and in two 20th-century works. Theatrical styles of each period through doing scenes, watching films, and the history of theater. No background in performing required. GER:DB-Hum, EC-Gender

5 units, Win (Friedlander, L)

ENGLISH 113C. The Two Elizabeths—Parallel issues in the reigns of Elizabeth I (1558-1603) and Elizabeth II (1953-present) through the written cultures of their periods, and critical essays from disciplines and sources including film and music. Themes include insularity, language, religion, politics, class, gender, the other, popular culture, and critics. GER:DB-Hum

5 units, Win (Wyatt, M)

ENGLISH 116A. The Poetry of John Milton—Introduction to Milton's major and minor poems, from *The Death of a Fair Infant* and *Nativity Ode* to *Paradise Regained* and *Samson Agonistes*. GER:DB-Hum

5 units, Win (Evans, M)

ENGLISH 117. 18th-Century Satire—Satire as a cultural universal. The commitment and intensity of 18th-century British satire, by turns funny, brutal, scabrous, and melancholy. How satire tends to focus on sex and power. The role of satire in contemporary American culture: when does speech become too hot to handle? Authors include: Horace, Juvenal, Swift, Pope, Johnson, Burney, Voltaire, and Orwell. GER:DB-Hum

5 units, Spr (Vermeule, B)

1750-1900

Lecture courses:120-129
Seminar courses: 130-139

ENGLISH 120. Masterpieces of English Literature II: From the Enlightenment to the Modern Period—(Same as 20; see 20.) GER:DB-Hum

5 units, Spr (Gigante, D)

ENGLISH 121. Masterpieces of American Literature: American Nomads from the Frontier to Cyberspace—(Same as 21; see 21.) GER:DB-Hum

5 units, Aut (Heise, U)

ENGLISH 122A. Austen and Woolf—Topics include: Austen's historical influence on Woolf; the Austen versus the Woolf narrator ; how each writer uses or transforms fictional techniques such as free indirect discourse and stream of consciousness; how each understands or resists the marriage plot and conventional cultural ideas concerning women and female sexuality; humor, satire, and social commentary. GER:DB-Hum

5 units, Win (Castle, T)

ENGLISH 123. American Literature and Culture to 1855—(Same as AMSTUD 150.) Sources include histories, poetry, autobiography, captivity and slave narratives, drama, and fiction. Authors include Mather, Bradstreet, Rowlandson, Franklin, Brockden Brown, Emerson, Douglass, Hawthorne, and Melville. GER:DB-Hum, EC-AmerCul

5 units, Spr (Richardson, J)

ENGLISH 126B. The Nineteenth-Century English Novel—The novel as a recent innovation developing in 18th-century England. Seven novels spanning the 19th and early 20th centuries, including the Romanticism of Shelley's *Frankenstein*, the realism of the major writers of high Victorian times, the nightmare of Conrad's *Heart of Darkness,* and Woolf's *To the Lighthouse* as a reflection on the 19th-century fictions to which the 20th century was compelled to respond. GER:DB-Hum

5 units, Spr (Polhemus, R)

ENGLISH 133. Johnson, Boswell, and Piozzi—Writers at the center of the artistic and intellectual life of late 18th-century London: Johnson, a commoner who became a celebrated moralist and public intellectual; Boswell, a Scot with aristocratic pretensions, a rake, and the founder of modern biography; and Piozzi, an upper-middle class Londoner and intellectual. Issues include genre, gender, and culture. GER:DB-Hum

5 units, Spr (Shesgreen, S)

ENGLISH 134C. Detectives, Criminals, and Monsters—The role of monsters and criminals in 19th-century literature. The role of the chase by a hero, the detective, through detective stories by Edgar Allan Poe and Arthur Conan Doyle, gothic novels including *Frankenstein* to *Dracula*, and films including *Nosferatu* and *Apocalypse Now*. GER:DB-Hum

5 units, Aut (Horowitz, E)

ENGLISH 135. Victorian Poetry—Rhythms, stanzas, topics, words, and ideas produced by poets including Alfred Tennyson, Matthew Arnold, Christina and Dante Gabriel Rossetti, Robert Browning, Thomas Hardy, and Gerald Manley Hopkins. Social contexts including science, masculinity, religion, history, aestheticism, gender, and sexuality. GER:DB-Hum

5 units, Spr (Horowitz, E)

ENGLISH 135E. William Blake: Poet and Painter—(Same as HUMNTIES 194G.) Introduction to the illuminated poetry of William Blake, romantic visionary, poet, artist, religious renegade, political revolutionary, philosopher, mythological historiographer, social misfit, and critic. GER:DB-Hum

5 units, Win (Gigante, D)

ENGLISH 136B. Samuel Taylor Coleridge and Romantic Genius—Poet, opium-addict, philosopher, and seer; Samuel Taylor Coleridge as the definition of the Romantic notion of genius. How he defined many literary critical terms in use today, including suspension of disbelief and marginalia. His eclectic writings in diverse genres, including literary autobiography and biography, aesthetic theory, lyric reverie and narrative, dramatic criticism, natural philosophy, and sociopolitical and religious critique.

5 units, Win (Gigante, D)

ENGLISH 138C. *Huckleberry Finn* and American Culture—(Same as AMSTUD 138C.) From publication to the present, Mark Twain's *Adventures of Huckleberry Finn* has generated widespread disagreement over what it is, what it does, and why it should be valued. The literature, history, and popular culture that shaped the novel, and that it helped shape. Topics include vernacular traditions in American literature, the history of racism in American society, and the role of African American voices in shaping the text. GER:DB-Hum, EC-AmerCul

5 units, Win (Fishkin, S)

ENGLISH 138D. Hawthorne and Melville—Sources and possible meanings of the power of blackness in *The Scarlet Letter, Moby Dick, Billy Budd,* and other works by Nathaniel Hawthorne and Herman Melville. The controversial distinction between novel and romance on which both writers insisted. GER:DB-Hum

5 units, Spr (Dekker, G)

POST 1900

Lecture courses: 140-149
Seminar courses: 150-159

ENGLISH 140A. Creative Resistance and the Holocaust—Literature, music, art, and photography that emerged from the European Jewish catastrophe. Sources include Elie Wiesel, Primo Levi, Dan Pagis, Paul Celan, Charlotte Salomon, Bernard Malamud, Philip Roth, and Cynthia Ozick. Guest lecture by Holocaust survivor. GER:DB-Hum

5 units, Win (Felstiner, J)

ENGLISH 141. British Literature of the 1930s—A period of economic crisis, the rise of communism and fascism, and impending war. Possible texts include: novels by Woolf, Isherwood, Bowen, and Waugh; prose by Orwell; poetry by Auden, Spender, and Eliot; and documentary writing and film, movie dramas, painting, and photography. GER:DB-Hum

5 units, Win (Woloch, A; Jenkins, N)

ENGLISH 143. Introduction to African American Literature—(Same as 43; see 43.) GER:DB-Hum
5 units, Aut (Elam, M)

ENGLISH 143A. American Indian Mythology, Legend, and Lore—(Same as 43A; see 43A.) GER:DB-Hum
5 units, Win (Fields, K)

ENGLISH 143B. Introduction to Chicana/o Literature and Culture—(Same as 43B; see 43B.) GER:DB-Hum
5 units, Aut (Moya, P)

ENGLISH 143C. Introduction to Asian American Literature—(Same as 43C; see 43C.) GER:DB-Hum, EC-AmerCul
5 units, Aut (Sohn, S)

ENGLISH 145F. American Detective Fiction: From Low Art to High Culture—(Same as 45F; see 45F.) GER:DB-Hum
5 units, Aut (Moser, J)

ENGLISH 146. Development of the Short Story: Continuity and Innovation—Required for Creative Writing emphasis and minor. The project of the short story as the illumination of love, death, desire, violence, and empathy. Writers include Maupassant, Babel, Chopin, D.H. Lawrence, Woolf, and Flannery O'Connor. GER:DB-Hum
5 units, Win (Tallent, E)

ENGLISH 146C. Hemingway, Hurston, Faulkner, and Fitzgerald—Concerns and styles of four writers who marked America's coming-of-age as a literary nation with their experiments in representing the regional and the global, the racial and the cosmopolitan, the macho and the feminist, and the decadent and the impoverished. GER:DB-Hum, EC-AmerCul
5 units, Aut (Jones, G)

ENGLISH 147. Masterpieces of Contemporary Literature—(Same as 47; see 47.) GER:DB-Hum
5 units, Spr (Staveley, A)

ENGLISH 150. Modern Poetry and the Visual Arts—The relationship between photography, painting, and sculpture, and poetry in the 20th century. GER:DB-Hum
5 units, Win (Di Piero, S)

ENGLISH 153H. Digital Humanities: Literature and Technology—(Same as HUMNTIES 198J.) How electronic texts, literary databases, computers, and digital corpora offer unique ways of reading, analyzing, and understanding literature. Intellectual and philosophical problems associated with an objective methodology within a traditionally subjective discipline.
5 units, Aut (Jockers, M)

ENGLISH 154C. Modern British Poetry—Poets include Thomas Hardy, G. M. Hopkins, Thom Gunn, and W. S. Graham. GER:DB-Hum
5 units, Win (Di Piero, S)

ENGLISH 154E. Twentieth-Century Irish Literature—Plays, poems, short stories, and novels. Writers include James Joyce, William Yeats, Mary Lavin, Kate O'Brien, William Trevor, Seamus Heaney, and Samuel Beckett. How the writer can sustain imaginative freedom and literary experiment in the face of a turbulent history. GER:DB-Hum
5 units, Spr (Boland, E)

REQUIRED COURSES

Lecture courses: 160-169; there are no required seminar courses.

ENGLISH 160. Poetry and Poetics—(Same as 60; see 60.) GER:DB-Hum, WIM
5 units, Aut (Jenkins, N), Win (Felstiner, J), Spr (Boland, E)

ENGLISH 163. Shakespeare—Major plays emphasizing theatrical representation of extreme characters. GER:DB-Hum
5 units, Aut, Win (Orgel, S), Spr (Riggs, D)

THEMES AND TOPICS

Lecture courses: 170-179
Seminar courses: 180-189

ENGLISH 171A. English in the World—World literatures in English outside the traditional British and American canons. The emergence of varieties of English worldwide and consequent literary production as a consequence of British colonialism. Major sites of such Anglophone literatures include the former British colonies of sub-Saharan Africa, the Caribbean, and S. Asia; the settler colonies of Australia, New Zealand, and Canada; and Ireland and S. Africa. GER:DB-Hum
5 units, Spr (Majumdar, S)

ENGLISH 172B. Introduction to Feminist Studies—(Same as FEMST 101.) What is feminism and why does it matter today? Debates over the status and meaning of feminism in the 21st century. Feminist theories and practices across topics that intersect with gender inequality such as race, health, socioeconomics, sexual orientation, international perspectives, new media, civil rights, and political change. Perspectives from philosophy, education, visual culture, literary and ethnic studies, performance and expressive arts, and social sciences. GER:DB-SocSci, EC-Gender
5 units, Aut (Elam, M)

ENGLISH 172D. Introduction to Comparative Studies in Race and Ethnicity—(Same as CSRE 196C, PSYCH 155.) How different disciplines approach topics and issues central to the study of ethnic and race relations in the U.S. and elsewhere. Lectures by senior faculty affiliated with CSRE. Discussions led by CSRE teaching fellows. GER:DB-SocSci
5 units, Win (Moya, P; Markus, H)

ENGLISH 172E. The Literature of the Americas—(Same as COMPLIT 142.) Comparative perspective, emphasizing continuities and crises common to N., Central, and S. American literatures and distinctive national and cultural elements. Topics include: modes of representation of an American new world experience; myths of America as utopia; and critiques of notions of self and nation to which such myths give rise in political, historical, and literary forms. GER:DB-Hum, EC-AmerCul
5 units, Aut (Greene, R; Saldívar, R)

ENGLISH 172G. Great Works of the African American Literary Tradition—Works such as: Booker T. Washington's *Up from Slavery*; W.E.B Du Bois' *The Souls of Black Folk*; Zora Neale Hurston's *Their Eyes Were Watching God*; Langston Hughes' *Collected Poems*; Lorraine Hansberry's *A Raisin in the Sun*; Ralph Ellison's *Shadow and Act*; and Toni Morrison's *Beloved*. GER:DB-Hum
5 units, Spr (Rampersad, A)

ENGLISH 172P. African American Poetry—Thematic and historical approaches. Topics such as identity, the black woman, Africa, resistance, and love. Poets include Phyllis Wheatley in the 18th century, Langston Hughes in the Harlem Renaissance, and contemporary writers such as Rita Dove, Nathaniel Mackey, and Harryette Mullen. Sources include the *Oxford Anthology of African-American Poetry* and the *Norton Anthology of African American Literature*. GER:DB-Hum
5 units, Win (Rampersad, A)

ENGLISH 174. The Novel: Developments in Modern Prose Narrative Fiction—(Same as 74; see 74.) GER:DB-Hum
5 units, Aut (Woloch, A)

ENGLISH 175. Ecology through Poetry—Can poems create fresh news, ecologic insights, and a saving force for the environment? How does poetry expose human interactions with nonhuman nature? Sources include: Native American songs; haiku; the Psalms; romantic poets (Wordsworth, Keats, Coleridge); early Americans (Whitman, Dickinson); modernists (Hardy, Hopkins, Yeats, Frost, Williams, Jeffers); a female tradition (Millay, Swenson, Bishop, Levertov, Oliver); and contemporaries (Hughes, Walcott, Snyder, Hass). GER:DB-Hum
5 units, Spr (Felstiner, J)

ENGLISH 175J. Voyages, Swims, and Misadventures: The Culture of the Ocean—The sea in iconographic terms as place of life and death. Poetry including the *Anglo-Saxon Seafarer*, G. M. Hopkins, Lear, Baudelaire, Hardy, and Stevie Smith. Novels and novellas including *Treasure Island*, Melville, and Conrad. Films, photography, documentary, and painting. GER:DB-Hum

5 units, Spr (Jenkins, N)

ENGLISH 176. Science Fiction: Human Identity in the Age of Technology—The articulation in the science fiction genre of hopes and fears about modernization, technological innovation, and the limits of the natural and the artificial. How science fiction novels from the 19th century to the present portray the transformation of human minds, bodies, and habitats through new technologies. Readings include novels, short stories, comics, and films from N. America, Latin America, Europe, and Japan. GER:DB-Hum

5 units, Spr (Heise, U)

ENGLISH 181B. *Paradise Lost* to *The Prelude*: The Great Long Poem in English—A close reading of Milton's *Paradise Lost* to prepare students to follow the transformation of poetic style by Augustan and Romantic poets. Authors include Milton, Pope, Keats, and Wordsworth. Attention to poetic form and literary history. GER:DB-Hum

5 units, Spr (Hoxby, B)

ENGLISH 182S. Looking North: Canadian Literature—Writers include Margaret Atwood, Alice Munro, Michael Ondaatje, Rohinton Mistry, Yann Martel, and Carol Shields. Themes of national identity, race, class, gender, postcolonialism, geography, bilingualism, regionalism, and landscape in Canadian writing. The culture and literary productivity of America's northern neighbor. GER:DB-Hum

5 units, Spr (Staveley, A)

ENGLISH 183F. Contemporary Critical Theory—The study and use of critical theory in the humanities from the 20th century onwards; antecedents in the 18th and 19th centuries. The relationship between disciplinary developments in the production of knowledge and the enactment of power in the domains of gender, class, and race. GER:DB-Hum

5 units, Spr (Majumdar, S)

ENGLISH 184. The Novel, The World—(Same as COMPLIT 123.) Combining perspectives of the novels of the world as anthropological force with the sense of reality, and as protean form that has reshaped the literary universe. Readings from: ancient Greece; medieval Japan and Britain; and early modern Spain, China, and Britain; romantic theories of the novel; 19th-century realism and popular fiction; modernist experiments; and postmodern pastiches. GER:DB-Hum

5 units, Spr (Moretti, F)

ENGLISH 184C. Texts in History: Medieval to Early Modern—(Same as HUMNTIES 162.) Priority to students in the Humanities honors program. The impact of change from the Middle Ages to the early modern world; how historical pressures challenged conceptions of artistic form, self, divine, and the physical universe. Interdisciplinary methods of interpretation. Texts include: Aristotle, *On the Soul*; Attar, *The Conference of the Birds*; Dante, *Inferno*; Chaucer, *Canterbury Tales*; Christine de Pizan, *The Book of the City of Ladies*; Letters of Columbus; Machiavelli, *The Prince*; Luther, *The Bondage of the Will*; Montaigne, *Essays*; Marlowe, *Doctor Faustus*; poems by John Donne and Lady Mary Wroth; Shakespeare, *Othello*; and works of art. GER:DB-Hum

5 units, Win (Brooks, H)

ENGLISH 185. Opera as Cultural History—The history of opera as mirror to the development of modernity in Western culture. Its interdisciplinary and crosscultural nature and its relationship to issues central to cultural studies such as gender, race, class, and nation. How it questions authorship, the meaning and reliability of musical and literary texts, and performance and production practices. Sources include filmed operas. GER:DB-Hum

5 units, Aut (Wyatt, M)

ENGLISH 185A. Writing Medicine—(Same as HUMBIO 176.) Classic and contemporary narrative prose about medicine. Focus is on illness and recovery, and good writing. Topics include being a patient, being a doctor, chronic illness, pain, modern medicine, and the modern hospital. Authors include Didion, Fadiman, Styron, Tolstoy, Williams, and contemporary doctors and patients.

3 units, Win (Zuger, A)

ENGLISH 186A. American Hauntings—Cultural, psychological, social, and political dynamics of haunting in American literature, from the early national period to the late 20th century. Sources include ghost stories and other instances of supernatural, emotional, or mental intervention. Authors include Charles Brockden Brown, Washington Irving, Edgar Allan Poe, Nathaniel Hawthorne, Louisa May Alcott, Charlotte Perkins Gilman, Charles Chesnutt, Henry James, Edith Wharton, Toni Morrison, and Stephen King. GER:DB-Hum

5 units, Win (Richardson, J)

ENGLISH 187G. Brokeback: Queering Western Literature—Seminar. How the West is depicted as a queer region in the 20th century. Readings include Owen Wister, Cherríe Moraga, Allen Ginsburg, Chrystos, John Rechy, Gloria Anzaldúa, Willa Cather, Dennis Cooper, Arturo Islas, David Henry Hwang, Miranda July, Adrienne Rich, Lynn Riggs, and Rebecca Brown. GER:DB-Hum

5 units, Aut (Gano, G)

ENGLISH 188G. The Modern West—Renewal and regeneration in the American west after WW I. Literature and arts of the interwar era, focusing on the influence of the Mexican revolution. Undefiled nature and primitive peoples versus a modern, cosmopolitan space inspiring the modern artist. GER:DB-Hum

5 units, Spr (Gano, G)

UNDERGRADUATE WORKSHOPS AND DIRECTED READING

ENGLISH 194. Individual Research—See section above on Undergraduate Programs, Opportunities for Advanced Work, Individual Research.

5 units, Aut, Win, Spr, Sum (Staff)

ENGLISH 196A. Honors Seminar: Critical Approaches to Literature—Required of students in the English honors program.

5 units, Aut (Summit, J)

ENGLISH 197. Seniors Honors Essay—In two quarters.

1-10 units, Aut, Win, Spr (Staff)

ENGLISH 198. Individual Work—Undergraduates who wish to study a subject or area not covered by regular courses may, with consent, enroll for individual work under the supervision of a member of the department. 198 may not be used to fulfill departmental area or elective requirements without consent. Group seminars are not appropriate for 198.

1-5 units, Aut, Win, Spr, Sum (Staff)

ENGLISH 198L. Individual Work: Levinthal Tutorial—Undergraduate writers work individually with visiting Stegner Fellows in poetry, fiction, and if available, nonfiction. Students design their own curriculum; Stegner Fellows act as writing mentors and advisers. Prerequisites: 90, 91, or 92; submitted manuscript.

5 units, Win (Staff)

ENGLISH 199. Senior Independent Essay—Open, with department approval, to seniors majoring in English who wish to work throughout the year on a 10,000 word critical or scholarly essay; see note under "Honors Program" above. Applicants submit a sample of their expository prose, proposed topic, and bibliography to the Director of Undergraduate Studies before preregistration in May of the junior year. Each student accepted is responsible for finding a department faculty adviser. May be repeated for credit.

1-10 units, Aut, Win, Spr (Staff)

CREATIVE WRITING

ENGLISH 90. Fiction Writing—The elements of fiction writing: narration, description, and dialogue. Students write complete stories and participate in story workshops. May be repeated for credit. Prerequisite: PWR 1.

5 units, Aut (Altschul, A; O'Keefe, J; Kealey, T; Tanaka, S; Hutchins, S), Win (Tanaka, S; Pneuman, A), Spr (Altschul, A; Reese, R; Tanaka, S; Dolleman, R; Hutchins, S), Sum (Staff)

ENGLISH 91. Creative Nonfiction—(Formerly 94A.) Historical and contemporary as a broad genre including travel and nature writing, memoir, biography, journalism, and the personal essay. Students use creative means to express factual content.

5 units, Aut, Win, Spr (Hummel, M)

ENGLISH 92. Reading and Writing Poetry—Prerequisite: PWR 1. Issues of poetic craft. How elements of form, music, structure, and content work together to create meaning and experience in a poem. May be repeated for credit.

5 units, Aut (Michas-Martin, S; Ekiss, K), Win (Ekiss, K) , Spr (Michas-Martin, S; Ekiss, K)

ENGLISH 94. Introduction to Creative Writing: Form and Structure—For minors in creative writing. The forms and conventions of the contemporary short story and poem. How form, technique, and content combine to make stories and poems organic. Prerequisite: 90, 91, or 92.

5 units, Win (Johnson, A), Spr (Hummel, M)

ENGLISH 190. Intermediate Fiction Writing—May be taken twice for credit. Lottery. Priority to last quarter/year in school, majors in English with Creative Writing emphasis, and Creative Writing minors. Prerequisite: 90 or 91.

5 units, Aut, Win (Altschul, A; O'Keefe, J), Spr (O'Keefe, J; MacDonald, D; Tanaka, S)

ENGLISH 190F. Fiction Writing for Film—Workshop. For screenwriting students. Story craft, structure, and dialogue. Assignments include short scene creation, character development, and a long story. How fictional works are adapted to screenplays, and how each form uses elements of conflict, time, summary, and scene. Priority to seniors and Film Studies majors. Prerequisite: 90.

5 units, Win (O'Keefe, J)

ENGLISH 190G. The Graphic Novel—Interdisciplinary. Evolution, subject matter, form, conventions, possibilities, and future of the graphic novel genre. Guest lectures. Collaborative creation of a graphic novel by a team of writers, illustrators, and designers. Prerequisite: consent of instructor.

5 units, Win (Johnson, A; Kealey, T)

ENGLISH 190P. Poetry and Prose in Conversation—Workshop. Dialogue and cross-pollination between poets and prose writers. Students read work that blurs the boundaries of poetry and fiction, produce creative work outside the constraints of their chosen genre, and experiment with hybrid forms of their own devising. Team-taught by fiction writers and poets. Prerequisite: 90 or 92, or consent of instructor.

5 units, Win (Altschul, A)

ENGLISH 190R. Form and Theory of the Novel—(Formerly 95.) Seminar for creative writers. How writers connect detail, description, action, dialog, and thought to create scenes; how the balance of these elements creates an author's voice. The novel in terms of tradition, convention, design, and narrative strategy. Guest instructors from Stanford's Jones Lecturers. Prerequisites: manuscript and consent of instructors.

5 units, Spr (Johnson, A)

ENGLISH 190V. Reading for Writers—Taught by the Stein Visiting Fiction Writer. Prerequisite: 90.

5 units, Win (Toibin, T)

ENGLISH 191. Intermediate Creative Nonfiction—Continuation of 91. Workshop. The application of advanced storytelling techniques to fact-based personal narratives, emphasizing organic writing, discovering audience, and publication. Guest lecturers, collaborative writing, and publication of the final project in print, audio, or web formats. Prerequisite: 91 or 90.

5 units, Spr (Johnson, A)

ENGLISH 192. Intermediate Poetry Writing—May be taken twice. Lottery. Priority to last quarter/year in school, majors in English with Creative Writing emphasis, and Creative Writing minors. Prerequisite: 92.

5 units, Win (Michas-Martin, S), Spr (Ekiss, K)

ENGLISH 192P. The Prose Poem—Cross-genre workshop. For poets who step away from the line; for prose writers who esperiment with compression. The history and implications of the hybrid form to identify and use techniques inherent to poetry and prose. Prerequisite: 90 or 92, or consent of instructor.

5 units, Aut (Michas-Martin, S)

ENGLISH 192V. The Occasions of Poetry—Taught by the Mohr Visiting Poet. Prerequisite: 92.

5 units, Spr (Bly, R)

ENGLISH 290. Advanced Fiction Writing—Workshop critique of original short stories or novel. Prerequisites: manuscript, consent of instructor, and 190-level fiction workshop.

5 units, Aut (MacDonald, D), Spr (Tallent, E)

ENGLISH 292. Advanced Poetry Writing—Promising student poets write poetry in an atmosphere of mutual aid. Students selected by instructor. Prerequisites: 192, manuscript, consent of instructor.

5 units, Spr (Michas-Martin, S)

ENGLISH 390. Graduate Fiction Workshop—For Stegner fellows in the writing program. May be repeated for credit. Prerequisite: consent of instructor.

3 units, Aut (Tallent, E), Win (Toibin, T), Spr (Wolff, T)

ENGLISH 392. Graduate Poetry Workshop—For Stegner fellows in the writing program. May be repeated for credit. Prerequisite: consent of instructor.

3 units, Aut (Fields, K), Win (Boland, E), Spr (Di Piero, S)

ADVANCED UNDERGRADUATE/GRADUATE

ENGLISH 201. The Bible and Literature—Differences in translations of the Bible into English. Recognizing and interpreting biblical allusion in texts from the medieval to modern periods. Readings from the Bible and from British, Canadian, American, African American, and African literature in English.

5 units, Spr (Parker, P)

ENGLISH 215. What is Tragedy?—Major theorists of tragedy and the plays that embody their critical ideals. Criticism includes Aristotle, Lessing, Coleridge, Hazlitt, Hegel, Nietzsche, and Frye. Tragedies by Sophocles, Euripides, Shakespeare, Racine, and Lessing.

5 units, Win (Hoxby, B)

ENGLISH 219. Representation and Repression in Fiction—Strategies of representation in 19th-century fiction. How do narratives reveal information? Why do many novels revolve around untold, compressed, or hidden events? The interplay between concealment and disclosure at the core of narrative fiction. Emphasis is on narrative construction, sequencing, perspective, and voice in relation to sociopolitical and literary frameworks. Writers such as Austen, Melville, Dickens, Gaskell, Collins, James, Conrad, and Perec.

5 units, Win (Woloch, A)

ENGLISH 223E. Whitman and Dickinson

5 units, Aut (Fields, K)

ENGLISH 235. English Gothic Fiction from Walpole to Bronte—The phantasmagoric side of 18th-century sensibility: literary representation of fantastic events, violations of natural law, and landscapes of terror, pathology, sublimity, and horror. Emphasis is on women and the Gothic; whether there is an encoded sexual plot in classic Gothic fiction; and why

the genre typically emphasizes scenarios of erotic vulnerability, abjection, violation, and perversion. Other sources include recent psychoanalytic, social, and historical treatments of the genre.
5 units, Win (Castle, T)

ENGLISH 235A. Hogarth and his Contemporaries—The excitement of looking. Historical, literary, and social viewpoints. Readings include Hogarth's *Harlot's Progress, Rake's Progress, Four Times of the Day, Industry and Idleness, The Four Stages of Cruelty*, and *Marriage a la Mode*; and works of other artists and writers to whom he is linked. The nature of Hogarth's comic achievement. Recent scholarship and 18th-century commentaries.
5 units, Win (Shesgreen, S)

ENGLISH 240. Jacobean Tragedy—Revenge tragedies such as *Hamlet*, domestic tragedies such as *Othello*, and tragedies of over-reaching such as *Macbeth*. Comparison of Shakespeare's plays to those of Jonson, Webster, Middleton, and Ford. The significance of carnal, bloody, and unnatural acts in these tragedies. Jacobean stage conventions. Modern films. Opportunities for theatrical direction and performance.
5 units, Win (Hoxby, B)

ENGLISH 242. Restoration Literature—Focus is on literature that depicts Satan such as Milton's *Paradise Lost*. Why did Satan become a powerful figure in the cultural imagination of the period after the restoration of Charles Stuart to the throne in 1660? Issues such as transgression, sexuality, regicide, and heroism. The focus of literary production upon the person of the king as charismatic, despite ambivalence toward his dissolution and promiscuity.
5 units, Aut (Vermeule, B)

ENGLISH 259. Experimental Writing by Contemporary Women Poets—Focus is on two contemporary N. American poets, Susan Howe and Lyn Hejinian. Readings include: Howe's *The Nonconformist's Memorial* and *My Emily Dickinson* which locates Dickinson in the tradition of early American antinomians; and Hejinian's *Writing Is an Aid to Memory* and *My Life* in the context of her writings on Gertrude Stein. How Stein's paratactic poetics and Dickinson's experiments with syntax foreground the materiality of language in poets; examples in works by Rosmarie Waldrop, Joan Retallack, Rae Armantrout, and Karen Mac Cormack.
5 units, Spr (Bruns, G)

ENGLISH 260B. The Politics of Language—(Same as FEMST 260B.) While the U.S. was founded on principles of linguistic plurality, the English language has always been dominant in the U.S., with standard English holding most power. The struggle to share linguistic power; how questions of gender, race, and class have shaped and responded to language wars. Varieties of English in contemporary fiction, music, and film.
5 units, Win (Lunsford, A)

ENGLISH 261. California Regionalism in Ethnic American Literature—The space of literary California as represented by ethnic American writers from locations such as San Francisco, Santa Cruz, Central California, Los Angeles, Orange County, and Mexico.
5 units, Aut (Sohn, S)

ENGLISH 261A. Geography, Time, and Trauma in Asian American Literature—The notion that homes can be stable locations for cultural, racial, ethnic, and similarly situated identity categories. The possibility that there really is no place like home for Asian American subjects. How geography, landscape, and time situate traumas within fictional Asian American narratives.
5 units, Win (Sohn, S)

ENGLISH 262A. Studies in American Biography—Topics include: psychoanalysis; the art of narration; problems in objectivity; politics, feminism, and race; oral history; and letters and diaries as evidence. Sources include biographies of Richard Ellman, Leon Edel, and Diane Middlebrook. Guest biographers.
5 units, Spr (Rampersad, A)

ENGLISH 270. From Plato to Postmodernism: The Anglo-American Critical Tradition—Historical study of literary critical theorizing from classical times to the present. Issues such as subjectivity, originality, gender, evaluation, and canonicity.
5 units, Win (Evans, M)

ENGLISH 271B. The Other Chaucer—Chaucer outside the *Canterbury Tales*. Readings include the dream poems, the lyrics, *Troilus and Criseyde*, and his prose. Topics include: medieval traditions of dream and debate; the legacy of classical philosophy; and the manuscript culture of Chaucer's readers.
4-5 units, Spr (Lerer, S)

ENGLISH 279D. James Joyce and *Ulysses*—Close reading of *Ulysses* as one of the most significant literary works of modernism and 20th-century literary history. The nature and variety of its significance, and the meanings that Joyce's epic of modernism generates.
5 units, Win (Polhemus, R)

ENGLISH 293. Literary Translation—Seminar and workshop. For undergraduates and graduate students. The art and practice of literary translation; its tradition, principles, and questions. Final project is a translation and commentary on work of the student's choosing. Recommended: knowledge of a foreign language and experience in imaginative writing.
3-5 units, Spr (Felstiner, J)

ENGLISH 296. Introduction to Critical Theory: Literary Theory and Criticism Since Plato—Required colloquium for incoming M.A. students. Contemporary theoretical movements. Topics such as the role of the intellectual in American life, the place of theory and politics in literary study, and what it means to be an academic writer. How different methodological approaches have been fruitful or not in analyzing specific texts.
5 units, Aut (Vermeule, B)

GRADUATE COLLOQUIA

ENGLISH 301B. Medieval Devotion—Foundational texts of late medieval English devotion, including mystical treatises (Richard Rolle, Julian of Norwich, and *The Cloud of Unknowing*), drama (the Digby *Mary Magdalene*, Croxton *Play of the Sacrament*), and William Langland's allegorical poem, *Piers Plowman*. Focus is on the politics of religious form and practice, including Wycliffite and early Reformation conflicts.
5 units, Aut (Summit, J)

ENGLISH 302A. The History of the Book—First of two quarter sequence. The book as developing concept and material object, from scroll to codex, manuscript to print, cold type to electronic medium. Bibliographical and paleographical techniques. History and theory. The use of books; the history of reading practices, including marginalia and other marks of ownership. Students develop individual projects from Stanford's rare book collection.
5 units, Aut (Orgel, S)

ENGLISH 302B. The History of the Book—Second of two quarter sequence; focus is on individual student projects. The book as developing concept and material object, from scroll to codex, manuscript to print, cold type to electronic medium. Bibliographical and paleographical techniques. History and theory. The use of books; the history of reading practices, including marginalia and other marks of ownership. Students develop individual projects from Stanford's rare book collection. Prerequisite: 302A.
5 units, Win (Orgel, S)

ENGLISH 303F. Institutions of Enlightenment: The Invention of the Public Sphere—(Same as COMPLIT 331C.) The cultural foundations of the Enlightenment as public sphere and its relationship to the private or intimate sphere. The invention and naturalization of fundamental institutions of the Enlightenment such as the public, the private, the market, public opinion, literature, the individual, society, culture, knowledge, and politics.
5 units, Spr (Bender, J)

ENGLISH 304H. Romantic Poetry and Poetics—Major poetic forms including lyrical ballads, songs, conversation poems, closet drama, romantic ode, sonnet, romance, and epic. Poets including Blake, Wordsworth, Coleridge, Shelley, Keats, and Byron.
5 units, Spr (Gigante, D)

ENGLISH 305H. Readings in Close Reading—The difference between reading and reading closely. Is close reading a specific method of literary criticism or theory, or does it describe a sensibility that can accompany any interpretation? Categories and frameworks for this ubiquitous, often undefined critical practice. Traditions of close reading: formalism, psychoanalysis, ideological critique, and hermeneutics. Focus is on Freud, Empson, Barthes, de Man and contemporary critics.
5 units, Aut (Woloch, A)

ENGLISH 307A. Modern British Literature: The Homosexual Tradition from Wilde to Winterson—20th-century British fictional and autobiographical works dealing with male and female homosexuality, by male and female authors. If there is a post-Wildean homosexual tradition in 20-century British literature, what are its features, historical and cultural determinants, and characteristic plots, modes, and tropes? Comparisons between male- and female-authored representations of homosexuality. More pragmatic, literary-historical, and text-based versus theoretical or abstractly philosophical. Recent queer theory scholarship including Sedgwick, Butler, Bristow, Sinfield, and Doan.
5 units, Spr (Castle, T)

ENGLISH 307B. *Entre Deux Guerres*: The Novel in Europe Between the Wars—Nine novels published from 1929 to 1939: a period manifesting memory of WW I, anticipation of WW II, and intense nationalist and internationalist energies. Focus is on works written in English; also contemporary texts originally written in Russian, German, and French. Challenges to the institution of national literatures. Novels by Hemingway, Nabokov, Woolf, Joseph Roth, Céline, Djuna Barnes, Beckett, Bowen, and Isherwood.
5 units, Win (Jenkins, N)

ENGLISH 309A. Novel of the Americas—(Same as COMPLIT 329.) The possibility of identifying aesthetic visions of an American imaginary in terms not defined by nationalist ideologies but open to the consequences of transnational forces. How America has been invented as a category in sociocultural terms; the form the American novel has taken. Readings include Chopin's *The Awakening*, Cather's *Death Comes for the Archbishop*, Faulkner's *Absalom! Absalom!*, Asturias's *Men of Maize*, Carpentier's *The Kingdom of this World*, Paredes's *The Shadow*, Silko's *Almanac of the Dead*, and Proulx's *Accordion Crimes*.
5 units, Spr (Saldívar, R)

SEMINARS

ENGLISH 314. Epic and Empire—(Same as COMPLIT 320A.) Focus is on Virgil's *Aeneid* and its influence, tracing the European epic tradition (Ariosto, Tasso, Camoes, Spenser, and Milton) to New World discovery and mercantile expansion in the early modern period.
5 units, Win (Parker, P)

ENGLISH 342. Elizabethan and Jacobean Tragedy—Nine tragedies by Christopher Marlowe, Thomas Kyd, Elizabeth Cary, Thomas Middleton, John Webster, and John Ford. Their literary and cultural settings. Why did Elizabethan and Jacobean playwrights depict extreme forms of sociopathic behavior such as murder, rape, infanticide, incest, and necrophilia? What are the connections between sex and violence in these plays? Why are they still read and performed today? What can be learned from them?
5 units, Aut (Riggs, D)

ENGLISH 346. The Performance of Culture—The analysis of culture as theater, and theater as cultural production. Focus is on sacrifice, king making, carnival, marriage, and death. Primary texts include rituals, festivals, and plays from various periods and cultures. Critics include Victor Turner, Mikhail Bakhtin, Clifford Geertz, and Joseph Roach. Goal is to theorize performance and the function of theater in any period.
5 units, Spr (Hoxby, B)

ENGLISH 350C. Materials and Methods for the Study of Poetry—(Same as COMPLIT 320P.) For graduate students in all national literatures and for comparatists. The intellectual and professional tools relevant to scholarship on poetry in any language. Theoretical issues and practical knowledge of forms, techniques, and cultural formations in verse. Topics such as voice, tropes, lineation, stanzas, meters, visuality, sound, prose poems, and translation.
3-5 units, Win (Greene, R)

ENGLISH 357E. The Avant Garde and the Americas—The aesthetic and political projects of the European avant gardes in the early 20th century, including futurism, vorticism/imagism, Dada, and surrealism. The transfer and transformation of these projects to avant garde movements in the Caribbean, Mexico, and Brazil from the 20s to the 50s, and their reformulation in the U.S. after 1970. Media such as manifestos, poetry, performance, painting, and film. Theories of the avant garde.
5 units, Win (Heise, U)

ENGLISH 360B. The Theory of the Novel—The novel as the most variable of literary genres. How can a theory explain its diversity? What should the relationship be between theory and history of the novel? Focus is on three major theories of the novel (Lukács, Bakhtin, and the formalist-structuralist lineage), and more recent work on morphology, fiction, and realism.
5 units, Spr (Moretti, F)

ENGLISH 362A. The Postcolonial and the Global—Reflexive reading of the relationship between studies of postcoloniality and globalization in their current disciplinary states. Is the difference between them a matter of temporal focus or spatial distribution of power? What explains disciplinary moorings such as postcolonialism's housing in literature and history, and globalization's in law, economics, urban studies, business and finance? Has postcolonial theory been subsumed into globalization studies?
5 units, Win (Majumdar, S)

ENGLISH 363D. Identity, Experience, and Knowledge in Feminist Theory—Debates in contemporary feminist thought focusing on texts that interrelate identity, experience, and knowledge.
5 units, Aut (Moya, P)

ENGLISH 365B. Antebellum American Literature and Culture—The diversity of U.S. literary production between 1820 and the Civil War to place texts in their social, cultural, and political contexts. Recent critical approaches. Authors include Irving, Poe, Melville, Hawthorne, Stowe, Dickinson, Whitman, Douglass, and Jacobs.
5 units, Win (Jones, G)

ENGLISH 370A. Medieval Seminar—(Same as HUMNTIES 322.) The cultural, literary, and artistic evolution of the Middle Ages. The barbarian invasions and the Germanic ethos, the Celtic heritage, and the monastic tradition. Romanesque art and architecture, pilgrimages, and the Crusades. Gothic aesthetics, chivalry and courtly love, scholasticism, and the rise of universities. The late Middle Ages, humanism, and the threshold of the Renaissance. Texts include: *Beowulf*, *Mabinogion*, *Song of Roland*, Chretien de Troyes' *Lancelot* and *Yvain*, Dante's *Divine Comedy*, Boccaccio's *Decameron*, and Chaucer's *Canterbury Tales*.
3-5 units, Win (Steidle, E)

ENGLISH 373D. Shakespeare, Islam, and Others—(Same as COMPLIT 311.) Shakespeare and other early modern writers in relation to new work on Islam and the Ottoman Turk in early modern studies. *Othello*, *Twelfth Night*, *Titus Andronicus*, *The Merchant of Venice*, and other Shakespeare plays. Kyd's *Solyman and Perseda*, Daborne's *A Christian Turned Turk*, Massinger's *The Renegado*, Marlowe's *The Jew of Malta*, and literary and historical materials.
5 units, Spr (Parker, P)

ENGLISH 374. Writing Race and Nation: Mark Twain and Paul Laurence Dunbar—Innovative treatment of issues of race and nation in the work of Twain and Dunbar, and the role their work played in shaping ideas of personal and national identity in the U.S. Sources include: their fiction, nonfiction, and poetry; and a recently recovered novel by Charles Chesnutt.
5 units, Spr (Fishkin, S)

ENGLISH 389B. Beckett—(Same as DRAMA 358C.) Beckett's plays and late writing, which have been described as proto-performance art. Recent Beckett scholarship, including new work about his analysis with Bion.
3-5 units, Spr (Phelan, M)

WORKSHOPS AND DIRECTED READING

ENGLISH 394. Independent Study—Preparation for first-year Ph.D. qualifying examination.
1-10 units, Sum (Staff)

ENGLISH 395. Ad Hoc Graduate Seminar—Three or more graduate students who wish in the following quarter to study a subject or an area not covered by regular courses and seminars may plan an informal seminar and approach a member of the department to supervise it.
1-5 units, Aut, Win, Spr (Staff)

ENGLISH 396. Introduction to Graduate Study for Ph.D. Students—For incoming Ph.D. students. The major historical, professional, and methodological approaches to the study of literature in English.
5 units, Aut (Jones, G)

ENGLISH 396L. Pedagogy Seminar I—(Same as COMPLIT 396L.) Required for first-year Ph.D students in English, Modern Thought and Literature, and Comparative Literature (except for Comparative Literature students teaching in a foreign language). Preparation for surviving as teaching assistants in undergraduate literature courses. Focus is on leading discussions and grading papers.
2 units, Aut (Jones, G)

ENGLISH 397A. Pedagogy Seminar II—Apprenticeship for second-year graduate students in English, Modern Thought and Literature, and Comparative Literature who teach in the Program in Writing and Rhetoric. Each student is assigned as an apprentice to an experienced teacher and sits in on classes, conferences, and tutorials, with eventual responsibility for conducting a class, grading papers, and holding conferences. Meetings explore rhetoric, theories and philosophies of composition, and the teaching of writing. Each student designs a syllabus in preparation for teaching PWR 1.
1 unit, Aut (Lunsford, A; Diogenes, M)

ENGLISH 398. Research Course—A special subject of investigation under supervision of a member of the department. Thesis work is not registered under this number.
1-18 units, Aut, Win, Spr, Sum (Staff)

ENGLISH 398R. Revision and Development of a Paper—Students revise and develop a paper under the supervision of a faculty member with a view to possible publication.
5 units, Aut, Win, Spr, Sum (Staff)

ENGLISH 399. Thesis—For M.A. students only. Regular meetings with thesis advisers required.
1-10 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

COMPLIT 157. Imitation of Life
3-5 units, Win (Gelder, A)

COMPLIT 257C/357C. Crowds—(Same as FRENGEN 317, ITALGEN 317.)
3-5 units, Aut (Schnapp, J)

PWR 193. Writing the Honors Thesis
1-5 units, Win, Spr (Obenzinger, H)

OVERSEAS STUDIES

Courses approved for the English major and taught overseas can be found in the "Overseas Studies" section of this bulletin, in the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu.

OXFORD

OSPOXFRD 17. Novels of Sensation: Gothic, Detective Story, Prohibition, and Transgression in Victorian Fiction
5 units, Spr (Plaskitt, E)

OSPOXFRD 82. Jane Austen and the Rise of the Woman Novelist
4-5 units, Aut (Plaskitt, E)

OSPOXFRD 114Z. Close Readings in English Literature, 1509-1642
5 units, Aut (van Es, B)

OSPOXFRD 116Z. Close Readings in English Literature, 1642-1740
5 units, Win (Bullard, P)

OSPOXFRD 154Z. Romantic Literature, 1740-1832
5 units, Spr (Plaskitt, E)

OSPOXFRD 163X. Shakespeare: Critical Commentary
5 units, Aut, Win (Rowley, R)

PROGRAM IN ETHICS IN SOCIETY

Director: Debra Satz

Steering Committee: Eamonn Callan (Education), Joshua Cohen (Philosophy, Political Science, Law), John Ferejohn (Political Science), Barbara Fried (Law School), Agnieszka Jaworska (Philosophy), Scotty McLennan (Dean of Religious Life), Josiah Ober (Classics, Political Science), Rob Reich (Political Science), Eric Roberts (Computer Science), Debra Satz (Philosophy), Brent Sockness (Religious Studies), Allen Wood (Philosophy), Lee Yearley (Religious Studies)

Affiliated Faculty: Kenneth Arrow (Economics, emeritus), Donald Barr (Sociology), Barton Bernstein (History), Michael Bratman (Philosophy), Albert Camarillo (History), Nadeem Hussain (Philosophy), David Kennedy (History), Benoît Monin (Psychology), Tamar Schapiro (Philosophy), David K. Stevenson (Pediatrics), Sylvia Yanagisako (Anthropology)

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Courses given in Ethics in Society have the subject code ETHICSOC. For a complete list of subject codes, see Appendix B.

The Program in Ethics in Society is designed to foster scholarship, teaching, and moral reflection on fundamental issues in personal and public life. The program is grounded in moral and political philosophy, but it extends its concerns across a broad range of traditional disciplinary domains. The program is guided by the idea that ethical thought has application to current social questions and conflicts, and it seeks to encourage moral reflection and practice in areas such as business, international relations, law, medicine, politics, and science.

Current and planned initiatives of the program include:

1. Supporting and fostering ethics research.
2. Supporting innovative teaching focusing on the ethical dimensions relevant to the different disciplines across the curriculum.
3. Establishing a yearly faculty-graduate seminar focusing on topics in ethics and public life.
4. Ethics@Noon, a weekly discussion by faculty, students, and staff on topics of ethical concern.

The program also sponsors several annual public lecture series, including the Tanner Lectures in Human Values and the Wesson Lectures in Problems of Democracy.

Students interested in pursuing studies that bring moral and political theory to bear on issues in public life should consult the director. There are many course offerings at Stanford that address moral and political questions. Not all of these courses are crosslisted with the Program in Ethics in Society. Students should consult the director to determine whether such courses may be applied towards an Ethics in Society honors program or minor.

UNDERGRADUATE PROGRAM

HONORS

The honors program in Ethics in Society is open to majors in every field and must be taken in addition to a department major. Students should apply for entry at the end of Spring Quarter of the sophomore year or no later than the beginning of the Autumn Quarter of the junior year. Applicants should have a cumulative grade point average (GPA) of 3.3 (B+) or higher. They should also maintain this minimum average in the courses taken to satisfy the requirements. Required courses must be taken for a letter grade.

Requirements—

1. Required courses (at least one of a or b must be taken at the 100 level):
   a) ETHICSOC 20. Introduction to Moral Theory; or ETHICSOC 170. Ethical Theory. Normally taken in the sophomore year.
   b) ETHICSOC 30. Introduction to Political Philosophy; or ETHICSOC 171. Justice. Normally taken in sophomore year.
   c) ETHICSOC 77. Methodology in Ethics: Translating Theory into Practice. Normally taken after the moral and political philosophy classes listed above.
2. One 4- or 5-unit undergraduate course on a subject approved by the honors adviser, designed to encourage students to explore those issues in Ethics in Society that are of particular interest to them. Courses of relevance to the Program in Ethics in Society are offered by members of the program committee and by other departments. Students may also take a course with the honors thesis in mind. To promote a broad interdisciplinary approach, this elective should normally be outside the Department of Philosophy. Students are not restricted to choosing from the cognate courses listed below.
3. ETHICSOC 190. Honors Seminar.
4. ETHICSOC 200A,B. Honors Thesis. On a subject approved by the honors adviser, with the work spread over two quarters. To receive honors in Ethics in Society, students must receive a grade of 'B+' on their thesis.

A typical student takes ETHICSOC 20 or 170 and 30 or 171 in the sophomore year. Upon admission to the honors program as a junior, he or she takes ETHICSOC 190 in the Winter Quarter, ETHICSOC 77 in the Spring Quarter, and requirement 2 (the optional subject) at any time during the junior year, or possibly Autumn Quarter of the senior year. The honors thesis is normally written during the Autumn and Winter quarters of the senior year. Courses taken to fulfill the Ethics in Society honors requirement may be double-counted for Philosophy and other majors; Ethics in Society minors may not double count courses.

MINORS

The Ethics in Society minor is open to students in any department who wish to explore moral issues in personal and public life. The minor also includes the possibility of pursuing classes around the theme of citizenship.

Students must declare the minor on Axess no later than the last day of Autumn Quarter of their senior year, although they are strongly advised to declare sooner. The student should discuss the minor with an adviser chosen from the Ethics in Society faculty list, and prepare a draft proposal that includes a list of courses planned to fulfill the requirements and the name of the faculty adviser.

A minor in Ethics in Society requires six courses for a minimum of 25 and a maximum of 30 units. Required courses must be taken for a letter grade.

Requirements—

1. Three Ethics in Society courses:
   a) ETHICSOC 20. Introduction to Moral Theory; or ETHICSOC 170. Ethical Theory
   b) ETHICSOC 30. Introduction to Political Philosophy; or ETHICSOC 171. Justice
   c) ETHICSOC 77. Methodology in Ethics: Translating Theory into Practice
2. Two courses at the 100 level or above that address some dimension of moral or political theory or practice.
3. One course at the 200 level or above that addresses a moral or political problem, in either theory or practice.

The 100-level and 200-level courses should be focused around a central theme such as biomedical ethics, ethics and economics, ethics and politics, or environmental ethics. The courses at the 100 and 200 level are normally taken after completion of ETHICSOC 20 or 170 and 30 or 171.

Subject to the approval of the Director of the Ethics in Society Program, a course covering similar subject matter in another department or program may be substituted for ETHICSOC 20/170 or 30/171. No course credited to the Ethics in Society minor may be double-counted toward major requirements.

CITIZENSHIP OPTION

The citizenship option for the minor introduces students to the theory, history, and practice of citizenship in democracies. When a student declares the minor in EIS on Axess, no notation is made of the citizenship option, and this notation does not appear on transcripts or the diploma. All students taking the citizenship option must take ETHICSOC 198, Community Engagement Internship. In addition to the courses listed in (1) above, students must take a total of three additional classes from two of the following categories. Students may petition to have other relevant courses counted towards the minor.

1. Citizenship and Government Action
   - a) ETHICSOC 133. Ethics and Politics of Public Service
   - b) POLISCI 142T. Social Protection Around the World
   - c) PUBLPOL 101. Politics and Public Policy
   - d) PUBLPOL 164. Comparative Public Policy
2. Citizenship and Entrepreneurship
   - a) ETHICSOC 108. Ethics and the Professions
   - b) ME 206A. Entrepreneurial Design to Extreme Affordability
   - c) PUBLPOL 180. Social Innovation
   - d) PUBLPOL 195. Business and Public Policy
   - e) URBANST 131. Social Innovation and the Social Entreprenuer
3. Citizenship and Education
   - a) EDUC 167. Educating for Equity and Democracy
   - b) EDUC 179B. Youth Empowerment and Civic Engagement
   - c) EDUC 220C. Education and Society
   - d) EDUC 247. Moral Education
   - e) EDUC 304. The Philosophical and Educational Thought of John Dewey
4. Global Citizenship and Nongovernmental Organizations
   - a) POLISCI 143. Nongovernmental Organizations and Development in Poor Countries
   - b) POLISCI 232. Civil Society and the Nonprofit Sector
   - c) PUBLPOL 183. Philanthropy and Social Innovation

GRADUATE STUDIES

The program's main provisions for graduate students are seminars on topics in applied ethics.

COURSES

ETHICSOC 20. Introduction to Moral Philosophy—(Same as PHIL 20.) What is the basis of moral judgment? What makes right actions right and wrong actions wrong? What makes a state of affairs good or worth promoting? What is it to have a good or virtuous character? Answers to classic questions in ethics through the works of traditional and contemporary authors. GER:DB-Hum, EC-EthicReas
5 units, Spr (Schapiro, T)

ETHICSOC 30. Introduction to Political Philosophy—(Same as PHIL 30, POLISCI 3.) State authority, justice, liberty, and equality through major works in political philosophy. Topics include human nature and citizenship, the obligation to obey the law, democracy and economic inequality, equality of opportunity and affirmative action, religion, and politics. GER:DB-Hum, EC-EthicReas
5 units, Aut (Hussain, N)

ETHICSOC 77. Methodology in Ethics: Translating Theory into Practice—(Same as PHIL 77.) Ideally, social policies are informed by ethical thought and reflection, but doing good in the world requires the active translation of moral theory and political philosophy into action. What kinds of empirical data are relevant to social decision making, and how should they be collected, evaluated, and integrated into normative analysis? What assumptions about human nature are in play? How should diverse cultural values be addressed? Case studies from biomedical science, business, and government.
4 units, Spr (Staff)

ETHICSOC 78. Medical Ethics—(Same as PHIL 78.) Introduction to moral reasoning and its application to problems in medicine: informed consent, the requirements and limits of respect for patients' autonomy, surrogate decision making, euthanasia and physician-assisted suicide, and abortion. GER:DB-Hum, EC-EthicReas
4 units, Win (Jaworska, A)

ETHICSOC 133. Ethics and Politics of Public Service—(Same as POLISCI 133.) Ethical and political questions in public service work, including volunteering, service learning, humanitarian assistance, and public service professions such as medicine and teaching. Motives and outcomes in service work. Connections between service work and justice. Is mandatory service an oxymoron? History of public service in the U.S. Issues in crosscultural service work. Integration with the Haas Center for Public Service to connect service activities and public service aspirations with academic experiences at Stanford. GER:DB-SocSci
5 units, Aut (Reich, R)

ETHICSOC 170. Ethical Theory—(Same as PHIL 170/270.) Major strands in contemporary ethical theory. Readings include Bentham, Mill, Kant, and contemporary authors. GER:DB-Hum, EC-EthicReas
4 units, Aut (Jaworska, A)

ETHICSOC 171. Justice—(Same as IPS 208, PHIL 171/271, POLISCI 136S, PUBLPOL 207.) Focus is on the ideal of a just society, and the place of liberty and equality in it, in light of contemporary theories of justice and political controversies. Topics include protecting religious liberty, financing schools and elections, regulating markets, assuring access to health care, and providing affirmative action and group rights. Issues of global justice including human rights and global inequality. GER:DB-Hum, EC-EthicReas
5 units, Aut (Cohen, J)

ETHICSOC 179M. Libertarianism and Its Critics—Libertarian arguments such as: is it unjust to tax some persons' market incomes in order to provide benefits for others; is such taxation a form of theft; is it morally equivalent to forcing some persons to work for others; is the minimum wage an unjust restriction of freedom?
4 units, Spr (Staff)

ETHICSOC 190. Ethics in Society Honors Seminar—(Same as PHIL 178.) For students planning honors in Ethics in Society. Methods of research. Students present issues of public and personal morality; topics chosen with advice of instructor.
3 units, Win (Reich, R)

ETHICSOC 198. Community Engagement Internship—Restricted to Ethics in Society minors with the citizenship option. Opportunities for students to engage in community work via the Haas Center for Public Service. Students work with Haas Center staff to design an internship involving community-based research or supported by a Haas Center fellowship or community service work/study, or to serve for an academic year as a tutor in one of the Haas Center's several K-12 programs in East Palo Alto. May be repeated for credit.
3-5 units, Aut, Win, Spr, Sum (Staff)

ETHICSOC 199. Independent Studies in Ethics in Society—May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

ETHICSOC 200A. Ethics in Society Honors Thesis—Limited to Ethics in Society honors students, who must enroll once in A and once in B.
1-5 units, Aut, Win, Spr, Sum (Staff)

ETHICSOC 200B. Ethics in Society Honors Thesis—Limited to Ethics in Society honors students, who must enroll once in A and once in B.
1-5 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ANTHSCI 191B/291B. Conduct and Misconduct in Science
3-5 units, not given this year

CASA 90. Theory of Cultural and Social Anthropology
5 units, Win (Ebron, P)

CASA 108. History of Archaeological Thought—(Same as ARCHLGY 103.)
5 units, Aut (Meskell, L)

CASA 174. Cultures of Disease: Cancer
5 units, Win (Jain, S)

COMM 131/231. Media Ethics and Responsibilities
4-5 units, Win (Glasser, T)

COMM 236G/336G. Democracy, Justice, and Deliberation
1-5 units, not given this year

COMM 238/338. Democratic Theory: Normative and Empirical Issues
1-5 units, not given this year

ECON 143. Ethics in Economics Policy
5 units, not given this year

ECON 224. Science, Technology, and Economic Growth
2-5 units, Win (David, P)

EDUC 167. Educating for Equity and Democracy
3 units, Sum (McDermott, R)

EDUC 179B/279B. Youth Empowerment and Civic Engagement
2-4 units, not given this year

EDUC 137X/237X. Social Justice in Education
3 units, Win (Callan, E)

EDUC 247. Moral Education
3 units, Win (Damon, W)

EDUC 304. The Philosophical and Educational Thought of John Dewey—(Same as PHIL 242.)
4 units, not given this year

FRENGEN 295. Science, Technology, and Society in Europe and the U.S.: Ethical Debates and Controversies
3-5 units, Win (Dupuy, J)

HISTORY 236. The Ethics of Imperialism
5 units, Aut (Daughton, J)

HISTORY 243G/343G. Tobacco and Health in World History
4-5 units, Aut (Proctor, R)

HISTORY 259A. Poverty and Homelessness in America
5 units, not given this year

HISTORY 259B. Poverty and Homelessness in America II
3 units, not given this year

HISTORY 294. Violence, Ethics, Colonialism: Gandhi, Liberalism, and the Politics of Friendship
5 units, Win (Kumar, A)

HUMBIO 122S. Social Class, Race, Ethnicity, Health
4 units, given next year

ME 206A. Entrepreneurial Design for Extreme Affordability—(Same as OIT 333.)
Win, 4 units (Beach, D; Patell, J)

PHIL 174/274. Freedom and the Practical Standpoint
4 units, not given this year

POLISCI 1. Introduction to International Relations
5 units, Spr (Tomz, M)

POLISCI 114S. International Security in a Changing World
5 units, Win (Sagan, S; Blacker, C)

POLISCI 130B/330B. History of Political Thought II: Early Modern Political Thought, 1500-1700
5 units, not given this year

POLISCI 130C/330C. History of Political Thought III: Freedom, Reason, and Power
5 units, not given this year

POLISCI 131. Children's Citizenship: Justice Across Generations—(Same as EDUC 158.)
5 units, not given this year

POLISCI 136R/336. Introduction to Global Justice—(Same as INTNLREL 136R.)
5 units, Spr (Pasternak, A; de Bres, H)

POLISCI 142T. Social Protection Around the World
5 units, not given this year

POLISCI 143. Nongovernmental Organizations and Development in Poor Countries—(Same as INTNLREL 143.)
5 units, Win (Abernethy, D)

POLISCI 231S. Contemporary Theories of Justice
5 units, not given this year

POLISCI 232. Civil Society and the Nonprofit Sector—(Same as URBANST 121.)
2-4 units, not given this year

POLISCI 236. Theories of Civil Society, Philanthropy, and the Nonprofit Sector
5 units, Spr (Reich, R; Sievers, B)

PSYCH 179/270. The Psychology of Everyday Morality
4 units, not given this year

PUBLPOL 101. Politics and Public Policy—(Same as POLISCI 123.)
5 units, not given this year

PUBLPOL 164. Comparative Public Policy
3 units, not given this year

PUBLPOL 180. Social Innovation
4 units, not given this year

PUBLPOL 183. Philanthropy and Social Innovation
5 units, Spr (Arrillaga, L)

SOC 130/230. Education and Society—(Same as EDUC 220C.)
4-5 units, Aut (Ramirez, F)

STS 110. Ethics and Public Policy—(Same as MS&E 197, PUBLPOL 103B.)
5 units, Win (McGinn, R)

URBANST 131. Social Innovation and the Social Entrepreneur
1 unit, Aut (Staff)

FEMINIST STUDIES

Director: Penelope Eckert

Program Committee: Penelope Eckert (Linguistics), Heather Hadlock (Music), Miyako Inoue (Anthropology), Helen Longino (Philosophy), Valerie Miner (Feminist Studies), Londa Schiebinger (History), Elizabeth Tallent (English)

Resource Faculty:

Anthropology: Melissa Brown, Paulla Ebron, Miyako Inoue, Sarah Jain, Matthew Kohrman, Barbara Voss, Sylvia Yanagisako

Art and Art History: Wanda Corn, Pamela Lee, Melinda Takeuchi

Asian Languages: Yoshiko Matsumoto

Biological Sciences: Joan Roughgarden

Business: Joanne Martin

Classics: Maud Gleason, Susan Stephens, Yasmin Syed

Comparative Literature: Patricia Parker

Developmental Biology: Ellen Porzig

Drama: William Eddelman, Harry J. Elam, Cherríe Moraga, Peggy Phelan

Education: Susanna Loeb, Joy Williamson, Christine Min Wotipka

English: Eavan Boland, Terry Castle, Michele Elam, Andrea Lunsford, Paula Moya, Sianne Ngai, Stephen Orgel, Ramón Saldívar, Jennifer Summit, Elizabeth Tallent

Feminist Studies: Patricia Karlin-Neumann, Susan Krieger, Valerie Miner

French and Italian: Carolyn Springer

German Studies: Russell Berman, Kathryn Strachota

History: Philippe Buc, Paula Findlen, Estelle Freedman, Katherine Jolluck, Nancy Kollmann, Carolyn Lougee Chappell, Paul Robinson, Londa Schiebinger, Kären Wigen

Human Biology: Anne Firth-Murray

Law: Deborah Rhode

Linguistics: Penelope Eckert, Arnold Zwicky

Medical School: Ann Arvin, Helen Blau, Roy King, Cheryl Koopman, Iris Litt

Music: Heather Hadlock

Philosophy: Agnieszka Jaworska, Helen Longino, Debra Satz

Political Science: Terry Karl, Carolyn Wong

Psychology: Albert Bandura, Laura Carstensen, Hazel Markus

Religious Studies: Charlotte Fonrobert, Hester Gelber, Linda Hess

Slavic Languages and Literatures: Monika Greenleaf

Sociology: Paula England, Cecilia Ridgeway

Spanish and Portuguese: Yvonne Yarbro-Bejarano

Program Office: Serra House, 589 Capistrano Way
Mail Code: 94305-8640
Phone: (650) 723-2412
Email: zamoram@stanford.edu
Web Site: http://feminist.stanford.edu

The Program in Feminist Studies is an interdisciplinary undergraduate program offering students the opportunity to investigate the significance of gender and sexuality in all areas of human life. Feminist analysis asserts that gender is a central factor in the organization of society, and that definitions of gender, sex, and sexuality are social constructions. As such, they vary across time and place, have strong ideological underpinnings, and serve political ends. The courses offered by the program use feminist perspectives to expand and reevaluate the assumptions at work in traditional disciplines in the study of individuals, cultures, social institutions, policy, and other areas of scholarly inquiry.

The Program in Feminist Studies coordinates the courses offered on women, gender, sexuality, and feminism throughout the University and facilitates the undergraduate major and minor in Feminist Studies. In addition, it encourages feminist analysis and teaching at Stanford, in courses within the program and those housed within other programs and departments.

The program committee awards the annual Michelle Z. Rosaldo and Francisco Lopes prizes for the best undergraduate work on women, gender, or feminism. The prizes are awarded in two divisions: a thesis division for senior honors theses and master's papers written by undergraduates in coterminal degree programs, and an essay division. The Rosaldo prizes are awarded for the best work in the social sciences and the Lopes prizes for the best work in the humanities. Submissions are due in the Feminist Studies office in early April for essays and mid-May for theses. See the web site for updates. Essays and theses completed later in Spring or Summer Quarter may be submitted for consideration the following year.

UNDERGRADUATE PROGRAMS

Curriculum guidelines and forms for the major, minor, and honors are available at the Feminist Studies office or at http://feminist.stanford.edu. Students interested in Feminist Studies should consult the program mentor.

BACHELOR OF ARTS

The major in Feminist Studies may be taken as a single major, as one of multiple majors, or as a secondary major. If taken as one of multiple majors, none of the 62 units counted toward the major in Feminist Studies may overlap with units counted toward the major in another department or program. If taken as a secondary major, up to 30 of the units counted toward the Feminist Studies major may also be counted as fulfilling the major requirements in another department or program if that department or program consents. A maximum of 10 of the 62 units for the major may be taken on a credit/no credit or satisfactory/no credit basis; a maximum of 10 may be taken as independent study or directed reading. FEMST core courses must be taken for a letter grade.

The major should normally be declared by the beginning of a student's junior year. Majors should choose two faculty advisers from the list of resource faculty, one of whom is usually the director of the Feminist Studies program. Faculty advisers work closely with the student in helping design an appropriate program of study. A proposal explaining the rationale for the plan of study and signed by both advisers must be submitted to the program office to declare the major.

CURRICULUM

The major in Feminist Studies includes a total of at least 12 courses at the 100 level or above for 62 units. The courses are divided among the core, the focus, and electives to reach the total course requirement.

THE CORE

1. FEMST 101. Introduction to Feminist Studies. This course must be taken before 103.
2. Designated feminist theory course. See the Feminist Studies web site to see which courses fulfill the theory requirement this year.
3. FEMST 103. Feminist Theories and Methodologies.
4. FEMST 104A,B. Practicum
5. One Feminist Studies or cognate course in the social sciences. Courses that fulfill this requirement can be found among courses listed under Anthropology, Communication, Education, History, Human Biology, Law, Medicine, Political Science, Psychology, and Sociology.
6. One Feminist Studies or cognate course in the humanities. Courses that fulfill this requirement can be found among courses listed in English, Linguistics, Philosophy, Religious Studies, the arts, and languages.

THE FOCUS

Every student designs a thematic focus consisting of at least five courses. These focuses are not declared on Axess; they do not appear on the transcript or diploma.

1. At least three of the focus courses should be Feminist Studies or cognate courses.
2. At least one course should be a major survey, methodology, or theory course offered by a department or interdepartmental program as an initiation into the practice of study in the field.
3. At least one course within the thematic focus should address crosscultural issues.

4. The focus should be designed in consultation with the student's advisers. The following are examples of common focuses, but students are also encouraged to develop new one:

   Feminism and the Arts
   Feminist Perspectives on Science, Technologies, and Health
   Gender and Education
   Gender and Popular Culture
   Gender in Language and Symbol
   Gender, Race, and Nation
   Masculinities
   Medieval Gender Studies
   Queer Studies
   Women and Health
   Women and Modernity
   Women and Religion
   Women and Work

WRITING IN THE MAJOR

Majors in Feminist Studies must satisfy the Writing in the Major (WIM) requirement 2007-08 by taking FEMST 260B, The Politics of Language, in Winter Quarter, or FEMST 253, Women and the Creative Imagination, in Spring Quarter. Honors students satisfy the WIM requirement through their honors work.

PRACTICUM

A practicum is required in order to bring together theory and practical experience. The practicum should involve field research, community service, or other relevant experience such as a public service internship. Students plan their practicum during Winter Quarter of the junior year in FEMST 104A, Junior Seminar and Practicum (1 unit). The practicum is normally done over the summer between junior and senior year, and may be taken for additional units. It is followed by FEMST 104B, Senior Seminar and Practicum (1 unit), in Autumn Quarter of the senior year.

ELECTIVES

Students are encouraged to take electives that provide intellectual breadth in the program and contribute to the 62-unit requirement.

MINORS

Students interested in minoring in Feminist Studies should consult the program mentor. The minor proposal should be drafted in discussion with a faculty adviser selected from the Feminist Studies resource faculty list.

The minor in Feminist Studies consists of at least six courses at the 100 level or above for a minimum of 30 and a maximum of 36 units. None of the units for the minor may count towards the student's major. The minor in Feminist Studies should be declared by the Winter Quarter of a student's junior year.

Requirements—

1. FEMST 101. Introduction to Feminist Studies. This must be taken before 103.
2. Designated feminist theory course, *or* FEMST 103. Feminist Theories and Methodologies

FOCUS

A four-course thematic focus may be designed by the student or may follow one of the suggested clusters listed above. One course within the thematic focus should address crosscultural issues.

HONORS CERTIFICATION

FEMINIST STUDIES MAJORS/MINORS

Admission—The honors program offers an opportunity to do independent research for a thesis of superior academic quality. It is open to students with a grade point average (GPA) of 3.3 or better in course work in Feminist Studies. Students must apply for honors certification by the end of the junior year, but are encouraged to apply earlier. To apply, students should design a project in consultation with their proposed thesis adviser and the Feminist Studies honors tutor. A proposal describing the project and the number of units to be awarded must be submitted to the director of the program for final approval. See the Feminist Studies web site for details.

Requirements—

1. In addition to the normal requirements for the major, students enroll in FEMST 105 for 10-15 units towards the preparation of the honors thesis, and one unit of directed research with the director of the program (Autumn, Winter, and Spring quarters for a total of 3 units), which is granted for satisfactory attendance at meetings conducted by the honors tutor throughout the year.
2. Throughout the senior year, students work with faculty advisers and the Feminist Studies honors tutor. The final thesis must be submitted by May 30 and be of acceptable quality to the student's faculty advisers. Creative projects of high intellectual caliber are eligible if they contain a section of scholarly analysis.

MAJORS IN OTHER DEPARTMENTS

Honors certification in Feminist Studies for majors in other departments or programs, as distinguished from honors for students pursuing a major in Feminist Studies, is intended to complement study in any major.

Admission—Honors certification is open to students majoring in any field with a GPA of 3.3 or better.

As a prerequisite, students must have completed the following courses with a grade of (B+) or better:

1. FEMST 101 and a designated feminist theory course
2. *or* three Feminist Studies courses related to the topic of their proposed honors research

To apply, students must first consult the Director of the Program in Feminist Studies outlining the plan for course work, the rationale for the program, and an honors project. Students must apply for honors by the end of the junior year.

Requirements—Students enroll in FEMST 105 for 10-15 units, and 1 unit of directed research with the director of the program (Autumn, Winter, and Spring quarters for a total of 3 units), which is granted for satisfactory attendance at meetings conducted by the honors tutor throughout the year. The final thesis must be submitted by May 30, and must be of acceptable quality to the student's faculty advisers. Creative projects of high intellectual caliber are eligible if they contain a section of scholarly analysis. For more information, see http://feminist.stanford.edu.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. Courses listed as cognate courses pay significant attention to gender difference, the situation of women in Western or non-Western cultures, or the role of sex/gender systems in social organization.

FEMINIST STUDIES COURSES

FEMST 101. Introduction to Feminist Studies—(Same as ENGLISH 172B.) What is feminism and why does it matter today? Debates over the status and meaning of feminism in the 21st century. Feminist theories and practices across topics that intersect with gender inequality such as race, health, socioeconomics, sexual orientation, international perspectives, new media, civil rights, and political change. Perspectives from philosophy, education, visual culture, literary and ethnic studies, performance and expressive arts, and social sciences. GER:DB-SocSci, EC-Gender

5 units, Aut (Elam, M)

FEMST 103/203. Feminist Theories and Methods Across the Disciplines—(Graduate students register for 203; same as PHIL 153.) The interdisciplinary foundations of feminist thought, and the nature of disciplines and of interdisciplinary work. The challenges of feminism for scholarship and research, taught by a Feminist Studies resource faculty member from one of the disciplines in question. GER:EC-Gender

4-5 units, Win (Longino, H)

FEMST 104A. Junior Seminar and Practicum—Restricted to and required of Feminist Studies majors. Preparation for practicum projects. How to identify goals, submit grant proposals, and negotiate ethical issues in feminist praxis. The relationship between potential projects and their academic focus in the major.

1 unit, Win (Staff)

FEMST 104B. Senior Seminar and Practicum—For Feminist Studies majors only. Students present reports on the relation of the practicum to their academic work, submit a draft revised analysis of the practicum, and discuss applications of feminist scholarship. May be repeated once for credit.
2 units, Aut (Staff)

FEMST 105. Honors Work
1-15 units, Aut, Win, Spr, Sum (Staff)

FEMST 108. Internship in Feminist Studies—For non-majors. Supervised field, community, or lab experience in law offices, medical research and labs, social service agencies, legislative and other public offices, or local and national women's organizations. One unit represents approximately three hours work per week. Required paper. May be repeated for credit. Prerequisites: course in Feminist Studies, consent of program office, written consent of faculty sponsor, application.
1-15 units, Aut, Win, Spr, Sum (Staff)

FEMST 120. Introduction to Queer Studies—Gay, lesbian, bisexual, transgender, transsexual, and queer political movement and theory; sexual identities and feminism; sexual identities and cultural representation; alternative family practices; queer theory in academia. Film screenings, guest speakers, and community field trips.
4-5 units, Win (Hunter, M)

FEMST 138. Violence Against Women: Theory, Issues, and Prevention—Interdisciplinary feminist perspective. Causes of abuse, approaches to ending violence against women, and its relationship to other forms of oppression such as racism, economic exploitation, heterosexism, and social class. Institutional barriers maintaining this violence; individual, community, political, legal, national, and global dimensions of possible solutions. Limited enrollment. Prerequisite: consent of instructor.
2-4 units, Aut (Baran, N)

FEMST 139. Rereading Judaism in Light of Feminism—During the past three decades, Jewish feminists have asked new questions of traditional rabbinic texts, Jewish law, history, and religious life and thought. Analysis of the legal and narrative texts, rituals, theology, and community to better understand contemporary Jewish life as influenced by feminism. GER:EC-Gender
4-5 units, alternate years, not given this year (Karlin-Neumann, P)

FEMST 140M. South Asian Women in the Diaspora—The lives of contemporary Indian and Pakistani women and constructions of gender in the diaspora. Migration from the subcontinent to different cultural contexts. Issues include fundamentalisms, women's bodies and the state, and feminist activism. Are Western categories, such as American liberal feminist discourse, meaningful to these women? How do discourses of postcoloniality, class, sexuality, and nation influence women's lives.
5 units, Spr (Ameeriar, L)

FEMST 140P. Queer Performance—(Same as DRAMA 164T.) History of 20th-century forms of performance including examples from drama, avant garde theatre, cabaret, musical theater, and performance art; contemporary critical gender and queer theories. Modes of performance such as Dada and Weimar cabaret, the postdramatic theatre of Robert Wilson and the Wooster group , and self-consciously critical performances such as the body and performance art movements of the 70s and 80s.
5 units, Spring, (Hunter, M)

FEMST 166. Feminist Theories of Knowledge—(Same as PHIL 184F/284F.) Feminist critique of traditional approaches in epistemology and alternative feminist approaches to such topics as reason and rationality, objectivity, experience, truth, the knowing subject, knowledge and values, knowledge and power. GER:DB-Hum, EC-Gender
4 units, not given this year (Longino, H)

FEMST 188N. Imagining Women: Writers in Print and in Person—Stanford Introductory Seminar. Preference to sophomores. Contemporary literature through recent texts and conversations with the authors including Stanford faculty and visiting writers. Analytical and creative writing. Write-2
4-5 units, Spr (Miner, V)

FEMST 191Q. Writing Women's Lives—Stanford Introductory Seminar. Preference to sophomores. Creative writing through dialogue focusing on prose about the lives of women in different cultures and generations. Novels, short stories, and micro-narrative including fiction and memoir. Students produce work using research, memory, imagination, and metaphor.
2 units, Aut (Miner, V)

FEMST 195. Directed Reading—May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

FEMST 253. Women and the Creative Imagination—Interdisciplinary. The lives of women artists in different cultures and generations. Students write about art forms, the role of artists in the academy, and their social responsibilities. Similarities and differences among artists. WIM
4-5 units, Aut (Miner, V)

FEMST 260/360. Seminar in Women's Health: Women and Disabilities—(Graduate students register for 360.) Topics include invisible disabilities and identities, sexualities, access, caretaking, self-definition, stigma and passing, and women's psychological as well as physical health. Prerequisite: consent of instructor. GER:DB-SocSci, EC-Gender
5 units, Spr (Krieger, S)

FEMST 260B. The Politics of Language—(Same as ENGLISH 260B.) While the U.S. was founded on principles of linguistic plurality, the English language has always been dominant in the U.S., with standard English holding most power. The struggle to share linguistic power; how questions of gender, race, and class have shaped and responded to language wars. Varieties of English in contemporary fiction, music, and film. WIM
5 units, Win (Lunsford, A)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CASA 116. Women in Muslim and Arab Worlds
5 units, Spr (Staff)

CASA 138/238. Archaeology of Sex, Sexuality, and Gender
5 units, Spr (Voss, B)

CASA 380. Practice and Performance: Bourdieu, Butler, Giddens, de Certeau
5 units, Win (Voss, B)

COMM 146/246. Language and Discourse: Race, Class, and Gender
4-5 units, Spr (Morgan, M)

CSRE 180C. Asian American Sexualities—(Same as PSYCH 180C.)
5 units, Win (Chiang, I)

CSRE 145A. Poetics and Politics of Caribbean Women's Literature—(Same as CASA 145A.)
5 units, Win (Duffey, Carolyn)

DRAMA 189Q. Mapping and Wrapping the Body
3 units, Aut (Eddelman, W)

EDUC 201. History of Education in the United States—(Same as HISTORY 158B.)
3-4 units, Spr (Staff)

ENGLISH 187G. Brokeback: Queering Western Literature
5 units, Aut (Gano, G)

HISTORY 161. U.S. Women's History, 1890s-1990s
5 units, Spr (Freedman, E)

HISTORY 221B. The Woman Question in Modern Russia
5 units, Aut (Jolluck, K)

HISTORY 221D/321D. Women's Activism in War and Peace
4-5 units, Spr (Jolluck, K)

HISTORY 295J. Chinese Women's History
5 units, Spr (Sommer, M)

HPS 156. History of Women and Medicine in the United States
5 units, Aut (Horn, M)

HUMBIO 129. Critical Issues in International Women's Health
4 units, Win (Murray, A)

INDE 245. Women and Health Care
1-2 units, Aut (Grudzen, M; LeBaron, S; Massion, C)

LAW 307. Gender, Law, and Public Policy
3 units, Win (Rhode, D)

RELIGST 156. Goddesses and Gender in Hinduism
4 units, Spr (Staff)

SOC 123/223. Sex and Love in Modern Society
3-5 units, Aut (England, P)

SOC 142/242. Sociology of Gender
3-5 units, Win (Ridgeway, C)

SPANLIT 101N. Visual Studies and Chicana/o Art
3-5 units, Spr (Yarbro-Bejarano, Y)

SPANLIT 178N. *Del Otro Lado:* Latina/o Performance in the U.S.
3 units, Win (Moraga, C)

SPANLIT 286/386. The Films of Lourdes Portillo
3-5 units, Aut (Yarbro-Bejarano, Y)

SPANLIT 289. The Body in Chicana/o Cultural Representations
5 units, Aut (Yarbro-Bejarano, Y)

OVERSEAS STUDIES

Courses approved for the Feminist Studies major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

BERLIN

OSPBER 28. Art and Body Culture: Dance in Germany from Modernism to Fascism and Beyond
4 units, Spr (Ross, J)

OSPBER 67. Sissy Sits, Lola Runs: Gender Moves in German Movies
5 units, Win (Kramer, K)

OSPBER 174. Sports, Culture, and Gender in Comparative Perspective
5 units, Spr (Junghanns, W)

FLORENCE

OSPFLOR 67. Women in Italian Cinema: Maternity, Sexuality, and the Image
4 units, Spr (Campani, E)

OSPFLOR 34. The Woman in Florentine Art
4 units, Aut (Verdon, T)

KYOTO

OSPKYOTO 44. Modernizing Women in Japan
4-5 units, Spr (Wigen, K)

SANTIAGO

OSPSANTG 56. Contemporary Chilean Women Writers
3-5 units, Spr (Haro, P)

OSPSANTG 111. Social Heterogeneity in Latin America
5 units, Aut (Valdés, T)

FINANCIAL MATHEMATICS

Director: Tze Leung Lai
Steering Committee: A. Dembo, K. Giesecke, T. Lai, A. Owen, G. Papanicolaou, J. Primbs, K. Singleton, A. Toussaint
Core Faculty:
Business: D. Duffie, J. M. Harrison, K. Singleton
Economics: T. Amemiya, P. Hansen, M. Kurz, J. Shoven
Electrical Engineering: T. Cover
Management Science and Engineering: K. Giesecke, D. Luenberger, J. Primbs
Mathematics: S. Brendle, A. Dembo, P. Diaconis, G. Papanicolaou, A. Toussaint
Statistics: T. Cover, A. Dembo, P. Diaconis, T. Lai, A. Owen

This is an interdisciplinary program that provides a master's level education in applied and computational mathematics, statistics, and financial applications to individuals with strong mathematical skills. The departments of Mathematics and Statistics, in close cooperation with the departments of Economics, and Management Science and Engineering, as well as the Graduate School of Business, provide many of the basic courses.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The program requires that the student take 45 units of work. Of these 45 units of work, 12 courses must be taken from the offerings provided on the lists of required and elective courses. These courses must be taken for a letter grade, but students may elect to take one of the 12 courses credit/no credit. An overall grade point average (GPA) of 2.75 is required. There is no thesis requirement.

Ordinarily, four quarters are needed to complete all requirements.

Admission—To be eligible for admission, students are expected to have taken the following courses or their equivalent:

1. Linear algebra at the level of MATH 103.
2. Advanced calculus (real analysis) at the level of MATH 115.
3. Basic ordinary and partial differential equations at the level of MATH 131 and 132 (basic partial differential equations).
4. Probability at the level of STATS 116; theory of statistics at the level of STATS 200; and stochastic processes at the level of STATS 217 or, preferably, MATH 136.
5. Computer programming at the level of CS 106A.

Some of these courses are offered as summer courses and may be taken by candidates lacking the required background.

Candidates for admission must take the general Graduate Record Examination and preferably the subject test in Mathematics as well. Information about these exams can be found at http://www.gre.org.

Requirements—For the M.S. degree in Financial Mathematics, students must fulfill six of the following required courses:

1. In stochastic processes and statistics:
    a) MATH 236. Introduction to Stochastic Differential Equations
    b) STATS 241. Statistical Modeling in Financial Markets
2. In differential equations, simulation, and computing:
    a) MATH 227. Partial Differential Equations and Diffusion Processes *or* STATS 362 Monte Carlo Sampling
    b) MATH 239. Computation and Simulation in Finance
3. In finance and economics:
    a) MS&E 242H. Investment Science Honors *or* MATH 240. Topics in Financial Mathematics: Fixed Income Models
    b) MATH 238/STATS 250. Mathematical Finance

Courses that are equivalent to the above and have been taken previously may be waived by the adviser, in which case they must be replaced by elective courses in the same subject area.

In addition, students must take at least six approved elective courses from a list that can be found on the web site at http://finmath.stanford.edu/. With the approval of the instructor, credit can be obtained for practical training in industry. Students must sign up for STATS 297 and write a detailed report in order to receive credit.

A seminar in Financial Mathematics is an integral part of the program and an opportunity to interact with leading academic and industry speakers (for credit, enroll in STATS 239).

Any remaining units required to complete the 45 total must be taken from the following options:

1. Courses from the approved list of electives with emphasis on computation, information technology, or finance.
2. STATS 200, 217, 218; MATH 131, 132, 202; or ECON 140.
3. Additional practical CS courses.

The requirements must be met within two years of entering the program, or four academic quarters for those already at Stanford.

COURSES

The following are required core courses.

MANAGEMENT SCIENCE AND ENGINEERING

MS&E 242H. Investment Science Honors—Concepts of modern quantitative finance and investments. Basic concepts under certainty including arbitrage, term structure of interest rates, and bond portfolio immunization. A situation of uncertainty in one period. Topics: arbitrage; theorems of asset pricing; pricing measures; derivative securities; applications and estimating of financial risk measures; mean-variance portfolio analysis; and equilibrium and the capital asset pricing model. Group projects involving financial market data. Prerequisites: basic probability, statistics, and economics such as MS&E 120, 121, MATH 51, ENGR 60, or equivalents. No prior knowledge of finance required.

3 units, Aut (Giesecke, K)

MATHEMATICS

MATH 227. Partial Differential Equations and Diffusion Processes—Parabolic and elliptic partial differential equations and their relation to diffusion processes. First order equations and optimal control. Emphasis is on applications to mathematical finance. Prerequisites: MATH 131 and MATH 136/STATS 219, or equivalents.

3 units, Win (Nolen, J)

MATH 236. Introduction to Stochastic Differential Equations—Brownian motion, stochastic integrals, and diffusions as solutions of stochastic differential equations. Functionals of diffusions and their connection with partial differential equations. Random walk approximation of diffusions. Prerequisite: 136 or equivalent and differential equations.

3 units, Win (Papanicolaou, G)

MATH 238. Mathematical Finance—(Same as STATS 250.) Stochastic models of financial markets. Forward and futures contracts. European options and equivalent martingale measures. Hedging strategies and management of risk. Term structure models and interest rate derivatives. Optimal stopping and American options. Corequisites: MATH 236 and 227 or equivalent.

3 units, Win (Papanicolaou, G)

MATH 239. Computation and Simulation in Finance—Monte Carlo, finite difference, tree, and transform methods for the numerical solution of partial differential equations in finance. Emphasis is on derivative security pricing. Prerequisite: 238 or equivalent.

3 units, Spr (Toussaint, A)

MATH 240. Topics in Financial Mathematics: Fixed Income Models—Introduction to continuous time models for arbitrage-free pricing of interest rate derivatives. Bonds, yields, and the construction of yield curves. Caps, floors, swaps, swaptions, and bond options. Short rate models. Yield curve models. Forward measures. Forward and futures. LIBOR and swap market models. Prerequisite: MATH 238.

3 units, Spr (Toussaint, A)

STATISTICS

STATS 241. Statistical Modeling in Financial Markets—(SCPD students register for 241P.) Nonparametric regression and yield curve smoothing. Advanced time series modeling and forecasting. Market risk measures. Substantive and empirical modeling approaches in financial markets. Statistical trading strategies. Prerequisite: 240 or equivalent.

3-4 units, Spr (Lai, T)

STATS 362. Monte Carlo Sampling—Fundamentals of Monte Carlo methods. Generating uniform and nonuniform variables, random vectors and processes. Monte Carlo integration and variance reduction. Quasi-Monte Carlo sampling. Markov chain Monte Carlo, including Gibbs sampling and Metropolis-Hastings. Examples, problems and motivations from Bayesian statistics, computational finance, computer graphics, physics.

2-3 units, Aut (Owen, A)

FRENCH AND ITALIAN

Emeriti: (Professors) John G. Barson, Marc Bertrand, Robert G. Cohn, John Freccero, René Girard, Ralph M. Hester, Pauline Newman-Gordon, Roberto B. Sangiorgi, Leo Weinstein
Chair: Robert Harrison
Director of Graduate Studies: Jeffrey Schnapp
Directors of Undergraduate Studies: Cécile Alduy (French), Carolyn Springer (Italian)
Professors: Jean-Marie Apostolidès, Jean-Pierre Dupuy, Hans U. Gumbrecht, Robert Harrison, Elisabeth Mudimbe-Boyi, Jeffrey T. Schnapp, Michel Serres
Associate Professors: Joshua Landy, Carolyn Springer
Assistant Professors: Cécile Alduy, Dan Edelstein, Laura Wittman
Senior Lecturer: Maria Devine
Lecturers: Dorian Bell (Humanities Fellow), Lorraine Sterritt, Sarah Sussman
Courtesy Professors: Keith Baker, Margaret Cohen, Paula Findlen, Michael Marrinan
Visiting Professors: Rachel Jacoff, Elena Russo

Department Offices: Building 260, Room 122-123
Mail Code: 94305-2010
Department Phone: (650) 723-4183
Email: fren-ital@stanford.edu
Web Site: http://french-italian.stanford.edu

Courses given in French and Italian have the subject codes FRENGEN, FRENLIT, ITALGEN, and ITALLIT. For courses in French or Italian language instruction with the subject code FRENLANG or ITALLANG, see the "Language Center" section of this bulletin. For a complete list of subject codes, see Appendix.

FRENCH SECTION

The French section provides students with the opportunity to pursue course work at all levels in French language, literature, cultural and intellectual history, theory, film, and Francophone studies. It understands the domain of French Studies as encompassing the complex of cultural, political, social, scientific, commercial, and intellectual phenomena associated with French-speaking parts of the world, from France and Belgium to Canada, Africa, and the Caribbean.

Three degree programs are available in French: a B.A., a terminal M.A., and a Ph.D. A Ph.D. in French and Italian is also available.

Visiting faculty and instructors contribute regularly to the life of the French section. The section maintains contacts with the Ecole Normale Supérieure, the Institut d'Etudes Politiques, and the Ecole Polytechnique.

A curator for Romance languages oversees the extensive French collection at Green Library. The Hoover Institute on War, Revolution, and Peace also includes materials on 20th-century France and French social and political movements.

France-Stanford Center for Interdisciplinary Studies—The center, founded in partnership with the French Ministry of Foreign Affairs, aims to bridge the disciplines of the humanities, social sciences, sciences, engineering, business, and law, to address historical and contemporary issues. Its programs bring faculty and students from across Stanford's departments and schools in contact with colleagues in France to explore issues of common intellectual concern. The center invites French-speaking scholars to offer courses or give lectures or seminars on campus. It facilitates internships for Stanford students in computer science and engineering in Sophia-Antipolis, France's new high-tech center near Nice.

La Maison Française—La Maison Française, 610 Mayfield, is an undergraduate residence that serves as a campus French cultural center, hosting in-house seminars as well as social events, film series, readings, and lectures by distinguished representatives of French and Francophone intellectual, artistic, and political life. Assignment is made through the regular housing draw.

Stanford in Paris—The Bing Overseas Studies Program in Paris offers undergraduates the opportunity to study in France during Autumn, Winter, and Spring quarters. It provides academic options, including course work at the Stanford center and at the University of Paris, independent study projects, and internships. In addition, the program promotes interaction with the local community through volunteer employment, homestays, and internships. The minimum language requirement for admission into Stanford in Paris is one year of French at the college level.

Courses offered in Paris may count toward fulfillment of the requirements of the French major or minor. Students should consult with the Director of Undergraduate Studies before and after attending the program, in order to ensure that course work and skills acquired abroad can be co-ordinated appropriately with their degree program. Detailed information, including program requirements and curricular offerings, may be obtained from the "Overseas Studies" section of this bulletin, the Stanford in Paris web site http://osp.stanford.edu/program/paris, or the Overseas Studies Program Office in Sweet Hall.

ITALIAN SECTION

The Italian section offers graduate and undergraduate programs in Italian language, literature, culture, and intellectual history. Course offerings range from small, specialized graduate seminars to general courses open to all students on authors such as Dante, Boccaccio, and Machiavelli.

Three degree programs are available in Italian: a B.A., a terminal M.A., and a Ph.D. A Ph.D. in French and Italian is also available.

Collections in Green Research Library are strong in the medieval, Renaissance, and contemporary periods; the Italian section is one of the larger constituents of the western European collection at the Hoover Institution for the Study of War, Revolution, and Peace; and the Music Library has excellent holdings in Italian opera.

La Casa Italiana—La Casa Italiana, 562 Mayfield, is an undergraduate residence devoted to developing an awareness of Italian language and culture. It works with the Italian Cultural Institute in San Francisco and with other local cultural organizations. It hosts visiting representatives of Italian intellectual, artistic, and political life. A number of departmental courses are taught at the Casa, which also offers in-house seminars. Assignment is made through the regular undergraduate housing draw.

Stanford in Italy—The Bing Overseas Studies Program in Florence affords undergraduates with at least three quarters of Italian language the opportunity to take advantage of the unique intellectual and visual resources of the city and to focus on two areas: Renaissance history and art, and contemporary Italian and European studies. The program is structured to help integrate students into Italian culture through homestays, Florence University courses, the Language Partners Program, research, internship and public service opportunities, and by conducting some of the program's classes in Italian. Many courses offered in Florence may count toward the fulfillment of requirements for the Italian major or minor. Students are encouraged to consult with the Italian undergraduate adviser before and after a sojourn in Florence to ensure that their course selections meet Italian section requirements. Information on the Florence program is available in the "Overseas Studies" section of this bulletin, the Stanford in Florence web site http://osp.stanford.edu/program/florence, or at the Overseas Studies office in Sweet Hall.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS IN FRENCH

The French section offers a major and a minor in French. Students are encouraged to pursue a course of study tailored to their individual needs and interests. A degree in French serves as a stepping stone to entering international business, law, translation, and teaching, or as preparation for graduate studies in French, history, or comparative literature.

The French literature, culture, and civilization specialization allows students to combine their work in French with work from another field such as African studies, linguistics, art history, music, economics, history, education, medicine, international relations, political science, or other foreign languages and literatures. The literature and philosophy specialization offers students the opportunity to pursue interdisciplinary studies at the intersection of literature and philosophy in a structured manner and alongside similarly interested students from a variety of humanistic disciplines.

Students who complete the department's two quarter IHUM sequence are eligible for 5 units towards the French major or minor. Students enrolled in the French language discussion section of the IHUM sequence receive, in addition to these 5 units, an additional 4 units (2 per quarter), assuming that they complete the written work in French.

Prerequisites—Before declaring a French major, a student must be proficient in written and spoken French at a second-year college level. Such proficiency must be demonstrated either:

1. by having completed the entire language sequence up to and including FRENLANG 23;
2. by having scored a 5 or better on either the French language or the French literature Advanced Placement (AP) exams; *or*
3. by having demonstrated equivalent proficiency on the departmental placement exam offered at the beginning of each academic quarter.

Students not meeting at least one of these criteria are required to complete the portion of the language sequence as deemed necessary by the department before beginning to take courses toward the major.

REQUIREMENTS

FRENCH

The French major requires a minimum of 56 units, all courses of which must be taken for a letter grade and must be selected in accordance with the following requirements:

1. *Advanced language* (ca. 4 units): FRENLANG 126, Stylistics and Textual Analysis.
2. *Introductory series on French and Francophone literature and culture* (ca. 12 units): three courses must be taken from the FRENLIT 130, 131, 132, 133 sequence. Any one of these courses fulfills the Writing in the Major requirement.
3. *Research Seminar* (5 units): a majors-only seminar, DLCL 189, must be taken in the Autumn Quarter of the senior year. This course prepares and assists students as they undertake either their senior project (see below) or honors thesis. It also familiarizes them with research resources in the department and University and helps students think critically about their research topics. By the end of the course, students must have chosen an adviser, generally a faculty member in the department, who offers support and feedback throughout the development of the senior project or honors thesis.
4. *Ancien Régime courses* (ca. 8 units): at least two courses must concern the period before July 1789. Courses fulfilling this requirement within the department must be drawn from the 140 level or above. Courses chosen from outside the department must be preapproved by the Director of Undergraduate Studies.
5. *Upper-level French courses* (ca. 8 units): at least two additional courses must be taken within the department. In total, at least 32 units of course work must be taken within the department. No more than three courses numbered lower than 130 may be counted towards the major.
6. *Remaining courses* (ca. 22 units): the student is encouraged to use the remaining five or more courses to develop a specialized knowledge of a specific domain related to either the senior project or the honors thesis. These courses must show obvious internal consistency and relevance to the chosen focus, and must be approved by the Director of Undergraduate Studies. Where possible, students are encouraged to complete their written work in French. Of these courses, only one, for a maximum of 4 units, may be drawn from individual work (199).

Senior Project—In order to demonstrate the quality of his or her scholarly work and command of written French, each major not writing an honors thesis (see "Honors Program" below) is required to submit a senior project to the project adviser before May 15 of the senior year. The project consists of a research paper with a target length of 20 pages and must be written in French.

The senior project is not graded and no credit is offered for it. However, acceptance of the senior project by the project adviser is a condition for graduation from the department. A paper deemed unsatisfactory by the project adviser is returned to the student for rework and resubmission by an agreed-upon date.

Students are advised to begin thinking about their senior projects as early as their junior year, even if they are in Paris. While in Paris, students should avail themselves of the unique resources the city has to offer for research on their chosen topic.

FRENCH AND PHILOSOPHY

The French and Philosophy major specialization requires a minimum of 16 courses, for a minimum total of 65 units, distributed as follows:

1. *Advanced language* (ca. 4 units): FRENLANG 126, Stylistics and Textual Analysis.
2. *Introductory Series on French and Francophone Literature and Culture* (ca. 12 units): three courses must be taken from the FRENLIT 130, 131, 132, 133 sequence.
3. *Philosophy Writing in the Major* (5 units): PHIL 80. Prerequisite: introductory philosophy class.
4. *Philosophy and Literature Gateway Course* (4 units): FRENGEN 181 (same as PHIL 81). This course should be taken as early as possible in the student's career, normally in the sophomore year.
5. *Aesthetics, Ethics, Political Philosophy* (ca. 4 units): one course from the PHIL 170 series.
6. *Language, Mind, Metaphysics, and Epistemology* (ca. 4 units): one course from the PHIL 180 series.
7. *History of Philosophy* (ca. 8 units): two courses in the history of philosophy, numbered above PHIL 100.
8. *Upper Division French Courses* (ca. 12 units): at least three courses numbered FRENLIT/FRENGEN 140 or higher.
9. *Related Courses* (ca. 8 units): two upper division courses relevant to the student's chosen area of specialization. One course (4 units) may be FRENLIT 199, Individual Work.
10. *Capstone Seminar* (ca. 4 units): this year's capstone seminars are COMPLIT 154/GERLIT 154, Heidegger on Hölderlin, and PHIL 173A, Aesthetics: Metaphor across the Arts. One of these courses must be taken in the student's senior year.

The capstone seminar and the two related courses must be approved by both the undergraduate adviser of French and the undergraduate adviser of the initiative in philosophical and literary thought administered through the DLCL. Substitutions, including transfer credit, are not normally permitted for items 5, 6, and 7, and are not permitted under any circumstances for items 3, 4, and 10. Up to 10 units of courses taken in the Philosophy department may be taken CR/NC or S/NS; the remainder must be taken for a letter grade.

EXTENDED MAJORS

Requirements for both extended majors are essentially identical to those of the French major with a concentration in French literature.

French and English Literatures—In addition to the requirements for the B.A. in French, candidates complete four English literature courses numbered 100 and above related to their French program.

French and Italian Literatures—In addition to the requirements for the B.A. in French, students complete four Italian courses numbered 200 and above related to their concentration in French.

FRENCH AND LINGUISTICS

Linguistics majors may elect to specialize in the French language. In addition to 50 units in Linguistics, of which two courses (LINGUIST 110 and 160) may be replaced by comparable courses in French, students opting for a French Language specialization must take three courses in the introductory series devoted to French and Francophone literature and culture (FRENLIT 130-133). For details, contact the Department of Linguistics.

MINOR IN FRENCH

Students considering a minor in French are encouraged to design a course of studies that fosters their understanding of the interaction between French and their major field of specialization. A minimum of 24 units of undergraduate work beyond the French 23 level must be completed. All courses must be taken for a letter grade.

Requirements for the minor include one advanced language course (at the 120 level); three of the introductory series on French and Francophone literature and culture (FRENLIT 130-133); and a minimum of two additional courses in language or literature numbered 121 and above. Of these, only one may be taught in English. All courses must be chosen in consultation with the Director of Undergraduate Studies.

Double-counting is not permitted; in other words, courses used to satisfy French minor requirements may not be counted toward a student's major or toward a second minor.

HONORS PROGRAM

Majors are eligible to apply to the honors program if they have maintained an average grade point average (GPA) of 3.5 in five upper-division French courses. The honors program candidate must fulfill all regular requirements for the major, save the senior project, from which he or she is exempt. Instead, the student undertakes the writing of a research paper no shorter than 50 pages in length, written in French or English, on a specialized topic. No later than the end of the Spring Quarter of the junior year, the student must submit to the Director of Undergraduate Studies an "Application for Honors," the central portion of which must contain an outline of the proposed honors essay. If it is in need of revisions, the Director of Undergraduate Studies helps the student through the revision process until the proposal is granted his or her approval. (The Director of Undergraduate Studies also helps the student identify an appropriate adviser for the essay.) Students may enroll for 2 units of credit in FRENLIT 189B for the drafting or revision of the thesis proposal in Spring Quarter of the junior year. In Autumn Quarter of the senior year, honors students must enroll in DLCL 189, a 5-unit seminar that focuses on researching and writing the honors thesis. Students then enroll for 5 units of credit in FRENLIT 189A while composing the thesis during Winter Quarter. Students who did not enroll in a 189B course in the junior year may enroll in FRENLIT 189B in Spring quarter of the senior year while revising the thesis, if approved by the thesis advisor. A total of 10-12 units are awarded for successful completion of honors course work, independent study, and the finished thesis. Honors essays are due to the thesis adviser no later than 5:00 p.m. on May 15 of the terminal year. If an essay is found deserving of a grade of 'A-' or better by the thesis adviser, honors are granted at the time of graduation.

Honors College—The Department of French and Italian encourages honors students to enroll in the honors college run by the Division of Literatures, Cultures, and Languages (DLCL). The college meets at the end of every summer, during the weeks directly preceding the start of the academic year, and is designed to help students develop their honors thesis projects. Applications must be submitted by the Spring Quarter of the same calendar year. For more information, contact the undergraduate student services officer in the DLCL.

BACHELOR OF ARTS IN ITALIAN

REQUIREMENTS

The Italian major offers students the opportunity to develop an in-depth knowledge of Italian literature, language, and civilization through a highly flexible program combining course work in Italian with work in such fields as art history, classics, comparative literature, economics, English, French, history, international relations, music, philosophy, and political science. All Italian majors are required to have completed three second-year language courses (or the equivalent taken at the Florence campus):

ITALLANG 21. Second-Year Italian, First Quarter
ITALLANG 22. Second-Year Italian, Second Quarter
ITALLANG 23. Second-Year Italian, Third Quarter

Completion of the department's two quarter Great Works IHUM sequence (see above) entitles a student to 5 units towards the Italian major or minor. Students considering an Italian major should consult with the Italian undergraduate adviser as early as possible (even before completing the language requirement) in order to ensure a maximum of flexibility in designing a course of study suited to individual needs and cultural interests.

Italian majors must complete 60 units of course work above the 100 level.

The remaining requirements for the major are:

1. A minimum of 32 units of Italian courses (selected from courses numbered 100 and above).
2. Of these courses, at least one on Dante is required, as well as at least one in each of the following areas: (a) the Middle Ages; (b) the early modern period; and (c) the modern period. A Dante course may fulfill the Middle Ages requirement.
3. The intermediate-level survey sequence (ITALLIT 127, 128, 129). Any one of these courses fulfills the Writing in the Major Requirement.
4. One advanced language course beyond the level of ITALLANG 114.

Of the 60 units required for the major, up to 28 units of course work in related fields may be taken outside the department.

ITALIAN AND PHILOSOPHY

A second option is now possible within the Italian major, offering students the opportunity to combine studies in literature and philosophy. Students take most of their courses alongside students from departments specializing in the intersection of literature and philosophy.

The Italian and Philosophy major track requires a minimum of 16 courses, for a minimum total of 65 units, distributed as follows:

1. *Italian Survey Sequence* (ca. 12 units): ITALLIT 127, 128, 129.
2. *Advanced Language Course* (ca. 4 units): ITALLANG 114 and above.
3. *Philosophy Writing in the Major* (5 units): PHIL 80. Prerequisite: introductory philosophy class.
4. *Philosophy and Literature Gateway Course* (4 units): ITALGEN 181 (same as PHIL 81). This course should be taken as early as possible in the student's career, normally in the sophomore year.
5. *Aesthetics, Ethics, Political Philosophy* (ca. 4 units): one course from the PHIL 170 series.
6. *Language, Mind, Metaphysics, and Epistemology* (ca. 4 units): one course from the PHIL 180 series.
7. *History of Philosophy* (ca. 8 units): two courses in the history of philosophy, numbered above PHIL 100.
8. *Upper Division Italian Courses* (ca. 12 units): at least three courses numbered ITALLIT/ITALGEN 100 or higher.
9. *Related Courses* (ca. 8 units): two upper division courses relevant to the student's chosen area of specialization.
10. *Capstone Seminar* (ca. 4 units): this year's capstone seminars are COMPLIT 154/GERLIT 154, Heidegger on Hölderlin, and PHIL 173A, Aesthetics: Metaphor across the Arts. One of these courses must be taken in the student's senior year.

The capstone seminar and the two related courses must be approved by both the undergraduate adviser of Italian and the undergraduate adviser of the program in philosophical and literary thought administered through the DLCL. No more than 24 units may be drawn from courses offered overseas. Substitutions, including transfer credit, are not normally permitted for items 5, 6, and 7, and are not permitted under any circumstances for items 3, 4, and 10. Up to 10 units of courses taken in the Philosophy department may be taken CR/NC or S/NS; the remainder must be taken for a letter grade.

EXTENDED MAJORS

Requirements for both extended majors are essentially identical to those of the Italian major with a concentration in Italian literature.

Italian and English Literatures—In addition to the 32 departmental units required for the B.A. in Italian, candidates must complete four English literature courses numbered 100 and above related to the field of concentration in Italian Studies.

Italian and French Literatures—In addition to the 32 departmental units required for the B.A. in Italian, candidates must complete four French literature courses numbered 100 and above related to the field of concentration in Italian Studies.

MINOR IN ITALIAN

Students considering a minor in Italian are encouraged to design a course of studies that fosters their understanding of the interaction between Italian and their second area of expertise. A minimum of 24 units of undergraduate work beyond ITALLANG 21 must be completed.

Requirements for the minor include ITALLANG 22 and 23 (or equivalent); all three of the introductory series on Italian literature and culture (ITALLIT 127, 128, 129); and a minimum of one advanced course in language or literature numbered 114 and above. All courses must be chosen in consultation with the Director of Undergraduate Studies, who is responsible for evaluating all requests and individual study plans for the minor.

HONORS PROGRAM

Italian majors with a grade point average (GPA) of 3.3 (B+) or better in all Italian courses are eligible for department honors. Students interested in the honors program should consult the Italian undergraduate adviser early in their junior year. In addition to the requirements listed above, the student must submit to the Italian faculty a proposal for the honors essay by the end of Spring Quarter of the junior year. During the quarter, students may enroll in ITALLIT 189B while drafting and revising the proposal and conducting preliminary research. In Autumn Quarter of the senior year, honors students must enroll in DLCL 189, a 5-unit seminar that focuses on researching and writing the honors thesis. Students then enroll for 5 units of credit in ITALLIT 189A while composing the thesis during Winter Quarter. Students who did not enroll in a 189B course in the junior year may enroll in ITALLIT 189B in Spring quarter of the senior year while revising the thesis, if approved by the thesis advisor. A total of 10-12 units are awarded for successful completion of honors course work, independent study, and the finished thesis. Honors essays are due to the thesis adviser no later than 5:00 p.m. on May 15 of the terminal year. If an essay is found deserving of grade of 'A-' or better by the thesis adviser, honors are granted at the time of graduation.

Honors College—The Department of French and Italian encourages honors students to enroll in the honors college run by the Division of Literatures, Cultures, and Languages (DLCL). The college meets at the end of every summer, during the weeks directly preceding the start of the academic year, and is designed to help students develop their honors thesis projects. Applications must be submitted by Spring Quarter of the same calendar year. For more information, contact the undergraduate student services officer in the DLCL.

MINOR IN LITERATURE AND MINOR IN MODERN LANGUAGES

The Division of Literatures, Cultures, and Languages offers two undergraduate minor programs, the minor in Literature and the minor in Modern Languages. Both of these minors draw on literature and language courses offered through this and other literature departments. See the "Literatures, Cultures, and Languages" section of this bulletin for further details about the minors and their requirements.

DIGITAL HUMANITIES MODULE

The French and Italian department, in collaboration with the Humanities Lab, also offers a digital humanities module that can be combined with any of the department's major programs. Students who are interested in digital humanities should contact the department's Director of Undergraduate Studies who facilitates coordination with the Humanities Lab. Students planning to combine the French major and the digital humanities module must fulfill the following requirements in addition to the general major requirements:

1. CS 105 or equivalent
2. Participate in the Humanities Lab gateway core seminar, HUMNTIES 198J/ENGLISH 153H, Digital Humanities: Literature and Technology (5 units)
3. Complete the HUMNTIES 201, Digital Humanities Practicum (2-5 units), in the junior year
4. Complete one digital project, in lieu of the course's main writing requirement, in a course offered in the department under the supervision of the course instructor and humanities lab adviser. This should usually be done in an upper-division course.

Students are encouraged to enroll in DLCL 99, Multimedia Course Lab, when working on the digital course project. For more information on the Digital Humanities Lab, see http://shl.stanford.edu.

COTERMINAL BACHELOR'S AND MASTER'S PROGRAM IN FRENCH OR ITALIAN

Each year the department admits a small number of highly motivated undergraduates to the coterminal B.A. and M.A. degree in French or in Italian. Applications must be submitted by January 31 of the senior year to the department chair and must include: a written statement of purpose, two letters of recommendation from faculty at Stanford, and a transcript. Students accepted into the coterminal program must have been undergraduate majors in the relevant language and must meet all requirements for the B.A. and the M.A.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

Admission to the M.A. and Ph.D. Programs—Applications and admissions information may be obtained from Graduate Admissions in the Registrar's Office, or at http://gradadmissions.stanford.edu. Applicants should read the general regulations governing degrees in the "Graduate Degrees" section of this bulletin. Applicants to the French program should have preparation equivalent to an undergraduate major in French; applicants to the Italian program should have done significant course work in Italian literature and/or Italian studies on the undergraduate level; in both cases, applicants should also have reached a high level of speaking and writing proficiency in the language. Previous study of an additional language is also highly desirable. Recent Graduate Record Examination (GRE) results are required, as are two writing samples representative of the applicant's best undergraduate work. One sample should be in English, one in the language of study.

MASTER OF ARTS IN FRENCH

The terminal M.A. in French provides a flexible combination of language, literature, cultural history, and methodology course work designed to enhance the preparation of secondary school, junior college, or college teachers.

Candidates must complete a minimum of 45 units of graduate work, all courses being taken for a letter grade, with a grade point average (GPA) of 3.3, as well as pass the master's examination at the end of their training. To fulfill the requirements in a single year, enrollment must be for an average of 15 units per quarter.

Candidates must take one cultural history course (to be taken either inside or outside the Department of French and Italian). All remaining units are to be taken in advanced French literature courses (200 level or above), three of which must be concerned with the pre-revolutionary period of French cultural history.

Applications for admission to the Masters of Arts program must be received by the last Friday of March in the prior academic year. Candidates for this degree are not eligible for financial aid or for teaching assistantships.

EXAMINATION

The terminal M.A. examination is normally administered two weeks before the end of the Spring Quarter by the three members of the examination committee, selected each year by the Director of Graduate Studies. It consists of two parts:

1. The written exam (two hours) tests the candidate's general knowledge of French literature and is based on the same reading list as that for the Ph.D. qualifying exam (see below).

   The exam requires that the candidate answer four questions (out of six) in a manner that demonstrates his/her ability to synthesize and draw parallels between periods, genres, and systems of representation on the basis of the standard reading list. At least one question must be answered in French and two in English. Use of a dictionary is allowed.

If the student's performance on the exam is deemed a 'pass' by two out of three of the members of the examining committee, the student is then permitted to go on to the oral examination (which is ordinarily taken later the same week).

Should the candidate fail the M.A. written exam, he/she is given a second chance at the end of the Spring Quarter.

2. The oral exam (90 minutes) assumes as its point of departure the student's answers on the written exam. It examines the candidate's knowledge and understanding of French literary history on the basis of the standard reading list.

At the conclusion of the oral exam, the examination committee meets in closed session and discusses the student's performance on the written and the oral portions of the examination. If it is judged adequate, the M.A. degree is granted. In no event may the master's written and oral exams be taken more than twice.

MASTER OF ARTS IN ITALIAN

The terminal M.A. in Italian provides a combination of language, literature, civilization, and general courses designed to prepare secondary school, junior college, or college teachers.

Reading knowledge of a second Romance language is required. French is recommended.

Candidates must complete a minimum of 45 units of graduate work, all courses being taken for a letter grade, with a GPA of 3.3 (B+). To fulfill the requirements in one year, students should enroll for an average of 15 units per quarter. The basic course program is nine graduate courses, one of which may be taken outside the department but must be in a related field. The option of substituting a master's thesis for two literature courses is available.

Requirements for the completion of the M.A. include a comprehensive literature and language oral examination, which is normally given before the end of Spring Quarter. Before taking the exam, a candidate for the degree must submit to the Italian faculty a sample graduate seminar paper representative of the quality of his or her graduate work. On the basis of this paper, the results of the comprehensive examination, and the student's overall progress, members of the department vote for or against awarding of the M.A. degree.

Applications for admission must be received by the last Friday of March in the prior academic year. It is preferred that applicants have an undergraduate degree in Italian or in a related field. Knowledge of a second Romance language is desirable. Candidates for this degree are not eligible for financial aid or teaching assistantships.

DOCTOR OF PHILOSOPHY

The Department of French and Italian offers three Ph.D. programs: a Ph.D. in French, a Ph.D. in Italian, and a Ph.D. in French and Italian. Requirements for each separate Ph.D. program are listed first, followed by general requirements. All requirements are binding.

FRENCH

The Department of French and Italian provides students with the opportunity to pursue advanced work in French language, literature, cultural history, theory, and Francophone studies within a uniquely flexible interdisciplinary framework. Unlike conventional Ph.D. programs, it encourages students to construct a highly individualized course of study, integrating specialization in a particular literary period or area with work in such fields as art history, classics, film studies, the history of science and technology, linguistics, literary theory, music, and philosophy. The program is founded on the belief that such a balance between period/area specialization and interdisciplinary breadth is not only desirable but essential in a field such as French Studies. Students in the Ph.D. program are normally admitted as French Fellows on a four- to five-year fellowship plan that integrates their financial support with rigorous training as scholars and as prospective university faculty.

Students admitted to the program work closely with the Director of Graduate Studies in structuring a plan consistent with their needs and interests. Aside from the benefits of the program's flexible structure, a number of unique resources are available to students. The French section's exchange program with the Ecole Normale Supérieure provides candidates (selected on a competitive basis) with the opportunity to pursue dissertation research in Paris.

Language Requirements—Attaining a native or near-native fluency in French is the individual responsibility of all candidates in the Ph.D. program, and remedial course work needed to achieve such fluency cannot count towards the Ph.D. degree. In addition, candidates are required to achieve a high level of proficiency in one additional foreign language, with the language in question to be determined by the student and his or her adviser as a function of the student's area of specialization. Such proficiency may be demonstrated either by successfully completing a third-year level or above undergraduate course or, better, a graduate seminar in the language in question; or by passing an exam that establishes a third-year or above level of competence in writing, reading, and speaking. (In no case is passage of a standard reading competence exam considered sufficient.) In the case of ancient Greek and Latin, a high level of proficiency means a level superior to a second year collegiate level of proficiency in reading and writing.

The second foreign language requirement should be completed as soon as possible, but in any case not later than the end of the third year for students who entered the program without an M.A., and not later than the end of the second year for students who entered the program with a master's degree. Completion of the language requirements is a prerequisite for taking the University Oral Examination.

ITALIAN

Stanford's Ph.D. program in Italian offers the opportunity for advanced work in Italian literature and studies within a flexible interdisciplinary framework. It is independent of the Ph.D. program in French and aims to encourage students to bring broad methodological and interdisciplinary concerns to bear on the study of Italian literature. While it places primary emphasis on developing a command of Italian literature as a whole, it allows students to construct a highly individualized course of study, integrating specialization in a particular literary period with work in such fields as art history, classics, comparative literature, feminist studies, film, French, history, history of science, linguistics, literary theory, Medieval or Renaissance studies, philosophy, and religion. The program is founded on the belief that balance between period specialization and interdisciplinary breadth is essential in a small field such as Italian studies, particularly given the diversity of the Italian literary canon which extends over many disciplines.

Students admitted into the Ph.D. program in Italian work closely with the adviser in structuring a plan of study appropriate to needs and interests. Such a plan usually involves a mix of teaching and courses taken within the Italian program, courses taken in other departments, and independent work under supervision of a member of the Italian faculty, thus integrating financial support with training as scholars and prospective university teachers. Assuming satisfactory academic progress, fellowships are typically offered for three or four years. Graduate-level work completed elsewhere may be counted as fulfilling part of the requirements for the degree. Students in the fifth year normally apply for outside fellowships or part-time teaching positions in the department.

Aside from the benefits of the program's structure and fellowship plan, a number of unique resources are available to Ph.D. students in Italian at Stanford. During their years of study, students may be permitted to take courses, pursue dissertation research, and do independent work at the Stanford campus in Florence under supervision of a member of the Italian faculty. The Florence center, located in a palazzo along the Arno, is near important Florentine libraries and archives and the University of Florence. Graduate students also have at their disposal the resources of La Casa Italiana, a residential theme house which serves as an Italian cultural center and hosts such events as colloquia, lectures, and film series.

Language Requirements—As soon as possible, but not later than the end of the third year, the candidate must have passed reading examinations in two additional foreign languages. If the candidate's period of concentration is earlier than the Romantic period, one of these must be Latin; if Romantic or later, French. Completion of the language requirement is a prerequisite for taking the University oral examination.

FRENCH AND ITALIAN

The Department of French and Italian provides students with the opportunity to pursue a Ph.D. in French and Italian studies. This unique program encourages students to construct a highly individualized course of study within an interdisciplinary framework, in order to foster a thorough and creative knowledge of both traditions and their intersections. Students are expected to specialize in one of three periods, (a) medieval and renaissance, (b) renaissance and early modern, or (c) modern and contemporary. Students in the Ph.D. program are normally admitted either as French Fellows or as Italian Fellows on a four- to five-year fellowship plan that integrates their financial support with rigorous training as scholars and as prospective university faculty.

Students admitted to the program work closely with the Director of Graduate Studies in structuring a plan consistent with their needs and interests. Where general requirements call for the participation of a Director of Graduate Studies, candidates for the Ph.D. in French and Italian should understand that the participation of the directors of both French and Italian, if they are different, is required.

Aside from the benefits of the program's flexible structure, a number of unique resources are available to students. The French Section's exchange program with the Ecole Normale Supérieure provides candidates (selected on a competitive basis) with the opportunity to pursue dissertation research in Paris. Students may also be permitted to take courses, pursue dissertation research, and do independent work at the Stanford campus in Florence under supervision of a member of the Italian faculty.

Language Requirements—Attaining a native or near-native fluency in both French and Italian is the individual responsibility of all candidates in the Ph.D. program, and remedial course work needed to achieve such fluency cannot count towards the Ph.D. degree.

For students specializing in areas (a) medieval and renaissance and (b) renaissance and early modern, proficiency in Latin equivalent to a second year collegiate level of proficiency (the equivalent of CLASSLAT 101, 102, and 103) in reading is also required. Such proficiency may be demonstrated by successfully completing a course in the language in question (at least second-year level, but preferably a graduate seminar); or by passing an exam that establishes a second-year or above level of competence. In no case is passage of a standard reading competence exam considered sufficient.

For students specializing in area (c) modern and contemporary, proficiency in a third language (beyond French and Italian) is not required; students are, however, encouraged to acquire competency in a third language or area that is relevant to their research (e.g. German, Film Studies).

The language requirements should be completed as soon as possible, but in any case not later than the end of the third year for students who entered the program without a master's degree, and not later than the end of the second year for students who entered the program with an external master's degree. Completion of the language requirements is a prerequisite for taking the University Oral Examination.

Distribution of Elective Courses—Students must take a minimum of four advanced courses on French literature and culture, and four advanced courses on Italian literature and culture.

Qualifying Examination—Students may take either two qualifying exams, one in French and one in Italian, or a single qualifying exam in French and Italian. The combined French and Italian qualifying exam covers one of three periods, (a) medieval and renaissance, (b) renaissance and early modern, or (c) modern and contemporary. For each period it is based on a standard reading list. The list may be expanded to reflect a student's particular interests, but not abridged. One third of the combined exam takes place in English, one third in French, and one third in Italian (with the student free to choose which portion transpires in which language).

An M.A. in French and Italian is awarded in the eventuality that a student completes the qualifying examination but whose work is judged insufficient for admission to candidacy for the Ph.D. This M.A. option is open only to students approved for the French and Italian Ph.D., and is not available to coterminal students, to M.A.-only students, or to Ph.D. students in French only or Italian only.

If, at the qualifying exam stage, a student's work is judged insufficient for admission to candidacy for the Ph.D., the student may petition to continue in French only or Italian only. This petition is reviewed by the qualifying exam committee, the relevant director of graduate studies, and the chair of the Department of French and Italian.

Special Topic Examination—The chosen topic must focus equally on French and Italian literature and culture, and actively explore their relationship. Two weeks before the exam, the student must also submit not one but two graduate seminar papers, one in French on a French topic and one in Italian on an Italian topic.

University orals—The reading list should include works in both French and Italian in all genres relevant to the period covered.

Dissertation—The dissertation topic must include a substantial quotient of material from both the French and the Italian tradition, and the dissertation must include, either (1) at least one chapter on French materials and one chapter on Italian materials, or (2) at least two chapters focusing on a comparison between French and Italian materials.

Teaching—Out of the five courses the student is required to teach, at least one must be a French language course and at least one an Italian language course.

GENERAL REQUIREMENTS FOR THE PH.D.

A candidate for the Ph.D. degree must complete at least 135 units of graduate-level study and teach five language courses in the section. 72 of the 135 units must be taken within the department. The remaining units must be selected in consultation with the Director of Graduate Studies.

Students entering with a master's degree or previous graduate work may receive credit as determined on a case-by-case basis, up to a maximum of 45 units. Fellowship funding, teaching, and other requirements may be adjusted accordingly.

Required/Recommended Courses—Three courses are required:

1. FRENGEN/ITALGEN 369, Introduction to Graduate Studies: Fragments of a Material History of Literature, a 5-unit seminar offered in Autumn Quarter of each year, designed to acquaint students with the theoretical and methodological concerns of literary study. This course must be taken in the first quarter of study.
2. Definition and Inquiry: FRENGEN/ITALGEN 301E, New Methods and Sources in French and Italian Studies, a 3 unit course designed to familiarize graduate students with research materials and techniques. This course must be taken no later than the end of the third year of study.
3. APPLLING 201, The Learning and Teaching of Second Languages, the second-language pedagogy course offered by the Stanford Language Center in the Spring Quarter of each year in order to prepare entering graduate students for teaching in their second year.

Distribution of Elective Courses—Apart from these requirements, students are granted considerable freedom in structuring a course of study appropriate to their individual needs. During the first year, most course work is usually done within the department, in order to ensure an adequate preparation for the qualifying examination. In the second and third years, however, the program of study is tailored to the specific interests of the student.

Candidacy—By the sixth quarter of graduate study, students must have satisfied all requirements to advance to candidacy for the Ph.D. Students must have passed the qualifying examination and satisfactorily completed at least 72 units of graduate-level study beyond the bachelor's degree (incompletes can not be counted). A candidacy form, available from the Student Services Officer, should be completed, signed and approved the department.

TGR status—Doctoral students who have been admitted to candidacy, completed all required courses and degree requirements other than the dissertation, completed 135 units, and submitted a Doctoral Dissertation Reading Committee form may request Terminal Graduate Registration status to complete their dissertations. Each quarter, all TGR students must enroll in FRENGEN 802 or ITALGEN 802 for zero units, in the appropriate section for their adviser.

EXAMINATIONS

There are three examinations: the qualifying exam, the special topic exam, and the University oral examination.

Qualifying Examination—The first oral examination, which normally takes place at the end of Spring Quarter of the first year of study, tests the student's knowledge of language and literature. The student is responsible for scheduling the exam one month in advance. The date and time chosen must be determined in consultation with the examining committee (see below).

The exam is based on a standard reading list covering major works from all periods of literature in the language(s) of study, from the Middle Ages to the present day. The list may be expanded to reflect a student's particular interests, but not abridged.

Half of the exam takes place in the language of study, half in English (with the student free to choose which portion transpires in which language).

The exam is 90 minutes in length and consists of two parts:

1. A 20-minute presentation by the candidate on a topic to be determined by the student. This presentation may be given in English or in the language of study and should engage, in a succinct and synthetic manner, an issue or set of issues of broad relevance to the literary history of the language(s) of study. The presentation must not simply be a text read aloud, but rather must be given from notes. It is meant to be suggestive and not exhaustive, so as to provoke further discussion.
2. A 70-minute question and answer period in which the examining committee follows up on the candidate's presentation and discusses the reading list with the student. At least part of this portion of the exam takes place in the language of study. The student is expected to demonstrate a solid knowledge of the texts on the reading list and of the basic issues which they raise, as well as a broader sense of the cultural/literary context into which they fit.

The examining committee consists of the student's faculty adviser (who chairs the examination), the Director of Graduate Studies of the relevant section, and one additional faculty member from the department.

Two weeks before the exam, the student must also submit a graduate seminar paper which he or she considers representative of the quality of his or her graduate work at Stanford.

On the basis of this paper, the results of the qualifying examination, and an evaluation of the student's overall progress, the members of the student's examining committee vote for or against admission to candidacy for the Ph.D. The terminal master's degree may be awarded to students who have completed the qualifying procedure, but whose work is judged insufficient for admission to candidacy for the Ph.D. If the overall case for or against promotion to candidacy is deemed uncertain, students may be asked either to retake the qualifying exam, to submit a new paper, or they may be admitted to candidacy on a probationary basis. Subject to approval by the Director of Graduate Studies and department chair, students already holding an advanced degree in the relevant area may be excused from the qualifying exam. However, they must present a formal request for a waiver to the Director of Graduate Studies upon their arrival at Stanford. Such a request must document the course work completed elsewhere and include all relevant reading lists. Only in cases where taking the qualifying exam would involve considerable repetition of already completed work is such a waiver likely to be granted.

Special Topic Examination—The second oral examination, which normally takes place at the end of Spring Quarter of the second year of study, concerns a topic (a particular literary genre or a broad theoretical, historical, or interdisciplinary question) freely chosen and developed by the individual student working in collaboration with his or her adviser and the Director of Graduate Studies. Students should design this research project so that it has the breadth and focus of a book they might write or a seminar they might teach. The proposed topic should be discussed with the Director of Graduate Studies before the end of the quarter preceding the quarter in which they plan to take the exam. The student and the Director of Graduate Studies choose a committee of two faculty members with interests close to the proposed topic. (In most cases, one of these committee members is the student's adviser.) In addition to these two members, the examination committee includes the Director of Graduate Studies, who serves in an ex officio capacity as the third member of the examination committee.

At the beginning of the quarter in which he or she takes this examination, the student discusses research plans with committee members, who offer suggestions on the project and on the reading list. In general, the reading list should be between one and two single-spaced pages in length. In the course of the quarter, the student should regularly consult with committee members to discuss his or her progress. The actual examination lasts one hour. The candidate must present a tentative reading list to the members of the committee about twelve weeks before the examination and a final reading list at least one week before the examination. This list, to be headed by a title describing the topic of the examination, may be divided into two parts: core works that the student has found to be central to his or her topic, and works that fill out the periphery of the topic. Two copies of the final reading list must be given to the student services officer for the Division of Languages, Cultures, and Literatures: one for the student's file and one for a special file which subsequent students can consult. The examination assumes the form of an oral colloquy between the student and the examining committee. It concentrates on the conclusions to which the student's research has led him or her, and aims to determine the student's overall mastery of the research topic in question. At the beginning of the examination, the student presents a talk of no longer than 20 minutes (not to be written out, but to be presented from notes) reviewing the results of his or her reading and outlining the major features and implications of the chosen topic. The remainder of the hour is devoted to a discussion between the student and the committee regarding the problems the student raised in the talk and the reading list itself.

The University Orals—The University Ph.D. examination follows most of the same procedures outlined above. Normally students put one, and at most two, full-time quarters of study into preparation for the exam. The University oral exam should virtually always be taken at the end of Spring Quarter of the third year of study. Students must complete minimum course requirements (as listed in this bulletin) and all language and course requirements before the quarter in which they take the University oral examination. By the time of the examination, they must have no outstanding incompletes.

Early in the quarter before they intend to take the University Ph.D. examination, students must discuss the scope and nature of the period to be covered, as well as the dissertation proposal, with the Director of Graduate Studies. The reading list should include works in all genres relevant to the period covered. The amount of non-literary or crossdisciplinary material on the reading list varies according to the period and the research interests of the student. Students ordinarily cover about a century of writing in great depth. As with the preceding examinations, the Director of Graduate Studies and the student determine the committee's makeup.

The governing principle is that the University oral examination must be a period examination rather than one on the specific concerns of the dissertation proposal, which is dealt with separately in a later colloquium. It follows from this basic principle that the examination covers the major authors and genres in the student's period of choice. The lists may well include critical and scholarly works or texts from outside the traditional domain of literary studies in the chosen tradition (such as film, philosophy, other literary traditions), but such coverage should be regarded as supplemental except in rare instances where the chair and faculty advisers have agreed to define these materials as the student's field.

The aim of the University oral is to establish the student's credentials as a specialist in the period of his or her choosing, so the core of the reading list must be made up of texts that are essential to any specialist. It follows that reading lists must not focus on the narrow area of the student's research interests. The tendency to bias reading lists toward the dissertation topic, be it an author or a genre, does not cancel the obligation to cover the major figures and genres. It is understandable that some students, by their third year, have become so deeply committed to their work toward the dissertation that they wish to use the preparation period for the examination as part of their dissertation research. Certainly, some of the exam work may prove relevant, but students should also remember that the examination is the central means of certifying their expertise in a literary period.

The exam committee consists of four members, in addition to a committee chair from outside the Department of French and Italian whose principal functions are to keep track of time and to call on the four members of the committee who question the candidate on the talk and on the reading list. Students are required to discuss the reading list for the examination with the Director of Graduate Studies and with members of their committee during the quarter preceding the examination. A final reading list must be in the hands of the committee and the student services officer for the Division of Literatures, Cultures, and Languages no later than two weeks preceding the examination. Students must submit the Request for University Oral Exam form to the student services officer at least three weeks before the proposed date of the exam. At the same time this form is submitted, students should also submit the Notice of Appointment of the Ph.D. dissertation reading committee. In addition, a Report on Ph.D. Foreign Language must be completed, certifying a reading knowledge of the foreign language the student presents to meet the language requirements.

The two-hour examination consists of the following two parts:

1. Forty minutes: a 20-minute talk by the candidate followed by a 20-minute question and answer period concerning the talk.

   Working with the committee members, the candidate's adviser prepares three or more questions to be presented to the candidate at 8:00 a.m. on the day of the examination. These questions concern broad topics pertinent to the candidate's reading list and period of specialization, including concerns relevant, but by no means limited, to the student's projected dissertation. The candidate chooses one of the questions and develops a 20-minute talk in response. Students must not read from a prepared text, but rather must speak from notes. They are free to consult any necessary materials while preparing the talk. The candidate is questioned for 20 minutes on the talk, with the dissertation adviser starting the questioning.
2. One hour, 20 minutes: questions on the area of concentration.

Each member of the committee, except for the chair, is assigned a 20-minute period to question the candidate on the reading list and its intellectual-historical implications.

The University oral examination is a formal University event. It represents the last occasion for the faculty to evaluate a student's overall preparation as a candidate for the Ph.D. After the University orals, only the colloquium on the dissertation prospectus and certification of the final dissertation by the student's reading committee stand in the way of conferral of the Ph.D. The examination, therefore, is a uniquely significant event and is designed to evaluate the student's preparation as a specialist in a given period, but within a broader context than that provided by a single course, examination, or even the dissertation itself.

Evaluation—At the end of each examination, the committee meets briefly and immediately informs the student whether he or she has passed. In the week following, the student is expected to meet individually with members of the committee to discuss strengths and weaknesses revealed during the examination.

DISSERTATION

The fourth and (if necessary) fifth years of graduate study are devoted to writing and researching the doctoral dissertation. The doctoral dissertation should demonstrate the ability to carry out research, organize, and present the results in publishable form. The scope of the dissertation should be such that it could be completed in 12 to 18 months of full-time work.

Colloquium on the Dissertation Proposal—The colloquium normally takes place in the quarter following the University oral examination; in most cases this means early in Autumn Quarter of the student's fourth year of study. The colloquium lasts one hour, begins with a brief introduction to the dissertation prospectus by the student (lasting no more than ten minutes), and consists of a discussion of the prospectus by the student and the three readers of the dissertation. At the end of the hour, the faculty readers vote on the outcome of the colloquium. If the outcome is favorable (by majority vote), the student is free to proceed with work on the dissertation. If the proposal is found to be unsatisfactory (by majority vote), the dissertation readers may ask the student to revise and resubmit the dissertation prospectus and to schedule a second colloquium.

The prospectus must be prepared in close consultation with the dissertation director during the months preceding the colloquium. It must be submitted in its final form to the readers no later than one week before the colloquium. A prospectus should not exceed ten double-spaced pages, in addition to which it should include a working bibliography of primary and secondary sources. It should offer a synthetic overview of the dissertation, describe its methodology and the project's relation to prior scholarship on the topic, and lay out a complete chapter-by-chapter plan.

It is the student's responsibility to schedule the colloquium no later than the first half of the quarter subsequent to the quarter in which the student passed the University oral examination. The student should arrange the date and time in consultation with the student services officer and with the three examiners. The student services officer schedules an appropriate room for the colloquium.

Members of the dissertation reading committee ordinarily are drawn from the University oral examination committee, but need not be the same.

ADVISING

Given the interdisciplinary nature of the Ph.D. programs and the opportunity they afford each student to create an individualized program of study, regular consultation with an adviser is of the utmost importance. The adviser for all entering graduate students is the Director of Graduate Studies, whose responsibility it is to assist students with their course planning and to keep a running check on progress in completing the course, teaching, and language requirements. By the end of the first year of study, each student must choose a faculty adviser whose expertise is appropriate to his or her own area of research and interests.

JOINT DEGREES

A candidate may also take a joint degree in French and Humanities, or Italian and Humanities, as described in the "Interdisciplinary Studies in Humanities" section of this bulletin. Minors are possible in related fields, including Comparative Literature, Linguistics, Modern Thought and Literature, Art History, History, Music, Philosophy, and Spanish. Ph.D. candidates in French may minor in Italian, and vice versa.

Students interested in a joint degree should design their course of study with their adviser(s). Joint degree programs frequently require 24 additional units of work, making completion of all course requirements in nine quarters difficult if careful advance planning is not done.

MINORS

Students interested in a minor should design their course of study with their adviser(s). A minor requires at lest 24 additional units of work, making completion of course requirements in nine quarters difficult if careful advance planning is not done.

Ph.D. Minor in French Literature—The department offers a minor in French Literature. The requirement for a minor in French is successful completion of 24 units of graduate course work in the French section. Interested students should consult the graduate adviser.

Ph.D. Minor in Italian Literature—The department offers a minor in Italian Literature. The requirement for a minor in Italian is a minimum of 24 units of graduate course work in Italian literature. Interested students should consult the graduate adviser.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement.

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Classics, Comparative Literature, English, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese, in the Program in Modern Thought and Literature, and in the Division of Literatures, Cultures, and Languages.

INTRODUCTION TO THE HUMANITIES (IHUM)

The following Introduction to the Humanities courses are taught by French and Italian department faculty members. IHUM courses are typically available only to freshmen seeking to fulfill IHUM requirements; see the "Introduction to the Humanities" section of this bulletin for further information. Prospective majors in French or Italian are advised to consider satisfying their IHUM requirements by registering for the following IHUM courses.

IHUM 2,3. Epic Journeys, Modern Quests—Two quarter sequence. Great religious, philosophical, and literary texts that have addressed timeless questions about human identity and the meaning of human life. Focus is on the epic tradition in the ancient and classical worlds and its transformations or abandonment in modernity. Compares conceptions of the afterlife. How traditions about the afterlife are created and appropriated. The diminished importance of the dead and increased emphasis on the power of the living in literary genres. GER:IHUM-2,3

IHUM 2: *4 units, Win (Harrison, R, Jacoff, R)*
IHUM 3: *4 units, Spr (Landy, J; Edelstein, D)*

FRENCH SECTION

Note—Changes in course offerings after this bulletin has gone to print are sometimes necessary. Students are advised to consult the department bulletin board regularly.

Undergraduate courses in Literature and Culture (130-199)
Courses for Advanced Undergraduates and Graduates (200-299)
Graduate Seminars (300-399)

FRENCH LANGUAGE COURSES

The following courses in French language instruction represent a typical sequence for three years of French language study. Majors and prospective majors should consult the requirements for a B.A. in French above. For descriptions, other information, and additional courses including special emphasis, intensive, summer, and activity courses at La Maison Française, see the "Language Center" section of this bulletin.

FRENLANG 1,2,3. First-Year French
5 units, Aut, Win, Spr (Ashaolu, O; Dozer-Rabedeau, J; Howard, H, Shashko, T; Samokhina, D; Tamas, J; Staff)

FRENLANG 22,23. Second-Year French
4-5 units, Aut, Win, Spr (Howard, H; Dozer-Rabedeau, J; Staff)

FRENLANG 120. Advanced French Oral Communication
3 units, Aut, Win, Spr (Staff)

FRENLANG 122. Introduction to French Culture and Civilization
3-4 units, Aut (Palumbo-Liu, S)

FRENLANG 123. French Creative Writing
3-4 units, Win (Palumbo-Liu, S)

FRENLANG 124. Advanced French Grammar
3-4 units, Aut, Win (Tsethlikai, K)

FRENLANG 126. French Stylistics and Textual Analysis
3-4 units, Spr (Calefas-Strebelle, A)

GENERAL (IN ENGLISH)

These courses, with the subject code FRENGEN, do not require knowledge of French and are open to all students.

FRENGEN 45N. American Writers in 20th-Century Paris—Stanford Introductory Seminar. Preference to freshmen. A crosscultural inquiry into Paris as a part of American culture, a myth, a longing, and source of inspiration. Role of artistic movements (Cubism, Surrealism, Existentialism) and cultural institutions such as the cafés, libraries, and salons in the life and creativity of the expatriate. Birth of their writing selves and existential questioning around issues of national and individual identities. Readings: Gertrude Stein, Hemingway, Fitzgerald, Anaïs Nin, and Baldwin. In English. GER:DB-Hum
3-4 units, Win (Alduy, C)

FRENGEN 122. Literature as Performance—(Same as COMPLIT 122.) Theater as performance and as literature. The historical tension between performance and sexuality in the Western tradition since Greek antiquity. Non-European forms and conventions of performance and theatricality. The modern competition between theater and other forms of performance and media such as sports, film, and television. Sources include: classical Japanese theater; ancient Greek tragedy and comedy; medieval theater in interaction with Christian rituals and its countercultural horizons; the classical age of European theater including Shakespeare, Lope de Vega, and Molière. GER:DB-Hum
5 units, Win (Gumbrecht, H)

FRENGEN 162. The Time and Space of the Historical Avant Garde—(Same as ITALGEN 162.) Avant garde strategies of representation. How avant garde artists reproduced the experience of modern life in works of various media. Focus is on manifestos, prose and poetry, performances, films, and collages. Readings by Apollinaire, Tzara, Breton, Cendrars, Ball, Fondane, Urmuz, Arp, Marinetti, De-Saint Point; films and audio performances by Marcel Janco, Jean Arp, and Hugo Ball.
3-5 units, Aut (Eram, C)

FRENGEN 163. Texts in History: Enlightenment to the Present—(Same as HUMNTIES 163.) Priority to students in the Humanities honors program and French majors. The relationship between intellectual, political, and cultural history, and literary creativity in the modern period. Texts include Voltaire, *Philosophical Letters;* Rousseau, *Second Discourse;* Kant, *What is Enlightenment?* and the *Critique of Judgment;* documents and speeches from the French Revolution; Hölderlin, *The Rhein;* Schlegel, *Dialogue on Poesy;* Balzac, *Père Goriot;* Dostoevsky, *Notes from the Underground;* Sorel, *Reflections on Violence;* T.S. Eliot, *The Waste Land;* Woolf, *Mrs. Dalloway;* Artaud, *Theater and its Double;* and Kane, *Ambiguous Adventure.* GER:DB-Hum
5 units, Spr (Edelstein, D)

FRENGEN 165. Comic and Erotic Literature of the French Renaissance—How 16th-century French writers use humor in their treatment of relationships between the sexes and in their social commentaries. Readings in English translation: François Rabelais, Marguerite de Navarre, and Giovanni Boccaccio. In English. No knowledge of French or Italian required. GER:DB-Hum
4 units, Aut (Sterritt, L)

FRENGEN 180Q. Aspects of Contemporary French Society through Film—Stanford Introductory Seminar. Preference to sophomores. Films depicting important events in French society since WW II, up to current problems of integration of minorities and changing familial, sexual, and political relations. Emphasis on autobiographical films in which historical events and a personal experience within them are recreated by the *metteur en scène* or the author of the script, such as Louis Malle's *Au revoir les enfants*. Films selected for filmic quality and documentary value. GER:DB-Hum
4 units, Spr (Bertrand, M)

FRENGEN 181. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum

4 units, Win (Anderson, L; Landy, J)

FRENGEN 192E. Images of Women in French Cinema: 1930-1990—The myth of the feminine idol in French films in historical and cultural context. The mythology of stars as the imaginary vehicle that helped France to change from traditional society to modern nation after 1945. Filmmakers include Renoir, Truffaut, and Nelly Kaplan. The evolution of the role of women in France over 60 years. Lectures in English; films in French with English subtitles. GER:DB-Hum, EC-Gender

3-5 units, Spr (Apostolidès, J)

FRENGEN 203. Dare (Not) to Know: The Gamble of the French Enlightenment—Focus is on tensions and transformations in the history of the French Enlightenment. How did the social and intellectual projects of the philosophes coexist? Could the modest epistemology of the early Enlightenment resist the temptations of absolute knowledge? Readings from Bayle, Fontenelle, Montesquieu, Condillac, Voltaire, Rousseau, Diderot, Condorcet, Destutt de Tracy, and authors from SULAIR's new Super-Enlightenment database. GER:DB-Hum

3-5 units, Win (Edelstein, D)

FRENGEN 207. Existentialist Fiction: The Literature of Absurdity—(Same as ITALGEN 207.) 20th-century French and Italian novels dealing with the theme of absurdity, including: Pirandello's *The Late Mattia Pascal;* Sartre's *Nausea;* Beckett's *Molloy;* Duras's *The Sailor from Gibraltar;* and Calvino's *Mr Palomar.* GER:DB-Hum

4-5 units, Spr (Harrison, R)

FRENGEN 208. The French New Novel: Fiction and Film—50s and 60s French experimental fiction: how they do away with traditional plot, chronological narrative, and character to focus on objects and investigate the nature of physical and mental perception. Authors include Butor, Duras, Ricardou, Robbe-Grillet, Sarraute, and Simon. Cinematic versions such as *Last Year at Marienbad* and *Hiroshima Mon Amour*. GER:DB-Hum

3-5 units, Spr (Wittman, L)

FRENGEN 221. The History of the Book in Europe—(Same as ITALGEN 221.) From 1450 to present. The printed book from its invention to the 20th century; focus is on France, Italy, and England. Topics include: the manuscript tradition; printing and typography; the scholar-printers of the Renaissance; illustration; readers and reading; marginalia; newspapers, pamphlets, and ephemera; the emergence of the novel; modernism; and futurism. Course held in Stanford Libraries' Special Collections.

3-5 units, not given this year

FRENGEN 247E. Fictions of the Self—A tradition of pseudo-confidence which critiques, parodies, and offers a substitute for the traditional confessional narrative; works in which talking about oneself constitutes not an act of self-description but a feat of self-construction. Readings: Constant, Proust, Beckett, Pérec, Nabokov.

3-5 units, Aut (Landy, J)

FRENGEN 253E. French Social Thought from Durkheim to Bourdieu—The originality, importance, and relevance of distinctive features of French social thought: reflexive French human sciences where the focus is on the social conditions in which such sciences are possible; epistemological and ontological issues as opposed to empirical realities and the notions of collective representations, social hypocrisy, the collective unconscious, and collective self-deception; and the indispensable role of religious mental structures for the understanding of social cohesion. Readings of Bourdieu, Durkheim, Mauss, Lacan, Lévi-Strauss.

3-5 units, not given this year

FRENGEN 256E. Political Anthropology from Rousseau to Freud—A confrontation between ways of accounting for society in an individualistic framework: the social contract; political economy; individualistic sociology; society as crowd; mass psychology; and sociopolitical institutions. Creating a typology of the ways in which a given anthropology constrains conceptions of the social and political order. Writers include Rousseau, Hume, Smith, Constant, Tocqueville, Marx, Durkheim, Weber, and Freud.

3-5 units, alternate years, not given this year

FRENGEN 258E. Foundations of Nanoethics: Toward a Rapprochement between Europe and the U.S.—(Same as STS 211.) Nanoethics as a new discipline that accompanies the rise of nanotechnology research in the U.S. and Europe. Differing approaches to the ethics of science and technology in the case of a fledgling technology.

3-5 units, alternate years, not given this year

FRENGEN 261. Framing the Aesthetic Experience, 1630-1780—Aesthetics as organization of cognition, experience, and feelings; the beholder framed as cognitive, sensitive subject and as member of an elite community defined culturally and politically. Topics include: the epistemology of confused perception and the poetics of incompleteness; the *je ne sais quoi* and the sublime; the dialectics of pleasure and pain; and taste and decadence. Works by Félibien, Bouhours, Dubos, Boileau, Fénelon, Marivaux, Montesquieu, Diderot, Leibniz, Burke, and Lessing.

3-5 units, Aut (Russo, E)

FRENGEN 263. Love Books of the Middle Ages—(Same as ITALGEN 263.) Love as a central theme in the Middle Ages of literature, natural philosophy, theology, and psychology. Literary works that probe the nature of love. Abelard and Heloise, *History of His Calamities* and *Personal Letters;* Andreas Capellanus, *The Art of Courtly Love;* Christine de Pizan, *The Book of the Duke of True Lovers;* Dante, *Vita Nuova;* Chaucer, *Troilus and Criseyde;* Boccaccio, *The Decameron;* and Shakespeare, *Antony and Cleopatra*.

3-5 units, not given this year

FRENGEN 275. Writing Hate: Anti-Semitism and Aesthetics in Modern French Literature and Culture—From the 19th century until WW II. Why were anti-Semites so preoccupied with the beautiful? How does aesthetics structure ideology? Readings may include fiction by the Goncourt brothers, Maupassant, and Drieu la Rochelle; anti-Semitic tracts by Drumont and Céline; and theoretical and critical texts by Plato, Aristotle, Sartre, Kristeva, Lacoue-Labarthe, and Carroll. GER:DB-Hum

3-5 units, Spr (Bell, D)

FRENGEN 288. Decadence and Modernism from Mallarmé to Marinetti—(Same as ITALGEN 288.) How the notion of decadence, initially a term of derision, shapes and underlies the positive terms of symbolism and modernism. Readings include theories of decadence and examples of symbolist and modernist texts that attempt to exorcise decadent demons, such as lust, mysticism, and the retreat into artificiality. Authors include Huysmans, Poe, Mallarmé, Nietzsche, Nordau, d'Annunzio, Valry, Ungaretti, Marinetti, and Breton.

3-5 units, not given this year

FRENGEN 290E. The Modern Tradition II: Self-Deception in Literature, Film, and Philosophy—(Same as MTL 334B.) Possibilities of cross-fertilization between continental philosophy (such as Sartre) and analytic philosophy (such as Donald Davidson) by reference to the topic of self-deception or bad faith. Literary works by Molière, Benjamin Constant, Dostoevsky, Camus, Sartre, Borges, and contemporary writers; films by Hitchcock, Losey, and Bergman.

3-5 units, Win (Dupuy, J)

FRENGEN 295. Science, Technology, and Society in Europe and the U.S.: Ethical Debates and Controversies—Differing approaches in the case of advanced technologies, focusing on the convergence of nanotechnology with biotechnology, information technology, and cognitive science. Relationship of these cases to the scientific, technological, industrial, economic, and military race. The necessity for cooperation in the establishment of ethical norms or standards at the international level.

3-5 units, Win (Dupuy, J)

FRENGEN 301E. New Methods and Sources in French and Italian Studies—(Same as ITALGEN 301E.) Based on student interest. Changes in research methods: the use of digitized texts, resources, and databases available through Stanford Libraries' gateways. Emphasis is on strategies for exploration of broad and specialized topics through new and traditional methods. Using a flexible schedule based on enrollment and the level of students' knowledge, may be offered in forms including a shortened version on the basics, independent study, or a syllabus split over two quarters. Unit levels adjusted accordingly.

1-4 units, Spr (Sussman, S)

FRENGEN 317. Crowds—(Same as COMPLIT 257C/357C, ITALGEN 317.) The place of human multitudes in the Western sociopolitical imagination from 1789 to the present. Theories of collectivity in works such as Tarde's *Laws of Imitation,* Le Bon's *Psychology of Crowds,* Freud's writings on mass psychology, and Canetti's *Crowds and Power.* Representations of crowds in literature, art, theater, and film. How modern mythologies are informed by premodern precedent and reflect upon the question of multitudes in postindustrial societies. Students write semantic histories and curate a virtual gallery.

3-5 units, Aut (Schnapp, J)

FRENGEN 325. Modern Seminar—(Same as HUMNTIES 325.) The postmodern condition as post-WW II rupture in Western tradition; moral, political, cultural, and aesthetical dimensions. Sources include literature, philosophy, essays, films, and painting. Authors and artists include : Primo Levi, Hannah Arendt, Alain Resnais, Samuel Beckett, Georges Bataille, Michel Foucault, Theodor Adorno, David Riesman, Georges Pérec, Juliet Mitchell, and Francis Bacon.

3-5 units, Win (Apostolidès, J)

FRENGEN 343. Guy Debord: His Life and His Work—(Same as DRAMA 343.) How Debord's intellectual and artistic productions can be connected to their concrete historical context; their contemporary pertinence. Increased academic visibility for his work and ideas.

5 units, Aut (Apostolidès, J)

FRENGEN 354. Racine—One of a series of seminars on the Western literary tradition to provide an updated image of an author's work using biography for historical context. Racine's drama and tragedy emphasizing 17th-century traditions and evolution of performance and the Alexandrin meter constitutive for tragedy in French classical drama. His engagement in other literary genres including as royal historiographer; contemporary intellectual positions and battles including Cartesian varieties of philosophy and the Jansenist attempt at a theological modernization in the Catholic Church.

3-5 units, Win (Gumbrecht, H)

FRENGEN 370. Anthropology of Speed—(Same as COMPLIT 370, ITALGEN 370.) Ideas about accelerated motion; its significance and effects on cultures, from prehistory to the present. Impact of transportation revolutions on beliefs regarding selfhood and society. The rise of forms of intelligence and human skill sets that interact with, resist, or enable such revolutions. Topics include: speed and divinity; the evolution of conventions and techniques for capturing accelerated movement; speed and accident; velocity and liminal states such as inspiration, transport, and intoxication; and cognitive implications of sped-up states and their impact on cultural norms.

3-5 units, Spr (Schnapp, J)

FRENGEN 395. Philosophical Reading Group—(Same as COMPLIT 359A, ITALGEN 395.) Discussion of one contemporary or historical text from the Western philosophical tradition per quarter in a group of faculty and graduate students. For admission of new participants, a conversation with H. U. Gumbrecht is required. May be repeated for credit.

1 unit, Aut, Win, Spr (Gumbrecht, H)

LITERATURE, THOUGHT, AND CULTURE

Courses in this section have the subject code FRENLIT.

UNDERGRADUATE

FRENLIT 130. Authorship, Book Culture, and National Identity in Medieval and Renaissance France—Introduction to the Middle Ages and the Renaissance. The birth of a national literature and its evolution. Literature as addressing cultural, philosophical, and artistic issues which question assumptions on love, ethics, art, and the nature of the self. Readings: epics (*La Chanson de Roland*), medieval romances (*Tristan,* Chrétien de Troyes' *Yvain*), post-Petrarchan poetics (Du Bellay, Ronsard, Labé), and prose humanists (Rabelais, Montaigne). Prerequisite: FRENLANG 126 or consent of instructor. GER:DB-Hum, WIM

4 units, Win (Alduy, C)

FRENLIT 131. Absolutism, Enlightenment, and Revolution in 17th- and 18th-Century France—The literature, culture, and politics of France from Louis XIV to Rousseau. How this period produced the political and philosophical foundations of modernity. Readings include Bodin, Hobbes, Racine, Lafayette, Locke, Voltaire, Diderot, Rousseau, and Beaumarchais. Prerequisite: FRENLANG 126 or consent of instructor. GER:DB-Hum, WIM

4 units, Aut (Apostolidès, J)

FRENLIT 132. Literature, Revolutions, and Changes in 19th- and 20th-Century France—Major literary genres, and social and cultural contexts. Focus is on the emergence of new literary forms such as *surréalisme, nouveau roman,* and *nouveau théâtre*. Topics of colonization, decolonization, and feminism. Readings include Balzac, Baudelaire, Césaire, Colette, and Ionesco. Prerequisite: FRENLANG 126 or consent of instructor. GER:DB-Hum, WIM

4 units, Aut (Boyi, E)

FRENLIT 133. Literature and Society in Africa and the Caribbean—(Same as COMPLIT 141.) Major African and Caribbean writers. Issues raised in literary works which reflect changing aspects of the societies and cultures of Francophone Africa and the French Caribbean. Topics include colonization and change, quest for identity, tradition and modernity, and new roles and status for women. Readings in fiction and poetry. Authors include Laye Camara, Mariama Ba, and Joseph Zobel. In French. Prerequisite: FRENLANG 126 or consent of instructor. GER:DB-Hum, EC-GlobalCom, WIM

4 units, Spr (Boyi, E)

FRENLIT 175. Literature of Crisis: Contradiction and Community—How antithetical responses provoked by crisis demonstrate literature's capacity to produce and sustain apparently untenable contradictions; how this paradoxically may make literature a conciliatory force. Focus is on opposed responses to crises in modern France: an epistemological crisis (Balzac and Flaubert), a political crisis (Rostand and Jarry), a crisis of community (Proust and Céline), and a literary crisis (Sartre and Gracq). In French.

3-5 units, Win (Picherit, H)

FRENLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.

5 units, Win (Staff)

FRENLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.

2 units, Spr (Staff)

FRENLIT 199. Individual Work—Restricted to French majors with consent of department. Normally limited to 4-unit credit toward the major. May be repeated for credit.

1-12 units, Aut, Win, Spr (Staff)

ADVANCED UNDERGRADUATE AND GRADUATE

Note—The prerequisite for the following courses taught in French is one course from the 130 series or equivalent.

FRENLIT 204. Revolutions in Prose: The 19th-Century French Novel—How the French Revolution and its aftershocks were represented in novels; how this political imperative revolutionized literary form. Readings from Stendhal, Hugo, Balzac, Flaubert, Sand, and Zola. GER:DB-Hum
3-5 units, Aut (Edelstein, D)

FRENLIT 209. Colonial Ghosts: The French Novel in the Age of Imperialism—How colonial encounters and elisions haunt works from the margins of the text, shape literary discourses about modernity, and serve or disrupt the novel's totalizing aspirations. Focus is on depictions of N. Africa. Readings may include novels by Balzac, Gautier, Maupassant, Loti, Bertrand, and Camus; and theoretical and critical texts by Freud, Said, Jameson, Behdad, and Dobie. GER:DB-Hum
3-5 units, Win (Bell, D)

FRENLIT 219. The Renaissance Body—The body as locus for desire, pleasure, disease, mortality, sexuality, and gender; and as canon of beauty and reflection of cosmic harmony. How literature responded to the development of an anatomical gaze in arts and medicine; how it staged the aesthetic, religious, philosophical, and moral issues related to such a promotion or deconstruction of the body. Does literature aim at representing the body, or use it as signifier for intellectual, emotional, and political ideas? Readings from Rabelais, Scève, Ronsard, Labé, d'Aubigné, Montaigne, and medical texts.
3-5 units, Aut (Alduy, C)

FRENLIT 243. Nature in 20th-Century French Poetry—Changing views of the natural world, imagined as lost paradise, exotic escape, national landscape, source of spiritual insight, or fragile environment. Authors include Cadou, Valéry, Eluard, Reverdy, Saint-John Perse, Char, Césaire, Segalen, Bonnefoy, and Deguy. In French.
3-5 units, Win (Wittman, L)

FRENLIT 248. Literature, History, and Representation—(Same as COMPLIT 250.) Literary works as historical narratives; texts which envision ways of reconstructing or representing an ancient or immediate past through collective or individual narratives. Narration and narrator; relation between individual and collective history; historical events and how they have shaped the narratives; master narratives; and alternative histories. Reading include Glissant, Césaire, Dadié, Cixous, Pérec, Le Clézio, Mokkedem, Benjamin, de Certeau, and White.
3-5 units, Spr (Boyi, E)

FRENLIT 278. Rethinking Identities in the Era of Globalization—(Same as COMPLIT 246.) Cultural issues faced by postcolonial societies and new visions proposed by writers and thinkers to meet the challenge of globalization and preserve the local. Emphasis is on questions of difference, language, nation and identities, and identity construction. Theoretical and fictional readings include Derrida, Glissant, Kristeva, Malouf, Morejon, Senghor, and Serres. May be repeated for credit.
3-5 units, not given this year

FRENLIT 288. Exile Literature in French: Place, Self, and Writing in French Literature—While some French intellectuals were forced into exile, writers from all over the world have gathered in France to find refuge. Emigrés and immigrés, from and to France, often wrote their most poignant works from a place of emotional longing and geographical distance from their native land. Issues such as national identity, marginality, foreigners' alienation, and the narrative of space. Readings by Du Bellay, Voltaire, Chateaubriand, Hugo, Camus, Kundera, Nancy Huston, and Le Clezio.
3-5 units, Spr (Alduy, C)

FRENLIT 293A. Topics in French Literature and Philosophy—Five-week course. May be repeated for credit.
2 units, Spr (Serres, M)

FRENLIT 293B. Topics in French Literature and Philosophy—Five-week course. May be repeated for credit.
2 units, not given this year

FRENLIT 299. Individual Work—May be repeated for credit.
1-12 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

FRENLIT 399. Individual Work—For students in French working on special projects or engaged in predissertation research.
1-12 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

French majors are advised to consult the "Literatures, Cultures, and Languages" section of this bulletin for additional cognate offerings. See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CASA 380. Practice and Performance: Bourdieu, Butler, Giddens, de Certeau
5 units, Win (Voss, B)

COMPLIT 101. What is Literature?
5 units, Spr (Nightingale, A)

COMPLIT 154. Heidegger on Hölderlin—(Same as GERLIT 154.)
5 units, Aut (Gumbrecht, H)

DLCL 189. Honors Thesis Seminar
5 units, Aut (Surwillo, L)

ITALIAN SECTION

Note—Changes in course offerings are sometimes necessary after this bulletin has gone to print. Students are advised to consult the department bulletin board on a regular basis.

Undergraduate courses in Literature and Culture (130-199)
Courses for Advanced Undergraduates and Graduates (200-299)
Graduate Seminars (300-399)

ITALIAN LANGUAGE COURSES

The following courses in Italian language instruction represent a typical sequence for three years of Italian language study. Majors and prospective majors should consult the requirements for a B.A. in Italian above. For descriptions, other information, and additional courses including special emphasis, intensive, summer, and activity courses at La Casa Italiana, see the "Language Center" section of this bulletin.

ITALLANG 1,2,3. First-Year Italian
5 units, Aut, Win, Spr (Baldocchi, M; Cellinese, A; Coggeshall, B; Devine, M; McCarty, A; Tempesta G, Staff)

ITALLANG 21,22,23. Second Year Italian
3-4 units, **21:** *Aut (Baldocchi, M),* **22:** *Win (Cellinese, A),* **23:** *Spr (Gelmetti, S)*

ITALLANG 113. Italian Cultural Studies
3-4 units, Aut (Gelmetti, S)

ITALLANG 114. Advanced Stylistics and Composition
3-4 units, Win (Baldocchi, M)

ITALLANG 115. Academic and Creative Writing
3-4 units, Spr (Baldocchi, M)

GENERAL (IN ENGLISH)

These courses, with the subject code ITALGEN, do not require knowledge of Italian and are open to all students.

ITALGEN 30N. Fascism and Culture—(Same as COMPLIT 30N.) Stanford Introductory Seminar. Preference to freshmen. Intellectual and political roots of fascism, its critique of liberal democracy and communism, and legacies. Themes include: fascism versus nazism; collectivism versus individualism; radical right attitudes towards technology and industrialization; and comparisons between mid-20th-century fascisms and subcultures of the new right including Le Pen's Front National and what has been called Islamofascism. Readings from fascist thinkers and theorists; case studies of artists, writers, architechts, and filmmakers who embraced fascism including Ezra Pound, Leni Riefenstahl, F.T. Marinetti, and Mario Sironi. GER:DB-Hum

4 units, Aut (Schnapp, J)

ITALGEN 144. Masters of the Italian Cinema—The aesthetics and cultural politics of the most famous Italian directors, from the neorealist movement to contemporary works. Historical and political contexts; stylistic analysis. Comedy in Italian film. Directors include Ross, Fellini, De Sica, Antonioni, Bertolucci, Pasolini, and Wertmüller.

3-5 units, Aut (Nathan, V)

ITALGEN 162. The Time and Space of the Historical Avant Garde—(Same as FRENGEN 162.) Avant garde strategies of representation. How avant garde artists reproduced the experience of modern life in works of various media. Focus is on manifestos, prose and poetry, performances, films, and collages. Readings by Apollinaire, Tzara, Breton, Cendrars, Ball, Fondane, Urmuz, Arp, Marinetti, De-Saint Point; films and audio performances by Marcel Janco, Jean Arp, and Hugo Ball.

3-5 units, Aut (Eram, C)

ITALGEN 166E. Women's Voices in Contemporary Italian Literature—The canon of Italian literature consists almost exclusively of male authors, yet Italian women writers have been active since the time of Dante. Women's prose fiction of the last 100 years. Issues include: sexual violence in female autobiographies; the experience of motherhood; conflict between maternal love and self-determination; and paths to political awareness. Authors include Sibilla Aleramo, Dacia Maraini, Anna Banti, Francesca Duranti, Fabrizia Ramondino. Eight novels in English translation; students encouraged to read excerpts in Italian. GER:DB-Hum, EC-Gender

4 units, Spr (Springer, C)

ITALGEN 181. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum

4 units, Win (Anderson, L; Landy, J)

ITALGEN 207. Existentialist Fiction: The Literature of Absurdity—(Same as FRENGEN 207.) 20th-century French and Italian novels dealing with the theme of absurdity, including: Pirandello's *The Late Mattia Pascal;* Sartre's *Nausea;* Beckett's *Molloy;* Duras's *The Sailor from Gibraltar;* and Calvino's *Mr Palomar.* GER:DB-Hum

4-5 units, Spr (Harrison, R)

ITALGEN 221. The History of the Book in Europe—(Same as FRENGEN 221.) From 1450 to present. The printed book from its invention to the 20th century; focus is on France, Italy, and England. Topics include: the manuscript tradition; printing and typography; the scholar-printers of the Renaissance; illustration; readers and reading; marginalia; newspapers, pamphlets, and ephemera; the emergence of the novel; modernism; and futurism. Course held in Stanford Libraries' Special Collections.

3-5 units, not given this year

ITALGEN 230. Italian Renaissance Epic: Ariosto—For graduate students and advanced undergraduates. Ariosto's epic poem *Orlando furioso* in the context of the social and political world of Renaissance Italy. Topics include: its relationship to precursor texts and traditions (classical, Arthurian, Carolingian); Ferrarese court culture and the politics of dynastic epic; its relationship to early modern ideologies of gender. Taught in English but requires advanced reading knowledge of Italian.

4-5 units, Spr (Springer, C)

ITALGEN 236E. *Purgatorio/Paradiso*—Reading the second and third canticles of Dante's *Divine Comedy*. Prerequisite: students must have read Dante's *Inferno* in a course or on their own. Recommended: reading knowledge of Italian. GER:DB-Hum

4-5 units, Win (Harrison, R; Jacoff, R)

ITALGEN 263. Love Books of the Middle Ages—(Same as FRENGEN 263.) Love as a central theme in the Middle Ages of literature, natural philosophy, theology, and psychology. Literary works that probe the nature of love. Abelard and Heloise, *History of His Calamities* and *Personal Letters;* Andreas Capellanus, *The Art of Courtly Love;* Christine de Pizan, *The Book of the Duke of True Lovers;* Dante, *Vita Nuova;* Chaucer, *Troilus and Criseyde;* Boccaccio, *The Decameron;* and Shakespeare, *Antony and Cleopatra.*

3-5 units, not given this year

ITALGEN 281. Novels into Film—20th-century Italian novels and their film adaptations. Texts include *The Leopard* (Tomasi di Lampedusa/De Sica), *The Garden of the Finzi-Continis* (Bassani, De Sica), *The Conformist* (Moravia/Bertolucci), *Christ Stopped at Eboli* (Levi/Rosi), *Padre/Padrone* (Ledda/Taviani).

4 units, Win (Springer, C)

ITALGEN 288. Decadence and Modernism from Mallarmé to Marinetti—(Same as FRENGEN 288.) How the notion of decadence, initially a term of derision, shapes and underlies the positive terms of symbolism and modernism. Readings include theories of decadence and examples of symbolist and modernist texts that attempt to exorcise decadent demons, such as lust, mysticism, and the retreat into artificiality. Authors include Huysmans, Poe, Mallarmé, Nietzsche, Nordau, d'Annunzio, Valry, Ungaretti, Marinetti, and Breton.

3-5 units, not given this year

ITALGEN 301E. New Methods and Sources in French and Italian Studies—(Same as FRENGEN 301E.) Based on student interest. Changes in research methods: the use of digitized texts, resources, and databases available through Stanford Library's gateways. Emphasis is on strategies for exploration of broad and specialized topics through new and traditional methods. Using a flexible schedule based on enrollment and the level of students' knowledge, may be offered in forms including a shortened version on the basics, independent study, or a syllabus split over two quarters. Unit levels adjusted accordingly.

1-4 units, Spr (Sussman, S)

ITALGEN 317. Crowds—(Same as COMPLIT 257C/357C, FRENGEN 317.) The place of human multitudes in the Western sociopolitical imagination from 1789 and the present. Theories of collectivity in works such as Tarde's *Laws of Imitation,* Le Bon's *Psychology of Crowds,* Freud's writings on mass psychology, and Canetti's *Crowds and Power.* Representations of crowds in literature, art, theater, and film. How modern mythologies are informed by premodern precedent and reflect upon the question of multitudes in postindustrial societies. Students write semantic histories and curate a virtual gallery.

3-5 units, Aut (Schnapp, J)

ITALGEN 353E. F. T. Marinetti and Futurism—(Same as COMPLIT 335.) Futurist artistic and literary theory and practice from its foundation by Marinetti through its avatars around the world. Focus is on readings from Marinetti; attention to writers and visual artists including Apollinaire, Mayakovsky, and Léger. Topics include: machines and culture; the futurist theater of surprise; poetry and performance; visual poetics and war; futurism's ties to bolshevism and fascism; and aeropainting and aeropoetry.

4 units, Spr (Schnapp, J)

ITALGEN 370. Anthropology of Speed—(Same as COMPLIT 370, FRENGEN 370.) Ideas about accelerated motion; its significance and effects on cultures, from prehistory to the present. Impact of transportation revolutions on beliefs regarding selfhood and society. The rise of forms of intelligence and human skill sets that interact with, resist, or enable such revolutions. Topics include: speed and divinity; the evolution of conventions and techniques for capturing accelerated movement; speed and accident; velocity and liminal states such as inspiration, transport, and intoxication; and cognitive implications of sped-up states and their impact on cultural norms.

3-5 units, Spr (Schnapp, J)

ITALGEN 395. Philosophical Reading Group—(Same as COMPLIT 359A, FRENGEN 395.) Discussion of one contemporary or historical text from the Western philosophical tradition per quarter in a group of faculty and graduate students. For admission of new participants, a conversation with H. U. Gumbrecht is required. May be repeated for credit.

1 unit, Aut, Win, Spr (Gumbrecht, H)

LITERATURE, THOUGHT, AND CULTURE

Courses in this section have the subject code ITALLIT.

UNDERGRADUATE

ITALLIT 127. Inventing Italian Literature: Dante, Boccaccio, Petrarca—The origins of Italian literature. Poetry such as 13th-century love lyrics, Dante's *Vita Nuova,* and Petrarca's *Canzoniere;* prose such as stories from Boccaccio's *Decameron*. GER:DB-Hum, WIM

4 units, Aut (Wittman, L)

ITALLIT 128. The Italian Renaissance and the Path to Modernity—The literature, art, and history of the Renaissance and beyond. Readings from the 15th through 18th centuries include Moderata Fonte, Machiavelli, Ariosto, Tasso, Galileo, and Goldoni. Prerequisite: 21 or equivalent. GER:DB-Hum, WIM

4 units, Win (Springer, C)

ITALLIT 129. Modern Italian History and Literature—The history of the Italian nation and national literary identity in the 19th and 20th centuries. The relationship between literary texts and their historical context from the Risorgimento to the Resistance. Focus is on the romantic lyric, futurism, fascism, and the changing status of women. Authors include Foscolo, Leopardi, D'Annunzio, Aleramo, Marinetti, Pirandello, Ungaretti, and Montale. Prerequisite: 21 or equivalent. GER:DB-Hum, WIM

4 units, Spr (Alberti, G)

ITALLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.

5 units, Win (Staff)

ITALLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.

2 units, Spr (Staff)

ITALLIT 199. Individual Work

1-12 units, Aut, Win, Spr (Staff)

ADVANCED LITERATURE

ITALLIT 249. Love and Death in the *Decameron*—The Black Death as the greatest natural disaster in European history, killing more than a quarter of Europe's population in four years. How the plague occasioned one of the masterpieces of western literature, Boccaccio's *Decameron,* which explores a parallel universe ruled not by death, but by love, a physical, sensual force that subverted the idealized conventions of medieval courtly love.

4 units, not given this year

ITALLIT 285. Identity in Modern Italian Fiction—The quest for a modern identity in the 20th-century Italian novel. The construction of subjectivity as it relates to changes brought about by modernity in Italy, such as mass culture, nationalism, industrialization, feminism, war, secularization, migration, and ethnic diversity. Fiction by Svevo, Pirandello, Calvino, Banti, and Tabucchi. In Italian.

3-5 units, Aut (Wittman, L)

ITALLIT 299. Individual Work

1-12 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

ITALLIT 399. Individual Work—For graduate students working on a special project or predissertation research. May be repeated for credit.

1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

Italian majors are advised to consult the "Division of Literature, Culture, and Languages" section of this bulletin for additional cognate offerings. See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ARTHIST 412. Problems in Italian Mannerism

5 units, Aut (Staff)

DLCL 189. Honors Thesis Seminar

5 units, Aut (Surwillo, L)

ENGLISH 185. Opera as Cultural History

5 units, Aut (Wyatt, M)

FILMSTUD 130/330. Italian Cinema: Neorealism and Beyond

4 units, Win (Levi, P)

OVERSEAS STUDIES

Courses approved for the French or Italian major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

FLORENCE

OSPFLOR 15. Is the Hero Serious or Facetious? Romances of Chivalry in Sixteenth-Century Europe

5 units, Aut (Sberlati, F)

PARIS

OSPPARIS 25. Literature and the City

4 units, Win (Rullier, F)

OSPPARIS 186F. Contemporary African Literature in French

4 units, Aut (Rullier, F)

GERMAN STUDIES

Emeriti: (Professors) Theodore M. Andersson,* Gerald Gillespie, Walter F. W. Lohnes, Katharina Mommsen, Kurt Müller-Vollmer*
Chair: Theodore M. Andersson
Director of Graduate Studies: Theodore M. Andersson
Director of Undergraduate Studies: Theodore M. Andersson
Professors: Russell A. Berman, Elizabeth Bernhardt, Amir Eshel (on leave, Autumn, Spring), Orrin W. Robinson III
Assistant Professors: Márton Dornbach, Charitini Douvaldzi
Senior Lecturers: William E. Petig (on leave, Spring), Kathryn Strachota (on leave, Winter)
Lecturers: Renate F. Cammin, Sarah Pourciau (Humanities Fellow), Shafiq Shamel
Visiting Professor: Karl Heinz Bohrer (Spring)
Visiting Assistant Professor: Sylke Tempel (Autumn)
Affiliated Academic Staff: Henry Lowood (Curator, Germanic Collections)

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*recalled to active duty

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Courses given in German Studies have the subject code GERGEN and GERLIT. For courses in German language instruction with the subject code GERLANG, see the "Language Center" section of this bulletin. For a complete list of subject codes, see Appendix.

The department's goal is to provide students with the linguistic and analytic facility to explore the significance of the cultural traditions and political histories of the German-speaking countries of Central Europe. At the same time, the interdisciplinary study of German culture, which can include art, history, literature, media theory, philosophy, and political science, encourages students to evaluate broader and contradictory legacies of modernity, such as how the literary, artistic, and cultural responses to the belated and rapid modernization of Germany allow for reflection on the modern condition in general.

Similarly, the German experience of national identity and political unification sheds light on wider issues of cultural cohesion and difference, as well as on the causes and meaning of phenomena such as racial prejudice, anti-Semitism, and the Holocaust. In general, an education in German Studies not only encourages the student to consider the effects of German-speaking thinkers and artists on the modern world, but also provides a lens through which the contours of the present and past can be evaluated.

The department offers students the opportunity to pursue course work at all levels in the languages, cultures, literatures, and intellectual histories of the German-language traditions. Whether interested in German literature, or the influence of German thought on other fields in the humanities, students find a broad range of courses covering language acquisition and refinement, literary history and criticism, cultural history and theory, history of thought, continental philosophy, and linguistics.

By carefully planning their programs, students may fulfill the B.A. requirements for a double major in German Studies and another subject. An extended undergraduate major in English and German literature is available, as are coterminal programs for the B.A. and M.A. degrees in German Studies, and joint programs for the Ph.D. degree with Comparative Literature, Interdisciplinary Studies in Humanities, Linguistics, and Modern Thought and Literature.

Special collections and facilities at Stanford offer possibilities for extensive research in German Studies and related fields pertaining to Central Europe. Facilities include the Stanford University Libraries and the Hoover Institution on War, Revolution, and Peace. Special collections include the Hildebrand Collection (texts and early editions from the 16th to the 19th century), the Austrian Collection (with emphasis on source material of the time of Maria Theresa and Joseph II, the Napoleonic wars, and the Revolution of 1848), and the Stanford Collection of German, Austrian, and Swiss Culture. New collections emphasize culture and cultural politics in the former German Democratic Republic. The Hoover Institution has a unique collection of historical and political documents pertaining to Germany and Central Europe from 1870 to the present. The department also has its own reference library. Extensive use is made of the language lab as well as the department's own audio-visual equipment, films, tapes, and slides.

The Republic of Austria has endowed the Distinguished Visiting Professorship in Austrian Studies. The professorship rotates on a yearly basis through several departments.

Haus Mitteleuropa, the German theme house at 620 Mayfield, is an undergraduate residence devoted to developing an awareness of the culture of Central Europe. A number of department courses are regularly taught at the house, and there are in-house seminars and conversation courses. Assignment is made through the regular undergraduate housing draw.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Majors must demonstrate basic language skills, either by completing GERLANG 1, 2, 3, First-Year German, or the equivalent such as an appropriate course of study at the Stanford in Berlin Center. Students then enroll in intermediate and advanced courses on literature, culture, thought, and language. Requirements for the B.A. include at least three courses at the 130-139 level (introductory surveys on topics in German literature, thought, linguistics, and culture). Every major is expected to complete at least one Writing in the Major (WIM) course. Including GERLANG 1, 2, 3, the total requirement for the B.A. is a minimum of 60 units of work; the German and Philosophy option requires 65 units. With the approval of the Director of Undergraduate Studies, appropriate courses offered by other departments can be accepted toward this total, up to a maximum of 25 units.

Internships—Internships in Germany are arranged through the Overseas Studies program. In addition, students may consult with the department to arrange local internships involving German language use or issues pertaining to Germany or Central Europe. Interns who prepare papers based on their experience enroll in GERLIT 298.

Extended Major in English and German Literatures—Students may enter this program with the consent of the chairs of both departments. See the "English" section of this bulletin.

Multiple Majors—Students can combine a major in German Studies with a major in any other field. By carefully selecting courses in such disciplines as history, international relations, or economics, students can prepare themselves exceptionally well in the area of Central Europe. Multiple majors are especially recommended for students spending one or more quarters at the Stanford in Berlin Center.

GERMAN AND PHILOSOPHY

The German and Philosophy major option offers students the opportunity to combine studies in literature and philosophy. Students take most of their courses from departments specializing in the intersection of literature and philosophy. This option is not declared in Axess; it does not appear on the transcript or diploma.

The German and Philosophy major option requires a minimum of 16 courses, for a minimum total of 65 units, distributed as follows:

1. 35 units in German Studies, including:
   a) three courses at the 130 level
   b) a WIM course
2. GERGEN 181/PHIL 81, the gateway course in philosophy and literature, preferably in the sophomore year.
3. Requirements in Philosophy:
   a) PHIL 80. Prerequisite: introductory philosophy class
   b) a course in the PHIL 180 series
   c) a course in the PHIL 170 series
   d) two courses in the history of philosophy numbered above 100

4. Two additional elective courses of special relevance to the study of philosophy and literature as identified by the committee in charge of the program. In German, these courses include the GERLIT 241-243 series, *Deutsche Geistesgeschichte*, and other advanced seminars in German thought and literature. Students must consult with their advisers, the Director of Undergraduate Studies, and undergraduate adviser of the program in philosophical and literary thought.
5. *Capstone:* this year's capstone seminars are COMPLIT 154/GERLIT 154, Heidegger on Hölderlin, and PHIL 173A, Aesthetics: Metaphor across the Arts. One of these courses must be taken in the student's senior year.
6. Units devoted to meeting the department's language requirement are not counted toward the 65-unit requirement.

The capstone seminar and the two related courses must be approved by both the German Studies Director of Undergraduate Studies and the undergraduate adviser of the program in philosophical and literary thought administered through the DLCL. Substitutions, including transfer credit, are not normally permitted for items 3b, 3c, and 3d, and are not permitted under any circumstances for items 2, 3a, and 5. Up to 10 units taken in the Philosophy Department may be taken CR/NC or S/NC; the remainder must be taken for a letter grade.

MINORS

The department offers two minor options.

German Language and Culture—Students may choose to minor in German Language and Culture if they are particularly interested in developing a strong ability in the German language, or in pursuing linguistic issues pertinent to German. Students satisfy the requirements for the minor in German Language and Culture by completing 35 units of course work, including at least three courses at the 100-129 level in either GERLANG or GERLIT, taught in German. Study at the Stanford in Berlin Center for at least one quarter is highly recommended.

German Cultural Studies—Students who wish to study German literature, culture, or thought, without necessarily acquiring facility in the German language, may pursue a minor in German Cultural Studies. Students meet the requirements for the minor in German Cultural Studies by completing 35 units of course work in German literature, culture, and thought in translation, including at least three courses at the 130 or 140 level.

MINOR IN LITERATURE AND MINOR IN MODERN LANGUAGES

The Division of Literatures, Cultures, and Languages offers undergraduate minor programs in Literature and in Modern Languages. Both of these minors draw on literature and language courses offered through this and other literature departments. See the "Literatures, Cultures, and Languages" section of this bulletin for further details about the minors and their requirements.

HONORS

Majors with a minimum grade point average (GPA) of 3.3 in German courses are eligible for departmental honors. Students interested in the honors program should consult the undergraduate adviser early in their junior year. The essay topic is chosen in consultation with a faculty member of the department and opportunities to start research projects are offered at the Stanford in Berlin Center. In addition to the requirements listed above, the student must submit a proposal for the honors essay to the German faculty by the end of Spring Quarter of the junior year. During this quarter, students may enroll for 2 units of credit in GERLIT 189B for the drafting or revision of the thesis proposal. In Autumn Quarter of the senior year, the student must enroll in DLCL 189, a 5-unit seminar that focuses on researching and writing the honors thesis. Students then enroll for 5 units of credit in GERLIT 189A while composing the thesis during Winter Quarter. Students who did not enroll in 189B in the junior year may enroll in GERLIT 189B in Spring Quarter of the senior year while revising the thesis, if approved by the thesis supervisor. A total of 10-12 units are awarded for completion of honors course work, independent study, and the finished thesis.

STANFORD IN BERLIN

Undergraduates interested in Germany are encouraged to enroll in the Berlin program, which is open for academic study during the Autumn, Winter, and Spring quarters. The program also offers internships in German industry, government, and cultural organizations year round. Through the Center, students with at least two years of college-level German can also take courses at the Freie Universität, Technische Universität, or Humboldt Universität. Most students live in homes with German hosts.

Most credits earned in Berlin can be applied to the undergraduate major in German Studies. All students who are planning to study at Stanford in Berlin or engage in an internship are encouraged to consult with their major Director of Undergraduate Studies and the Overseas Studies office about integrating work done abroad into their degree program. Returning interns who wish to develop a paper based on their experience should enroll in GERLIT 298. More detailed information is available at the Overseas Studies Program in Sweet Hall or with the faculty adviser in the department.

COTERMINAL PROGRAMS

Students may elect to combine programs for the B.A. and M.A. degrees in German Studies. For details, see the "Undergraduate Degrees" section of this bulletin.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

The University requirements for the M.A. and Ph.D. degrees are described in the "Graduate Degrees" section of this bulletin.

MASTER OF ARTS

This program is designed for those who do not intend to continue studies through the Ph.D. degree. Students desiring the M.A. degree must complete a minimum of 45 units of graduate work. If students enroll for three quarters for a minimum of 15 units per quarter, they can fulfill the M.A. requirements in one year. The program normally includes at least one course in each of the three areas of concentration: language and linguistics, literature, and thought.

In addition, students must take graduate-level courses in German and/or approved courses in related fields such as art history, comparative literature, linguistics, history, or philosophy.

M.A. candidates must take an oral examination toward the end of their last quarter.

DOCTOR OF PHILOSOPHY

The requirements for the Ph.D. include:

1. A minimum of 36 graduate units during the first year of graduate study, 45 units for the completion of the M.A., and a minimum of 9 units per quarter during the six quarters following the first year. A total of 135 units is required for the Ph.D.; doctoral candidates are advised to complete at least one course with each member of the department.
2. A reading knowledge of one language other than English and German, normally French. Students in Medieval Studies must also have a reading knowledge of Latin.
3. A master's oral examination, unless the student has an M.A. upon entering the program
4. A qualifying paper
5. A qualifying examination
6. The University oral examination
7. A dissertation

During the first year of work, the student should select courses that provide an introduction to the major areas of the discipline. During Spring Quarter of the first year, students, except those admitted with a master's degree, must take an oral M.A. examination. During the one-hour examination, the student is questioned by three faculty members, two of whom are regular faculty in the department, chosen by the student, on work undertaken in specific graduate courses.

By July 1 of the summer following the first year of graduate study, students should present as a qualifying paper an example of their course work. Although ordinarily not meant to represent an original contribution to scholarship, it should demonstrate the candidate's ability to grasp complex subject matter with sufficient competence to organize materials and to present arguments in a clear and concise manner commensurate with scholarly standards. The paper is submitted to the department chair, who passes it on for approval by the student's faculty adviser and a second reader appointed by the chair in consultation with the Director of Graduate Studies.

Students who enter the program with a master's degree from another institution must submit, in lieu of a qualifying paper, a master's thesis or a major research paper as evidence of ability to pursue advanced scholarly work.

At the end of the sixth quarter of study (and only if the qualifying paper has been accepted), the student takes a one-hour oral qualifying exam with two faculty members from German Studies, the student's chosen adviser, and another faculty member appointed by the chair. The purpose of this examination is to demonstrate a broad familiarity with the literature of the major periods, movements, and some major figures. Only after completion of the qualifying procedure will the department approve the student's admission to candidacy. A student who fails the qualifying examination may retake it once at the beginning of the seventh quarter.

After passing the qualifying exam, the student should consult with appropriate faculty members in order to develop a dissertation topic. It is important to consider scholarly significance, access to resources, and feasibility of completion within a reasonable period. The student then prepares a preliminary statement describing the topic (no more than five pages), which is circulated to prospective committee members for discussion at a meeting normally held during the eighth quarter. The purpose of this meeting is to provide the student with feedback and guidance in the preparation of the formal prospectus.

The University oral examination in the Department of German Studies is based on the dissertation prospectus. The prospectus, normally 25 pages plus bibliography, elaborates on the topic, the proposed argument, and the organization of the dissertation. It must be distributed to the committee members and the outside chair at least two weeks before the formal University oral examination. Students should plan this examination for the end of the third year or the end of the subsequent summer. The examination lasts approximately two hours, permitting each of the four examiners a 25-minute question period and reserving an optional ten minutes for questions from the chair of the examination.

Students, regardless of their future fields of concentration, are expected to acquire excellence in German and thorough knowledge of the grammatical structure of German. The department expects Ph.D. candidates to demonstrate teaching proficiency in German; APPLLING 201, The Learning and Teaching of Second Languages is required. The teaching requirement is five quarters during the second and third years of study. The fifth and final quarter of teaching may be postponed until the student has worked extensively on the dissertation and may be devoted to a literary topic related to the dissertation. Such courses are subject to departmental review procedures.

The department expects candidates to demonstrate research skills appropriate to their special areas of study. The requirement can be fulfilled in the capacity of either a University Fellow or a Research Assistant.

Graduate students are also advised to start developing skills in the teaching of literature by participating in the teaching of undergraduate literature courses. Students can earn up to 3 units of graduate credit for practice teaching in literature.

Regular attendance at the departmental colloquium is mandatory. Each student is expected to make a formal presentation at the colloquium for public discussion.

INTERDISCIPLINARY PROGRAMS

The department participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in German Studies and Humanities. For a description of that program, see the "Interdisciplinary Studies in Humanities" section of this bulletin.

Students may work toward a Ph.D. in German Studies with minors in such areas as comparative literature, modern thought and literature, linguistics, or history. Students obtaining a Ph.D. in such combinations may require additional training.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Classics, Comparative Literature, English, French and Italian, Slavic Languages and Literatures, and Spanish and Portuguese, in the Program in Modern Thought and Literature, and in the Division of Literatures, Cultures, and Languages.

GERMAN LANGUAGE COURSES

The following courses in German language instruction represent a typical sequence for three years of German language study. Majors and prospective majors should consult the requirements for a B.A. in German Studies above. For descriptions, other information, and additional courses including special emphasis, intensive, summer, and activity courses at the Haus Mitteleuropa, see the "Language Center" section of this bulletin.

GERLANG 1,2,3. First-Year German
5 units, Aut, Win, Spr (Strachota, K; Nissler, P; Staff)

GERLANG 21,22. Intermediate German
4 units, **21:***Aut,* **22:** *Win (Petig, W)*

GERLANG 100. *Hundert Deutsche Jahre:* One Hundred German Years
3-4 units, Spr (Strachota, K)

GERLANG 101,102. Advanced Language Study
3-4 units, **101:** *Aut (Urlaub, P),* **102:** *Spr (Engel, A)*

GERLANG 110. German Newspapers
3-4 units, Aut (Strachota, K)

GERLANG 111. Television News from Germany
3-4 units, Win (Urlaub, P)

GENERAL (IN ENGLISH)

These courses, with the subject code GERGEN, do not require knowledge of German and are open to all students.

UNDERGRADUATE

GERGEN 50N. Charlemagne's Germany—Stanford Introductory Seminar. Preference to freshmen. The Carolingian Renaissance. The imprint of Charlemagne on the development of Europe. Who he was, what he accomplished, and how a myth grew up around him. Did he attempt to recreate the Roman Empire? His influence over political design and many branches of modern learning. GER:DB-Hum
3-4 units, Aut (Andersson, T)

GERGEN 104N. Resistance Writings in Nazi Germany—Stanford Introductory Seminar. Preference to sophomores. The letters and diaries of individuals who resisted Nazi oppression and paid with their lives. Readings include the Scholl diaries, Bonhoeffer's letters and his *Ethics*, and letter exchanges from other crucial figures. No knowledge of German required; students may read texts in original if able. GER:DB-Hum
3 units, Aut (Bernhardt, E)

ADVANCED UNDERGRADUATE AND GRADUATE

GERGEN 181. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical

significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum
4 units, Win (Anderson, L; Landy, J)

GERGEN 183/283. Scenarios of Dissolution in the Modern Novel—How do novels capture chaos? 20th-century novels responding to catastrophes such as: the disintegration of the Austro-Hungarian monarchy (Musil, Roth); demise of the Third Reich (Mann); chaotic forces in an oppressive order (Bulgakov); corrosion of imperial confidence through fear of barbarian invaders (Coetzee); and transformation of masses into a mob destroying the body politic from within (Krasznahorkai). GER:DB-Hum
4 units, Spr (Dornbach, M)

GERGEN 205/305. Technologies of the Self—Important moments in the history of the discursive and rhetorical construction of the subject. Emphasis is on tensions between uniqueness and exemplariness, chronology and repetition, narrative and archive, and aesthetics and ethics of retrospection. Works by Augustine, Teresa of Avila, Montaigne, Rousseau, Goethe, Nietzsche, Joyce, Gide, Sartre, Leiris, and Barthes. Theoretical and critical essays including by Lejeune, Starobinski, De Man, Derrida, Marin, Koerner, Foucault, and Beaujour. GER:DB-Hum
3-5 units, Win (Douvaldzi, C)

GERGEN 267/367. Freud and the Apostle Paul—Intersections between Freud's psychoanalysis of society and Paul's political theology. Emphasis is on the issues of law, love, justice, community, and language. Readings include Freud and Paul, and theoretical essays by Taubes, Badiou, Santner, Agamben, Assmann, Zizek, and Boyarin. GER:DB-Hum
3-5 units, Win (Douvaldzi, C)

LITERATURE, THOUGHT, AND CULTURE

Courses in this section have the subject code GERLIT.

UNDERGRADUATE

At this level, students have several options depending on their interests. After completing GERLANG 3 or the equivalent, students may register for courses at the GERLIT 120-level, which consider special topics in German culture while advancing language learning. Alternatively, GERLANG 21, 22, and 101 emphasize a systematic review of the language, while GERLANG 21W, 22W, and 105 study the language of business and international relations. GERLANG 100, 110, and 111 develop German language skills in the context of media such as film, television, and newspapers. Language instruction courses with the subject code GERLANG are listed in the "Language Center" section of this bulletin.

GERLIT 123N. The Brothers Grimm and Their Fairy Tales—Stanford Introductory Seminar. Preference to freshmen. Historical, biographical, linguistic, and literary look at the *Kinder-* and *Hausmärchen* of Jacob and Wilhelm Grimm. Readings from the fairy tales, plus materials in other media such as film and the visual arts. Small group performances of dramatized fairy tales. In German. Prerequisite: GERLANG 3 or equivalent. GER:DB-Hum, WIM
4 units, Spr (Robinson, O)

GERLIT 124. Wotan's Demise: Concepts of Nature in German Culture—Wagner's Ring as a parable for a dichotomy that has characterized the cultural discourse in Germany from the onset of modernity: nature as organic expression of culture versus an alienated, destructive mechanization of the Earth. Historical and contemporary contexts. Sources include literary, secondary, cinematic, and musical materials. In German. Prerequisite: GERLANG 3 or equivalent. GER:DB-Hum
4 units, Aut (Tempel, S)

GERLIT 127. The German Thriller—Intermediate readings with discussion and writing practice in German. Sources include Müllner's *Der Kaliber*, and Dürrenmatt's *Der Richter und sein Henker* and *Der Verdacht.* In German. Prerequisite: GERLANG 3 or equivalent. GER:DB-Hum , WIM
4 units, Win (Andersson, T)

GERLIT 128. Goethe: Poetic Vision in the Age of Reason—Goethe's novels, dramas, and poetry as a contribution to modernity and in relation to principles of the European Enlightenment. His notion of *Weltliteratur* (world literature) against the background of romanticism. Readings include poems, *Die Leiden des jungen Werthers, Faust*, poems from the *West-östlicher Divan*, and the novella. Prerequisite: GERLANG 3 or equivalent. GER:DB-Hum
4 units, Aut (Shamel, M)

GERLIT 130. Holocaust Memory in the Literary Imagination of Germany and Austria—How literary texts shaped the early memory of the Holocaust in the lands of the perpetrators. Narrative and dramatic strategies of authors in East Germany (Bruno Apitz, Jurek Becker), West Germany (Peter Weiss, Rolf Hochhuth), and Austria (Ilse Aichinger, Christoph Ransmayr) who resisted the official discourse on the Holocaust and contributed to shaping its memory today. Readings in German. Prerequisite: GERLANG 3 or equivalent.
4 units, Spr (Cammin, R)

GERLIT 132. Insights and Outlooks: Confronting the Nazi Past through Literature—Writers such as: autobiographical W. German authors during the 50s, including Heinrich Böll and Günther Grass; the search for the better Germany in antifascist E. Germany, including Franz Fühmann and Christa Wolff; confronting fathers during the student revolution, including Peter Schneider; Jewish identity in the land of the perpetrators, including Peter Weiss and Maxim Biller; and seeking a new Germanness, including Malin Schwedtfeger and Judith Hermann. In German. Prerequisite: GERLANG 3 or equivalent. GER:DB-Hum, WIM
4 units, Aut (Tempel, S)

GERLIT 133Q. Modernism and Fiction—Stanford Introductory Seminar. Preference to sophomores. Innovative ideas and narrative forms in German modernism. International and specifically German features. Problems of narration. Texts such as Musil's *Törless*, Mann's *Tod in Venedig,* Kafka's *Die Verwandlung,* and Broch's *Pasenow*. Close reading technique. Prerequisite: reading knowledge of German. GER:DB-Hum
4 units, Spr (Berman, R)

GERLIT 136. Twentieth-Century German Short Fiction—Cultural and historic contexts. Writers include Borchert, Böll, Lenz, Brecht, Frisch, and Bachmann. Primarily in German. Prerequisite: GERLANG 3 or equivalent.
4 units, Win (Urlaub, P)

GERLIT 148/248. Heart to Heart: Theories of Expression at the Turns of Two Centuries—Paradigms of expression around 1800 and 1900, from *Empfindsamkeit* (sensibility) to German expressionism. The heart that overflows into speech in the works of Klopstock, Goethe, Tieck, and Kleist, and the reformulation a century later of this idea as avant garde practice and modernist credo. Readings of poets, philosophers, and artists on relationships between inside and out, heart and voice, emotion and language, and self and art. Discussion in English. GER:DB-Hum
3-5 units, Aut (Pourciau, S)

GERLIT 151/251. German Underworlds—German theories about what lies beneath: is it hell or the subterranean foundations that keep the world from collapsing? Cosmic architecture and the question of the inferno in Kant, Novalis, Wagner, Marx, Freud, Kafka, and the films of Fritz Lang. GER:DB-Hum
3-5 units, Win (Pourciau, S)

GERLIT 154. Heidegger on Hölderlin—(Same as COMPLIT 154.) The encounter of Friedrich Hölderlin, a poet with philosophical passions in the first half of the 19th century, and Martin Heidegger, a philosopher who wrote poetically in the 20th century. What Hölderlin's poems and Heidegger's philosophy reveal about the essence and potential of lyrical texts: how neither attributes representational function to poetic texts, but sees them as existential and historical sites in which events can take place. In English; texts also available in German. GER:DB-Hum
5 units, Aut (Gumbrecht, H)

GERLIT 158/258. German Dialects—Linguistic characteristics of dialect areas. History of the study of language variation in Germany; traditional dialect grammars; dialect-geographical revolution; and insights of modern sociolinguistics. Sources include native speakers, professionally-made tapes with transcripts, and secondary readings. GER:DB-Hum
3-4 units, Win (Robinson, O)

GERLIT 163/263. Readings in 19th-Century German Literature—Works by Goethe, Tieck, Kleist, Hoffmann, Heine, Büchner, Grillparzer, Droste-Hülshoff, Stifter, and Keller. Their divergent responses to artistic, ethical, and political challenges of modernity. Prerequisite: GERLANG 3 or equivalent. In German. GER:DB-Hum
4 units, Aut (Dornbach, M)

GERLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.
5 units, Win (Staff)

GERLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.
2 units, Spr (Staff)

GERLIT 195/295. The Culture of Reason and its Discontents: Introduction to Modern German Intellectual History—Characteristics of modernity such as rational self-legislation, growing separation of spheres of life, and liberating and disorienting loss of traditional frameworks of meaning. Texts include Kant, Schiller, Marx, Nietzsche, Weber, Adorno, and Horkheimer. Discussion and written work in English. Students may read texts in translation; assistance provided to those reading in German. GER:DB-Hum
4 units, Spr (Dornbach, M)

GERLIT 199. Independent Reading—36 hours of reading per unit, weekly conference with instructor. May be repeated for credit. Prerequisite: consent of instructor.
1-10 units, Aut, Win, Spr, Sum (Staff)

ADVANCED UNDERGRADUATE AND GRADUATE

GERLIT 206/306. Narrative, Visuality, Memory—Moments in the history of the relationship between verbal and visual: the classical ars memoriae; the ekphrasis debates of the 18th century; and the emergence of a new visuality and mnemonic art as structuring principles for modernist narrative. Authors include Plato, Aristotle, Cicero, Augustine, Winkelmann, Lessing, Diderot, Goethe, Moritz, Flaubert, Rilke, and Proust. GER:DB-Hum
3-5 units, Spr (Douvaldzi, C)

GERLIT 226. Heinrich Heine: The Poet, Critic, and Thinker—For graduate students and advanced undergraduates. Heine's major writings against their 19th-century background and within the context of modern German and European literary history.
3-5 units, Win (Müller-Vollmer, K)

GERLIT 256. Old High German—Introduction to the grammar and the texts of the earliest attested stage of high German.
3-4 units, Win (Robinson, O)

GERLIT 285/385. Thomas Mann—(Same as COMPLIT 214/314.) Key work, including short fiction, major novels, and essays. Mann's relation to naturalism and modernism, the conservative revolution and democracy; his American exile. Engagement with myth and the reception of romanticism, Wagner, and Nietzsche. Music in literature. Mann and Adorno. Readings in German include *Death in Venice, The Magic Mountain,* and *Doctor Faustus*. GER:DB-Hum
3-5 units, Win (Berman, R)

GERLIT 298. Individual Work—Open only to German majors and to students working on special projects, including written reports for internships. Honors students use this number for the honors essay. May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

GERLIT 299. Present Pasts: History, Fiction, Temporality—(Same as COMPLIT 321.) Relationship among history, memory, and literature in contemporary novels that engage with recent history. Theories of this relationship, including the proposition that Western culture in the second half of the 20th century is characterized by a crisis of temporality and an aversion to or dissatisfaction with traditional conceptions of the past. Readings include: Toni Morrison, J.M. Coetzee, Amos Oz, Orhan Pamuk, and Haruki Murakami; and theoretical works including Adorno, Heidegger, Benjamin, Jameson, Elias, and Huyssen.
5 units, Win (Eshel, A; White, H)

GRADUATE

GERLIT 320. German Romanticism—(Same as COMPLIT 334.) Prose, lyrics, and aesthetic theory of the earlier Jena Romantics and late Romanticism. Why literary Romanticism was later understood as a revolutionary step toward modernity. Readings include *Tieck*, Novalis' *Hymnen an die Nacht*, Schlegel's *Rede über die Mythologie*, Brentano, Eichendorff, and Hoffmann.
3-4 units, Spr (Bohrer, K)

GERLIT 325. Decadence and Vitalism—(Same as COMPLIT 352.) A major motif in European literature from 1890 to 1920, the interdependence of the topics and their ideological and political implications. Readings in Nietzsche, Wilde, H.v.Hofmannsthal, Mann, Chekhov, D'Annunzio, Jünger, Marinetti, D.H. Lawrence, and Musil.
3-4 units, Spr (Bohrer, K)

GERLIT 369. Introduction to Graduate Studies: Criticism as Profession—(Same as COMPLIT 369.) Major texts of modern literary criticism in the context of professional scholarship today. Readings of critics such as Lukács, Auerbach, Frye, Ong, Benjamin, Adorno, Szondi, de Man, Abrams, Bourdieu, Vendler, and Said. Contemporary professional issues including scholarly associations, journals, national and comparative literatures, university structures, and career paths.
5 units, Aut (Berman, R)

GERLIT 399. Independent Study
1-15 units, Aut, Win, Spr, Sum (Staff)

GERLIT 400. Dissertation Research—For graduate students in German working on dissertations only.
1-12 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

German majors are advised to consult the "Literatures, Cultures, and Languages" section of this bulletin for additional offerings. See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

DLCL 189. Honors Thesis Seminar
5 units, Aut (Surwillo, L)

ENGLISH 140A. Creative Resistance and the Holocaust
5 units, Win (Felstiner, J)

ENGLISH 304H. Romantic Poetry and Poetics
5 units, Spr (Gigante, D)

MUSIC 16N. Music, Myth, and Modernity: Wagner's Ring Cycle and Tolkien's *Lord of the Rings*
3 units, Spr (Grey, T)

MUSIC 17N. The Operas of Mozart
3 units, Win (Berger, K)

PHIL 103. 19th-Century Philosophy
4 units, Spr (Staff)

PHIL 125/225. Kant's First *Critique*
4 units, Aut (Anderson, L)

PHIL 127B. Kant's Anthropology and Philosophy of History—(Same as PHIL 227B.)
4 units, Spr (Wood, A)

PHIL 130/230. Hegel's *Elements of Philosophy of Right*
4 units, Aut (Wood, A)

PHIL 135/235. Existentialism
4 units, Spr (Anderson, L)

OVERSEAS STUDIES

These courses are approved for the German major and taught at the campus indicated. Course descriptions can be found in the "Overseas Studies" section of this bulletin or in the Overseas Studies Program office, 126 Sweet Hall.

BERLIN

OSPBER 11. The Vanishing City: Lost Architecture and the Art of Commemoration in Berlin
4-5 units, Spr (Ebeling, K)

OSPBER 174. Sports, Culture, and Gender in Comparative Perspective
5 units, Spr (Junghanns, W)

OSPBER 101A. Contemporary Theater
5 units, Spr (Kramer, K)

HISTORY

Emeriti: (Professors) Carl N. Degler, Peter Duus, Terence Emmons, George M. Fredrickson, Harold L. Kahn, George H. Knoles, Richard W. Lyman, Mark Mancall, Peter Paret, Paul A. Robinson, Paul Seaver, James J. Sheehan, Rixford K. Snyder, Peter Stansky, David B. Tyack, Lyman P. Van Slyke; (*Senior Lecturer*) Joseph J. Corn
Chair: Aron Rodrigue
Professors: Keith M. Baker, Joel Beinin, Barton J. Bernstein, Philippe Buc, Albert Camarillo, Clayborne Carson, Gordon Chang, Paula Findlen, Estelle Freedman, Stephen Haber, Tamar Herzog, David Holloway, David M. Kennedy, Nancy S. Kollmann, Mark E. Lewis, Carolyn Lougee Chappell, Ian Morris, Norman M. Naimark, Robert Proctor, Jack N. Rakove, Richard L. Roberts, Aron Rodrigue, Richard P. Saller, Londa Schiebinger, Richard White, Steven J. Zipperstein
Associate Professors: David R. Como, Jessica Riskin, Matthew H. Sommer, Amir Weiner, Kären E. Wigen
Assistant Professors: Robert Crews, James P. Daughton, Zephyr Frank, Sean Hanretta, Aishwary Kumar, Kathryn Miller, Yumi Moon, Thomas S. Mullaney, Priya Satia, Laura Stokes, Jun Uchida, Caroline Winterer
Professor (Teaching): Herbert Klein
Courtesy Professors: Giovanna Ceserani, Lawrence Friedman, Avner Greif, Amalia Kessler, Larry Kramer, Joseph Manning, Reviel Netz, Walter Scheidel, Joy Williamson, Sam Wineburg, Gavin Wright
Senior Lecturers: Katherine Jolluck, Martin W. Lewis
Acting Assistant Professor: Jovana Knezevic

Department Office: Building 200, Room 113
Mail Code: 94305-2024
Phone: (650) 723-2651
Web Site: http://history.stanford.edu/

Courses given in History have the subject code HISTORY. For a complete list of subject codes, see Appendix.

History courses teach the analytical, interpretive, and writing knowledge and skills necessary for understanding the connections between past and present. History is a pragmatic discipline in which the analysis of change over time involves sifting the influences and perspectives that affect the course of events, and evaluating the different forms of evidence historians exploit to make sense of them. Teaching students how to weigh these sources and convert the findings into persuasive analysis lies at the heart of the department's teaching. Graduates with a history major pursue careers and graduate study in law, public service, business, writing, and education.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The Department of History offers several tracks to the B.A. in History. These tracks are not declared on Axess.

The General History track emphasizes breadth of study among historical areas and periods as well as concentration in one selected field. The two tracks with interdisciplinary emphasis (Literature and the Arts, and History of Science and Medicine) combine the study of history with the methods and approaches of other disciplines, and involve substantial course work outside of History. Two new tracks with interdisciplinary emphasis are being introduced this year: History and Law, and Public History/Public Service.

All History majors require the following:

1. Completion of a minimum of 58 units and at least 12 courses of at least 3 units each, to include:
   a) one Sources and Methods seminar
   b) two 200-level undergraduate colloquia
   c) at least one other small group course, to be chosen among the department's undergraduate colloquia, research seminars, or Stanford Introductory Seminars.

2. Courses comprising the 58 units must be taken for a letter grade, and the student must maintain a grade point average (GPA) in History courses of 2.0 or higher.
3. At least six courses must be taken from regular faculty members of the Department of History.
4. History's Writing in the Major requirement is satisfied by completing one of the following: a WIM-option colloquium or seminar; an Honors thesis in History; or a 15-page research paper in History written under faculty direction (HISTORY 299W). Work on the research paper must begin no later than Winter Quarter of the senior year (at least two quarters prior to graduation).
5. At least six quarters of enrollment in the major. Each candidate for the B.A. in History should declare a major by the Autumn Quarter of the third year of study (earlier, if possible).

One Directed Writing (299W) or Directed Research (299S) taken for 3-5 units and for a letter grade may be applied toward the twelve courses required for the B.A. in History. A maximum of five transfer courses may be applied toward the major. Advanced placement credits do not fulfill any major requirements.

Completion of the major requires planning. In Spring Quarter of the junior year, following consultation with faculty advisers, History majors are required to complete a departmental Degree Progress Review and submit it to the History office.

The department also encourages students to acquire proficiency in foreign languages and study at one of Stanford's overseas programs. Such studies are not only valuable in themselves; they can provide an opportunity for independent research and a foundation for honors essays and graduate study.

For information on specific History courses' satisfaction of major requirements, refer to the Department of History course information web site at http://history.stanford.edu/Courses/.

THE GENERAL HISTORY TRACK

In pursuing the above requirements for all History majors, the student in the General History track is required to satisfy breadth and concentration requirements.

1. *Breadth*: to ensure chronological and geographical breadth, at least two courses must be completed in a premodern chronological period and in each of three geographical fields: Field I (Africa, Asia, and Middle East); Field II (the Americas); and Field III (Europe, including Western Europe, Eastern Europe, and Russia). Courses fulfilling the premodern chronological period may also count for Fields I-III.
2. *Concentration*: to develop some measure of expertise, students must complete four courses in one of the following fields of concentration: Africa, Asia, Eastern Europe and Russia, Europe before 1700, Europe since 1700, Jewish history, Latin America, science and technology, the United States, the Middle East, international history, comparative empires and cultures; or a thematic subject treated comparatively, such as war and revolution, work, gender, family history, popular culture, or high culture. The proposed concentration must be approved by the major adviser; a proposal for a thematic concentration must have the approval of both the adviser and the department's undergraduate studies committee. At least one and preferably two of these four courses should be an undergraduate colloquium or seminar.

Certain Introduction to the Humanities (IHUM) courses taught by History faculty in a Winter-Spring sequence count toward the General History major.

HISTORY TRACKS WITH INTERDISCIPLINARY EMPHASIS (HMIE)

These tracks are designed for several types of students: students interested in other disciplines who want to focus on the historical aspects of the subject matter covered by that discipline; students in History who want to understand how interdisciplinary approaches can deepen their understanding of history; and students primarily interested in developing interdisciplinary approaches to historical scholarship by combining the careful attention to evidence and context that motivates historical research with the analytic and methodological tools of science and the humanities. In pursuing the above requirements for all History majors, students in HMIE are required to complete their twelve courses for the major as follows:

Gateway Course (one course)—Students are required to take the appropriate gateway course for their interdisciplinary track. This introduces students to the application of particular interdisciplinary methods to the study of history. See the section on each HMIE for the gateway course appropriate to that major.

Methodological Cluster (three courses)—This cluster is designed to acquaint students with the ways in which interdisciplinary methods are employed in historical scholarship, by practicing historians and scholars in other disciplines whose work is historical. This program of study must provide methodological coherence and must be approved in advance by the student's adviser. See the section on each HMIE for the appropriate historical methods courses.

Geographic Cluster (four courses)—History is embedded in time and place. This cluster is designed to emphasize that the purpose of studying methodology is to more fully understand the history of a particular region of the world. Students select a particular geographic region, as specified in the History major, and complete four courses in that area.

Interdisciplinary Cluster (four courses)—These courses, taken outside the Department of History, acquaint students with the methods and approaches of another discipline appropriate for the interdisciplinary study of history. This program of study must provide methodological coherence and must be approved in advance by the student's adviser. See the section on each HMIE for appropriate interdisciplinary courses.

HMIE tracks do not mandate the breadth or concentration requirements of the General History track. Introduction to the Humanities courses taught by History faculty may apply to HMIEs only insofar as their content is specifically appropriate to the particular methodological or geographic cluster. Courses preapproved for the clusters in interdisciplinary tracks are listed on the History advising web site.

HISTORY, LITERATURE, AND THE ARTS

The History, Literature, and the Arts track is designed for the student who wishes to complement his or her work in History with study in literature, particularly in a foreign language. For the purposes of this major, literature is defined broadly, including art, drama, films and poetry, memoirs and autobiography, novels, as well as canonical works of philosophy and political science. It appeals to students who are interested in studying literature primarily in its historical context, or who want to focus on both the literature and history of a specific geographical area while also learning the language of that area.

Gateway Course—HISTORY 239E, History, Literature, and Arts in Great Britain (Autumn Quarter), gives students a broad introduction to the study of literary texts in history.

Methodological Cluster—This cluster teaches students how historians, in particular, analyze literary texts as documentary sources. Students choose three courses from among the pre-approved HLA Methodology curriculum; other courses must be approved by the HLA coordinator. These courses need not be in the student's geographic concentration.

Geographic Cluster—Students select four History courses in one geographic area. Examples include: Europe, Britain and the countries of the former British Empire, Asia, North America, Latin America, the Middle East, or Africa. These four courses must be taken in addition to the three methodological courses required above.

Interdisciplinary Cluster—Four courses, taken outside the Department of History, must address the literature and arts, broadly defined, of the area chosen for the geographic concentration. The student's adviser must pre-approve all courses in this cluster; these courses may not be double-counted towards a minor or major other than History.

General Requirements—Among the history courses taken, students must include a Sources and Methods seminar, two 200-level courses, and one other small group class. In addition, the Writing in the Major (WIM) requirement must be completed.

HISTORY, SCIENCE, AND MEDICINE

The History, Science, and Medicine (HS&M) track is a collaborative program of the Department of History, the Program in the History and Philosophy of Science, and the Stanford School of Medicine. The major is designed for: (1) students who wish to complement their work in science and/or premedical study with a History track that focuses on science and medicine; (2) students in the humanities and social sciences whose interest in science and medicine is primarily historical and contextual. This major allows students who are contemplating medical school to study the history of medicine and the medical humanities while fulfilling the premedical curriculum.

Gateway Course (1 course)—Students fulfill this requirement by taking the gateway course for HS&M that is offered annually: HISTORY 232F, The Scientific Revolution (Winter Quarter).

Methodological Cluster (3 courses)—These History courses focus on the history of science, technology, and medicine. Courses must be approved by the student's adviser. The choice of courses depends on the student's particular interests (for example, premodern science, medical history and literature, history of technology, medical anthropology).

Geographic Cluster (4 courses)—Students select four History courses in one geographic area. Examples include: Europe, Britain and the countries of the former British Empire, Asia, North America, Latin America, the Middle East or Africa. These four courses must be taken in addition to the three methodological cluster courses. Courses in the history of science, technology, and medicine that have a geographic focus may be used to fulfill this requirement, but cannot be double-counted in the methodological cluster.

Interdisciplinary Cluster (4 courses)—These courses are taken outside the Department of History. The cluster can be defined in any of four ways:

1. two medical humanities courses plus two complementary science courses
2. two courses about science, such the anthropology, sociology, or philosophy of science) plus two complementary science courses
3. four courses in medical humanities
4. two courses in medical humanities and two about science.

In all instances, the Interdisciplinary Cluster must be approved in advance by the student's adviser.

Medical Humanities Course in the Medical School—Majors in the Medical Humanities field of the track in History, Science, and Medicine are expected to take at least one course in the School of Medicine.

General Requirements—Among history courses taken, students must include a Sources and Methods seminar, two 200-level courses, and one other small group class. In addition, the Writing in the Major (WIM) requirement must be completed.

HISTORY AND LAW

The History and Law (HL) interdisciplinary track is for students who wish to explore the intersections between historical and legal studies. The HL curriculum focuses on the role of legal institutions, policies, and structures in various societies. HL track majors enroll in at least three History department courses that focus on issues of law in civil societies and four courses that provide a geographic concentration. In addition, students enroll in four courses outside History that provide disciplinary or interdisciplinary perspectives on the role of law in shaping societies.

Core Courses (3 courses)—Students enroll in at least three History department courses, including courses outside History taught by faculty affiliated with the department, that focus on how law, policies, constitutions, and legal structures affect the development of various societies. These courses include, but are not limited to, the following: HISTORY 57, The Constitution: A Short History; HISTORY 135, History of European Law; HISTORY 222, Honor, Law, and Modernity; HISTORY 245G, Law and Colonialism in Africa; HISTORY 251, Creating the American Republic, HISTORY 251G, Topics in Constitutional History; HISTORY 293, Law and Society in Late Imperial China; and HISTORY 352B, History of American Law (same as LAW 318; open to undergraduates with consent of instructor; semester-long).

Geographical Cluster (5 courses)—Students choose five History courses in one geographic area, such as the United States, Europe, Latin America, Asia, Middle East, or Africa. The faculty coordinator must pre-approve all courses in this cluster.

Interdisciplinary Cluster (4 courses)—Students choose four courses from outside the History department including courses offered in the School of Law and the School of Education. The faculty coordinator must pre-approve all courses in this cluster.

Small Group Requirements—Students must enroll in one sources and methods course and at least two 200-level small group courses while completing the three core courses and the five-course geographical cluster. The Writing in the Major (WIM) requirement must be completed in a History department WIM-designated course.

PUBLIC HISTORY/PUBLIC SERVICE

The Public History/Public Service (PH/PS) interdisciplinary history track is designed for students who wish to include in their course of studies the application of historical study in:

1. public settings such as museums and heritage sites, national and state parks, public agencies, and private foundations, and
2. public service settings in nonprofit organizations, public agencies, and educational institutions.

PH/PS majors enroll in a gateway course on public history and public service and in History department courses that provide a geographic concentration. In addition, students consult with the PH/PS faculty coordinator to select a cluster of service-learning courses, listed annually by the Haas Center for Public Service, that provide interdisciplinary and methodological perspectives on public service. PH/PS majors must also complete an internship through a regularly offered service-learning course or through a summer internship or fellowship.

Gateway Course (1 course)—HISTORY 201, Introduction to Public History and Public Service, provides grounding in the theory and practice of public service and exposure to the types of public history practiced in venues such as museums, historical sites, parks, and nonprofit organizations including local historical societies.

Geographical Cluster (4 courses)—Students select four History courses in one geographic area, such as the United States, Europe, Latin America, Asia, Middle East, or Africa. The faculty coordinator must pre-approve all courses in this cluster.

Interdisciplinary Cluster (4 courses)—Students select four courses from outside the History department drawn from the annual listing of service-learning and theory/practice courses provided by the Haas Center for Public Service. The faculty coordinator must pre-approve all courses in this cluster.

Methodological Cluster (2 courses)—Students must enroll in one Sources and Methods course and one additional 200-level small group course. The Writing in the Major (WIM) requirement must be completed in a History department WIM-designated course.

Public Service/Service-learning Internship (1 course)—Students must engage in at least a one quarter internship through a service-learning course or through a full-time public service or public history summer internship or fellowship. This internship must be pre-approved by the faculty coordinator.

MINORS

Candidates for the minor in History must complete six courses, at least three of which must have a field or thematic focus. The department ordinarily defines fields in terms of geography or chronology, but it also invites students to pursue thematic topics that can be examined in broadly comparative terms. Students completing the minor may choose to concentrate in such fields as African, American, British, Asian, European (medieval, early modern, or modern), Russian and East European history, comparative empires and cultures, or such thematic topics as the history of gender, the family, religion, technology, or revolution. Students may also petition to have a concentration of their own design count toward the minor.

All six courses must be of at least 3 units each and must be taken for a letter grade. The student must maintain a grade point average (GPA) in

History courses of 2.0 (C) or higher. Two of the six courses must be small-group in format (Stanford Introductory Seminars, Sources and Methods Seminars, departmental colloquia, and research seminars). History courses taken at overseas campuses may count toward the minor, but at least three of the six courses must be taken from Stanford History faculty. One History course from Introduction to the Humanities may count toward the six-course requirement, but not for the field concentration. One directed writing (299W) or directed research (299S) course may count towards the minor, if taken for 3-5 units and for a letter grade. A maximum of three transfer courses may be used toward the minor. Advanced placement credits do not fulfill any minor requirements.

Students must declare the minor in History no later than the Autumn Quarter of the senior year. They do so via Axess under Declare Major/Minor. Minor declarations are then approved by the Department of History and confirmation is sent via email to the student.

HONORS PROGRAM

For a limited number of majors, the department offers a special program leading to honors in History. Students accepted for this program, in addition to fulfilling the general requirements stated above, begin work on an essay in Spring Quarter of the junior year and complete the essay by mid-May of the senior year. In addition to the Junior Honors Colloquium, 299H, students normally take 11 to 15 units of Senior Research, to be distributed as best fits their specific project. For students in the honors program, Senior Research units (299A,B,C) are taken in addition to the twelve required courses in History.

To enter this program, the student must be accepted by a member of the department who agrees to advise the research and writing of the essay, and must complete the Junior Honors Colloquium (299H) offered in Winter Quarter. An exception to the latter requirement may be made for those studying overseas Winter Quarter of the junior year, but such students should consult with the director of the honors program, if possible, prior to going overseas. Under exceptional circumstances, students are admitted to the program in the Autumn Quarter of the senior year.

In considering an applicant for such a project, the adviser and director of the honors program take into account general preparation in the field of the project and expect a GPA of at least 3.3 (B+) in the student's previous work in history and in the University. Students completing the thesis with a grade of 'B+' or higher are eligible for honors in History. To enter the honors program, apply at the Department of History office.

Outstanding honors essays may be considered for the University's Golden Medals, as well as for departmental James Birdsall Weter prizes.

SECONDARY (HISTORY) TEACHER'S CREDENTIAL

Applicants for the Single Subject Teaching Credential (Secondary) in the social studies may obtain information regarding this program from the Credential Administrator, School of Education.

COTERMINAL B.A. AND M.A. PROGRAM

The department each year admits a limited number of undergraduates for coterminal B.A. and M.A. degrees in History. Coterminal applications are accepted during Autumn Quarter for admission in Spring Quarter; check with the History office for the application deadline. Applicants are responsible for checking their compliance with University coterminal requirements listed in the "Undergraduate Degrees and Programs" section of the this bulletin. Applicants must meet the same general standards as those seeking admission to the M.A. program; they must submit a written statement of purpose, a transcript, GRE test scores, and three letters of recommendation, at least two of which should be from members of the Department of History faculty. To be competitive, coterminal applicants should have a 3.75 GPA in their undergraduate history major (or equivalent if they are entering without a History major). The decision on admission rests with the department faculty upon recommendation by the Graduate Admissions Committee. Students must meet all requirements for both degrees. They must complete 15 full-time quarters (or the equivalent), or three full-time quarters after completing 180 units, for a total of 225 units. During the senior year they may, with the consent of the instructors, register for as many as two graduate courses. In the final year of study, they must complete at least three courses that fall within a single Ph.D. field.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

ADMISSION

Applicants for admission to graduate work must take the General Test of the Graduate Record Examination. It may be taken at most American colleges and in nearly all foreign countries. For details, see the *Guide to Graduate Admission*, available from Graduate Admissions, the Registrar's Office, 630 Serra Street, Suite 120, or at http://gradadmissions.stanford.edu.

Students admitted to graduate standing do not automatically become candidates for a graduate degree. With the exception of students in the terminal M.A. program, they are admitted with the expectation that they will be working toward the Ph.D. degree and may become candidates to receive the M.A. degree after completing three quarters of work.

MASTER OF ARTS

University requirements for the M.A. degree are described in the "Graduate Degrees" section of this bulletin.

The department requires the completion of nine courses (totaling not less than 45 units) of graduate work; seven courses of this work must be Department of History courses. Of the seven, one must be a seminar and four must be either graduate colloquia or graduate seminars. Directed reading may be counted for a maximum of 10 units. A candidate whose undergraduate training in history is deemed inadequate must complete nine courses of graduate work in the department. The department does not recognize for credit toward the M.A. degree any work that has not received the grade of 'A' or 'B.'

Terminal M.A. Program—Applicants who do not wish to continue beyond the M.A. degree are admitted to this program at the discretion of the faculty in individual fields (U.S., modern Europe, and so on). Students admitted may not apply to enter the Ph.D. program in History during the course of work for the M.A. degree.

M.A. in Teaching (History)—The department cooperates with the School of Education in offering the Master of Arts in Teaching degree. For the general requirements, see the "School of Education" section of this bulletin. For certain additional requirements made by the Department of History, contact the department office. Candidates must possess a teaching credential or relevant teaching experience.

DOCTOR OF PHILOSOPHY

Students planning to work for the doctorate in history should be familiar with the general degree requirements of the University outlined in the "Graduate Degrees" section of this bulletin. Those interested in applying for admission to the M.A. and Ph.D. programs should contact the graduate program coordinator in the History department. Online applications are available in September of the year prior to intended enrollment. The application filing deadline is December 4, 2007. Applicants must file a report of their general scores on the Graduate Record Examination and submit a writing sample of 10-25 pages on a historical topic. Successful applicants for the M.A. and Ph.D. programs may enter only in Autumn Quarter.

Upon enrollment in the graduate program in History, the student has a member of the department designated as an adviser with whom to plan the Ph.D. program. Much of the first two years of graduate study is spent taking courses, and, from the outset, the student should be aware that the ultimate objective is not merely the completion of courses but preparation for general examinations and for writing a dissertation.

Admission to the Department of History in the graduate division does not establish any rights respecting candidacy for an advanced degree. At the end of the first year of graduate study, students are evaluated by the faculty and given a progress report. A decision as to whether the student is admitted to candidacy for the Ph.D. is normally made by the start of the student's third year.

After the completion of certain further requirements, students must apply for acceptance for candidacy for the doctorate in the graduate division of the University.

REQUIREMENTS

1. In consultation with the adviser, students select an area of study from the list below in which to concentrate their study and later take the University oral examination. The major concentrations are:
    - Europe, 300-1500
    - Europe, 1400-1800
    - Europe since 1700
    - Jewish History
    - Russia
    - Eastern Europe
    - Middle East
    - East Asia before 1600
    - China since 1600
    - Japan since 1600
    - Africa
    - Britain and the British Empire since 1460
    - Latin America
    - The United States (including colonial America)
    - History of Science, Medicine, and Technology
2. The department seeks to provide a core colloquium in every major concentration. Students normally enroll in this colloquium during the first year of graduate study.
3. Students are required to take two research seminars, at least one in the major concentration. Normally, research seminars are taken in the first and second years.
4. Each student, in consultation with the adviser, defines a secondary concentration. This concentration should represent a total of four graduate courses or their equivalents, and it may be fulfilled by working in a historical concentration or an interdisciplinary concentration. The historical concentrations include:
    a) One of the concentrations listed above (other than the student's major concentration).
    b) One of the concentrations listed below, which falls largely outside the student's major concentration:
        - The Ancient Greek World
        - The Roman World
        - Europe, 300-1000
        - Europe, 1000-1400
        - Europe, 1400-1600
        - Europe, 1600-1789
        - Europe, 1700-1871
        - Europe since 1848
        - England, 450-1460
        - Britain and the British Empire, 1460-1714
        - Britain and the British Empire since 1714
        - Russia to 1800
        - Russia since 1800
        - Eastern Europe to 1800
        - Eastern Europe since 1800
        - Jewish History
        - Middle East to 1800
        - Middle East since 1800
        - Africa
        - China before 1600
        - China since 1600
        - Japan before 1600
        - Japan since 1600
        - Latin America to 1825
        - Latin America since 1810
        - The United States (including Colonial America) to 1865
        - The United States since 1850
        - The History of Science, Medicine, and Technology
    c) Work in a national history of sufficiently long time to span chronologically two or more major concentrations. For example, a student with Europe since 1700 as a major concentration may take France from 1000 to the present as a secondary concentration.
    d) A comparative study of a substantial subject across countries or periods. The secondary concentration requirement may also be satisfied in an interdisciplinary concentration. Students plan these concentrations in consultation with their advisers. Interdisciplinary concentrations require course work outside the Department of History which is related to the student's training as a historian. Interdisciplinary course work can either add to a student's technical competence or broaden his or her approach to the problems of the research concentration.
5. Each student, before conferral of the Ph.D., is required to satisfy the department's teaching requirement.
6. There is no University or department foreign language requirement for the Ph.D. degree. A reading knowledge of one or more foreign languages is required in concentrations where appropriate. The faculty in the major concentration prescribes the necessary languages. In no concentration is a student required to take examinations in more than two foreign languages. Certification of competence in commonly taught languages (that is, French, German, Italian, Portuguese, Russian, and Spanish) for candidates seeking to fulfill the language requirement in this fashion is done by the appropriate language department of the University. Certification of competence in other languages is determined in a manner decided on by faculty in the major concentration. In either case, certification of language competence must be accomplished before a student takes the University oral examination.
7. The student is expected to take the University oral examination in the major concentration in the third graduate year.
8. The student must complete and submit a dissertation which is the result of independent work and is a contribution to knowledge. It should evidence the command of approved techniques of research, ability to organize findings, and competence in expression. For details and procedural information, inquire in the department.

JOINT PH.D. IN HISTORY AND HUMANITIES

The Department of History participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in History and Humanities. See the "Interdisciplinary Studies in Humanities" section of this bulletin.

FINANCIAL SUPPORT

Students who are admitted with financial support are provided multiple years of support through fellowships, teaching and research assistantships, and tuition grants. Applicants should indicate on the admissions application whether they wish to be considered for such support. No separate application for financial aid is required.

U.S. citizens and permanent resident aliens who are interested in area language studies in East Asia, Africa, and the republics of the former Soviet Union may request a Foreign Language and Area Studies (FLAS) fellowship application from the FLAS coordinator of the respective programs offering the FLAS (CEAS, CAS, CREEES). The FLAS application deadlines are in January and February (CAS).

RESOURCES

The above section relates to formal requirements, but the success of a student's graduate program depends in large part on the quality of the guidance received from faculty and on the library resources available. Prospective graduate applicants are advised to study the list of History faculty and the courses this faculty offers. As to library resources, no detailed statement is possible in this bulletin, but areas in which library resources are unusually strong are described following.

The University Library maintains strong general collections in almost all fields of history. It has a very large microtext collection, including, for instance, all items listed in Charles Evans' *American Bibliography*, and in the *Short-Title Catalogues* of English publications, 1474-1700, and virtually complete microfilmed documents of the Department of State to 1906. It also has a number of valuable special collections including the Borel Collection on the History of California; many rare items on early American and early modern European history; the Brasch Collection on

Sir Isaac Newton and scientific thought during his time; the Gimon Collection on French political economy, and other such materials.

The rich collection of the Hoover Institution on the causes, conduct, and results of WW I and WW II are being augmented for the post-1945 period. The materials include government documents, newspaper and serial files, and organization and party publications (especially the British and German Socialist parties). There are also important manuscript collections, including unpublished records of the Paris Peace Conference of 1919 and the Herbert Hoover archives, which contain the records of the Commission for Relief in Belgium, the American Relief Administration, the various technical commissions established at the close of WW I for reconstruction in Central and Eastern Europe, the personal papers of Herbert Hoover as United States Food Administrator, and other important personal papers. Other materials for the period since1914 relate to revolutions and political ideologies of international importance; colonial and minority problems; propaganda and public opinion; military occupation; peace plans and movements; international relations; international organizations and administration including the publications of the United Nations, as well as principal international conferences. The Hoover Institution also possesses some of the richest collections available anywhere on the British labor movement; Eastern Europe, including the Soviet Union; East Asia (runs of important newspapers and serials and extensive documentary collections, especially for the period of WW II); and Africa since 1860, especially French-speaking Africa, the former British colonies, and South Africa.

COURSES

See the *Time Schedule* and http://history.stanford.edu/courses/ for updated information.

Courses are listed in the following order:

Introductory Undergraduate
Undergraduate (by Area or Theme)
Graduate (by Area or Theme)
Overseas Studies Program Courses in History

INTRODUCTORY UNDERGRADUATE

Introductory undergraduate History courses are listed in the following subsection order:

Introduction to the Humanities (IHUM)
Introductory Lectures: 1-99
Stanford Introductory Seminars: 1N-99N, 1Q-99Q
Sources and Methods Seminars: 1S-99S

IHUM (INTRODUCTION TO THE HUMANITIES)

The following Introduction to the Humanities courses are taught by History faculty members. IHUM courses are typically available only to freshmen seeking to fulfill GER:IHUM requirements; see the "Introduction to the Humanities" section of this bulletin for further information. Prospective majors in History are advised to consider satisfying their IHUM requirements by registering for the following courses.

IHUM 4A,B. Mass Violence from Crusades to Genocide—The evolution, varieties, causes, and logic of mass violence in premodern and modern history; how mass violence shaped historical trends. What accounts for the persistence of mass violence in history? Do religions, ethnicity, and modernity foment or restrain mass violence? Is there a common pattern of mass violence thoughout the centuries? Geographic focus is Europe; comparisons with societies which the Europeans encountered such as the Aztec empire, the Islamic world, and the African colonies. GER:IHUM-2,3

IHUM 4A: *4 units, Win (Buc, P)*
IHUM 4B: *4 units, Spr (Weiner, A)*

IHUM 6A,B. World History of Science—The broad sweep of global science, from the prehistoric roots of the oldest known technologies, the events of the Scientific Revolution, through recent triumphs in the physical and life sciences. History as unavoidably selective. How science transforms and is transformed by human engagements with technology, religion, art, politics, and moral. GER:IHUM-2,3

IHUM 6A: *4 units, Win (Proctor, R)*
IHUM 6B: *4 units, Spr (Proctor, R)*

INTRODUCTORY LECTURES

HISTORY 31. Science, Technology, and Art: The Worlds of Leonardo—The intersections among science, technology, and society, and an interdisciplinary introduction to Renaissance studies. Why does this 15th-century artist, engineer, and inventor continue to fascinate and inspire innovative, interdisciplinary work? The world of the historical Leonardo, looking at his range of interests and accomplishments (including Mona Lisa, human anatomies, flying machines), and the culture of invention that shaped him. Students think with Leonardo, reconstructing some of his projects. The persistence of the Renaissance as a touchstone for innovation in the 21st century, examining the myth of Leonardo. GER:DB-Hum

5 units, Spr (Rutkin, D)

HISTORY 59. Introduction to Asian American History—The historical experience of people of Asian ancestry in the U.S. Immigration, labor, community formation, family, culture and identity, and contemporary social and political controversies. Readings: interpretative texts, primary material, and historical fiction. GER:DB-SocSci, EC-AmerCul

5 units, Aut (Chang, G)

HISTORY 70. Culture, Politics, and Society in Latin America—Introduction to the political and social history of Latin America. Emphasis is on interactions among institutional change, social structure, and political movements, emphasizing the environment and cultural values. GER:DB-SocSci, EC-GlobalCom

5 units, Win (Frank, Z)

HISTORY 92A. The Historical Roots of Modern East Asia—Focus is on China and Japan before and during their transition to modernity. The populous, urbanized, economically advanced, and culturally sophisticated Ming empire and Muromachi shogunate in the 16th century when Europeans first arrived. How the status quo had turned on its head by the early 20th century when European and American steamships dominated the Pacific, China was in social and political upheaval, and Japan had begun its march to empire. GER:DB-SocSci, EC-GlobalCom

5 units, Win (Sommer, M; Wigen, K)

STANFORD INTRODUCTORY SEMINARS

See http://introsems.stanford.edu/ for applications and information.

HISTORY 30N. Fiction and English Society—Stanford Introductory Seminar. Preference to freshmen. The nature of English society from the mid-18th to mid-20th century through novels. Texts include Henry Fielding's *Joseph Andrews*, Jane Austen's *Mansfield Park*, George Eliot's *Middlemarch*, Charles Dickens' *Hard Times*, E.M. Forster's *Howards End*, Virginia Woolf's *Mrs. Dalloway*, Evelyn Waugh's *A Handful of Dust*. The novels themselves, and how they illuminate the English society. GER:DB-Hum

4 units, Aut (Stansky, P)

HISTORY 34N. The European Witch Hunts—Stanford Introductory Seminar. Preference to freshmen. Witch trials, early modern demonology, and historians' interpretations. What was it about early modernity that fueled witch hunting? Forms of the supernatural in history, whether from the ordered world of organized religion, or frightening, uncontrolled, and dangerous. The idea of witchcraft; the fear that some people harm others supernaturally. Reformation era witch hunts conducted in a period of state building and scientific discovery and in violation of extant laws and procedures.

4 units, Win (Stokes, L)

HISTORY 36N. Gay Autobiography—Stanford Introductory Seminar. Preference to freshmen. Gender, identity, and solidarity as represented in nine autobiographies: Isherwood, Ackerley, Duberman, Monette, Louganis, Barbin, Cammermeyer, Gingrich, and Lorde. To what degree do these writers view sexual orientation as a defining feature of their selves? Is there a difference between the way men and women view identity? What politics follow from these writers' experiences? GER:DB-Hum, EC-Gender

4 units, Spr (Robinson, P)

HISTORY 48Q. South Africa: Contested Transitions—Stanford Introductory Seminar. Preference to sophomores. The inauguration of Nelson Mandela as president in May 1994 marked the end of an era and way of life for S. Africa. The persistence of the legacies of racism and inequality. Focus: overlapping and sharply contested transitions. Who advocates and opposes change? Why? What are their historical and social roots and strategies? How do people reconstruct their society? Historical and current sources, including films, novels, and the Internet. GER:DB-Hum

3 units, Win (Samoff, J)

HISTORY 51N. The American Enlightenment—Stanford Introductory Seminar. Preference to freshmen. The resonance of Enlightenment ideas in 18th-century America, a laboratory for new political, scientific, and artistic theories; how Americans applied such ideas. Was America a state of nature, and did animals, plants, and people improve or worsen there? What entities, such as children, apes, women, and slaves, were considered unreasonable in the Age of Reason; why? What was the place of religion and feeling? What was the best kind of government, and how could it be discovered? Readings in original texts and material culture.

5 units, Win (Winterer, C)

HISTORY 62N. The Atomic Bomb in Policy and History—Stanford Introductory Seminar. Preference to freshmen. Emphasis is on declassified files from WW II and recent interpretations. Why did the U.S. drop A-bombs on Japan? Were there viable alternatives, and, if so, why were they not pursued? What did the use of the A-bombs mean then and later? How have postwar interpreters explained, and justified or criticized, the A-bombings? Approaches from history, international relations, American studies, political science, and ethics address the underlying conceptions, the roles of evidence, the logic and models of explanation, ethical values, and cultural/social influences. GER:DB-SocSci

5 units, Spr (Bernstein, B)

HISTORY 90Q. Buddhist Political and Social Theory—Stanford Introductory Seminar. Preference to sophomores. Historical and textual roots, emphasizing Tibetan, Bhutanese, and Thai Buddhism. Society and polity in Buddhist thought, Buddhist spiritual, social, and political practice. The state, sovereignty, and the individual and society. Law. Buddhist economic theory, Gross National Happiness, and sustainable economy. The Buddhist critique of neoliberalism. GER:DB-SocSci, EC-GlobalCom

4-5 units, Aut (Mancall, M)

HISTORY 91Q. Mao Zedong: The Man Who Would Become China—Stanford Introductory Seminar. Preference to sophomores. His life, including early anthropological work, reinterpretation of Marxism, ascendance to power in the Communist Party, theory of guerilla warfare, socioeconomic vision in the early People's Republic, the Great Leap Forward, deification during the Cultural Revolution, and repercussions of his death in 1976.

5 units, Spr (Mullaney, T)

HISTORY 94N. Colonialism and Collaboration—Stanford Introductory Seminar. Preference to freshmen. Roles and problems of collaboration in the rise, sustenance, and fall of empires, and in the politics of occupied regimes and colonies. Focus is on 19th and 20th centuries, including WW II, the Soviet Union, and cases from Africa, Latin America, and S. and E. Asia. Who collaborated, and why; dilemmas they faced. Readings include memoirs, novels, and primary historical sources. GER:EC-Global

4-5 units, Win (Moon, Y)

HISTORY 97N. Modernizing Women in Japan—Stanford Introductory Seminar. Preference to freshmen. Late 19th through 20th century. Women as objects and agents of experiments in social change in the modern world. Research papers using primary sources. Sources include film, fiction, oral history, diaries, journalism, memoirs, and secondary works. GER:EC-Gender

5 units, Aut (Wigen, K)

COGNATE COURSES

CLASSGEN 22N. Technologies of Civilization: Writing, Number, and Money

4-5 units, Spr (Netz, R)

SOURCES AND METHODS SEMINARS

Sources and methods seminars introduce the processes of historical investigation and interpretation by providing experience in interpreting documents, constructing a coherent story from them, interpreting their implications, and discovering how it is possible to agree on facts while disagreeing on meaning.

HISTORY 10S. The Witness in Modern History: Memoir, Reportage, Image—The rise of the witness as icon; debates about its reliability as a historical source. The power of eyewitness accounts to convict the accused, inspire indignation about war and genocide, and attract attention to humanitarian crises. Their notorious unreliability due to exaggeration and misapprehension. Sources include reportage, photography, and documentary film. Case studies include criminal cases, war, poverty, and natural disasters.

5 units, Win (Daughton, J)

HISTORY 14S. Travel in an Age of Religious Crisis: Infidels, Heretics, and Missionaries—Using travel to assess the impact of 16th- and 17th-century religious crises on Europe's discovery of the Americas, Africa, and Asia by Columbus, Vespucci, DaGama, and those who followed them; how that exploration shaped Europe's understanding of its own identity. Sources include journals, letters, and missionary and diplomatic reports.

5 units, Spr (Sutherland, S)

HISTORY 23S. Living and Killing in the Ethnic Borderlands: Eastern Europe, 1914-48—Mass violence and coexistence in the ethnically diverse communities of E. Europe in the first half of the 20th century. How did people conceive of ethnic differences? Under what circumstances did violence erupt? How were ethnic interactions, peaceful and violent, experienced? How have they been remembered and memorialized? Poland, Czechoslovakia, Romania, and Yugoslavia. Empires, Soviet and Nazi policies, the Holocaust, and German expulsions. Memoirs, oral histories, newspapers, novellas, posters, photographs, film, and music.

5 units, Aut (Ward, K)

HISTORY 30S. To Kill the King: Sovereignty, Betrayal, and the End of Monarchy in Early Modern Europe—The dangers of early modern Europe for princes, from those who attained great power to those who met unpleasant ends. Focus is on the executions of Charles I of Britain and Louis XVI of France: did kings possess a sacred character; how was monarchy supposed to function; how did regicide become the abolition of monarchy itself? Authors include Machiavelli and Shakespeare; sources include paintings, newsbooks, tracts, hymns, court records, and speeches.

5 units, Win (Millstone, N)

HISTORY 31S. Jesus and Mohammad: Christian Encounters with Islam in the Early Modern Mediterranean—Christian anxiety at the 15th-century rise of Turkish power. How Europeans, including warriors and spies, understood Muhammad and the Turks from 1450 to 1700. When did they cooperate and when did they fight? How Europe's relationship with Mohammad reflected its troubled relationship with Jesus; who was a Christian in the age of the Reformation? Sources include poetry, artwork, religious tracts, travelogues, letters, and diplomatic correspondence.

5 units, Win (Tazzara, C)

HISTORY 38S. Decadence: The History of a European Preoccupation, 1848-1945—Decadence as a pan-European phenomenon in the cultural crises of the late 19th and 20th centuries. How decadence was championed and derided in conjunction with artistic creativity, individuality, sexuality, and exoticism; how the rhetoric of decadence as degeneration reflects a cultural paradigm shift toward a biological worldview; and how decadence relates to other preoccupations of period such as authenticity and progress. Sources include literature, philosophy, and art.

5 units, Spr (Mann, P)

HISTORY 39S. The Napoleonic Experience, 1798-1815: From the Battle of the Pyramids to Waterloo—Bonaparte and his Grande Armée's campaigns in the Orient and Europe; admiring and horrified reactions in different countries. Sources include peace treaties, soldiers' accounts, Beethoven's music, and Goya's paintings. The experience and legacy of war and peace as the starting point of modern European history.

5 units, Win (Mintzker, Y)

HISTORY 41S. Science and Science Fiction from Christopher Columbus to Frankenstein's Monster—What is a fact; how is it distinguished from fiction? The co-development and eventual divergence of science and science fiction in the early modern world. The history of science and its relationship to literature, travel, nation building, and colonialism. Sources include travelers' accounts, natural histories, scientific illustrations, maps, and novels.

5 units, Aut (Barnett, L)

HISTORY 47S. Health and Healing in Sub-Saharan Africa—Traditional and modern and physical and spiritual systems of health and healing. Focus is on fertility and male and female sexuality. Initiation rites, fertility cults, birth maintenance, abortion, childbirth, and sexually transmitted diseases. African ideals of female sexuality and notions of femininity, masculinity, and political and legal institutions. Sources include: missionary archives; newspapers; diaries, memoirs, and life histories; medical, government, and legal documents; and novels, films, and artifacts.

5 units, Spr (Powers, J)

HISTORY 54S. America's Cold War in Asia from Korea to Vietnam, 1945-1975—How America came to fight its major wars of the Cold War in Korea and Vietnam; who supported and who opposed them. The role of international and domestic politics, culture, ideology, and economics. How they affected the lives of Korean, Vietnamese, and Americans involved. Sources include novels, films, cartoons, periodicals, speeches, letters, and archival documents.

5 units, Aut (Kim, K)

HISTORY 55S. Border Lives, Border Identities: The History of Mexican American Women in the United States—Chicana consciousness from 1900 to the present. The 70s Chicana movement. Topics include: the impact of labor, education, immigration, and sexuality; and Chicanas' roles in feminist, civil rights, and ethnic identity struggles. Primary sources including manifestos, poetry, court cases, film, and art. Stanford archival research. Field trip to San Francisco's Mission District.

5 units, Win (Flores, L)

HISTORY 81S. Iraq Declassified: The History and Historiography of Iraq, 1920-2003—Origins and development of Iraqi political, economic, and social structures. How the Iraqi state came into being; sources of political conflict within it; how American military forces came to occupy it. Emphasis is on British imperialism, the dynamics of anticolonial revolution, and geopolitical implications of oil development. Sources include recently declassified government documents.

5 units, Aut (Wolfe-Hunnicutt, B)

UNDERGRADUATE

Lecture courses (100-199) are surveys of geographical regions and time periods.

Colloquia (200-299) are small-group courses on historical themes, primarily for juniors and seniors majoring in history. Admission is by consent of the instructor. Courses with a suffix 'H' are for honors students only.

Undergraduate research seminars (200S-299S) provide opportunities to research and write a paper using primary sources.

Suffixes A,B,C,D indicate a course sequence. Unless otherwise stated, earlier courses are not prerequisites to later courses, and students need not take an entire sequence. Other letter suffixes, and numbers without suffixes, denote stand-alone courses.

Undergraduate courses are listed in the following subsection order:

International, Global, and Thematic: 100-109, 200-209
Europe Survey: 110A,B,C
Ancient and Medieval Europe: 111-119, 211-219
Eastern Europe, Russia, and Eurasia: 120-129, 220-229
Early Modern and Modern Europe: 130-139, 230-239
History of Science and Technology: 140-144, 240-244
Africa: 145-149, 245-249
United States Survey: 150A,B,C
United States: 151-169, 251-269
Latin America: 170-179, 270-279
Middle East: 180-184, 280-284
Jewish History: 185-189, 285-289
Asia: 190-198, 290-298
Individual Work: 299

INTERNATIONAL, GLOBAL, AND THEMATIC

See also 227A.

HISTORY 102. The History of the International System—World politics and international relations from the dominance of empires and nation states at the turn of the century to the present. The influence of communism, fascism, and anti-imperialism, and the emergence of society as a factor in international relations. Questions of sovereignty versus the new world order. GER:DB-SocSci, EC-GlobalCom, WIM

5 units, Win (Sheehan, J)

HISTORY 103E. History of Nuclear Weapons—(Same as POLISCI 116.) The development of nuclear weapons and policies. How existing nuclear powers have managed their relations with each other. How nuclear war has been avoided so far and whether it can be avoided in the future. GER:DB-SocSci

5 units, Spr (Holloway, D)

HISTORY 104. Trials that Made History: Courtroom Martyrs and Villains from the Classical to Modern Period—Socrates, the Knights Templar, Galileo, Salem witchcraft, and the Scopes (monkey) trials. How trials reflect cultural conflicts and political climate. Tensions between individuals and the state and between science and religion that are evident in trials. The role of trials in public discourse. Trial as drama. Reading assignments are interdisciplinary and range from surviving trial transcripts to the work of literary scholars and filmmakers.

5 units, Spr (Miller, K)

HISTORY 105. Gandhi, King, and Nonviolence—(Same as RELIGST 118.) Lives, times, theory, and practice of Mohandas Gandhi and Martin Luther King, Jr.; their significance to issues of violence and nonviolence today.

4 units, Win (Carson, C; Hess, L)

HISTORY 106A. Global Human Geography: Asia and Africa—(Same as INTNLREL 161A.) Global patterns of demography, economic and social development, geopolitics, and cultural differentiation, covering E. Asia, S. Asia, S.E. Asia, Central Asia, N. Africa, and sub-Saharan Africa. Use of maps to depict geographical patterns and processes. GER:DB-SocSci

5 units, Aut (Lewis, MW)

HISTORY 106B. Global Human Geography: Europe and Americas—(Same as INTNLREL 161B.) Patterns of demography, economic and social development, geopolitics, and cultural differentiation. Use of maps to depict geographical patterns and processes. GER:DB-SocSci

5 units, Win (Lewis, M)

HISTORY 201. Public Service through Public History—(Same as 301.) Gateway course for the History and Public Service interdisciplinary track. How public service and the study of history are connected. Opportunities for students to apply history to public service. Theory and practice of public service. GER:DB-SocSci

5 units, Aut (Camarillo, A; McKibben, C)

HISTORY 202. International History and International Relations Theory—(Same as 306E, POLISCI 316.) The relationship between history and political science as disciplines. Sources include studies by historians and political scientists on topics such as the origins of WW I, the role of nuclear weapons in international politics, the end of the Cold War, nongovernmental organizations in international relations, and change and continuity in the international system. GER:DB-SocSci

5 units, not given this year (Holloway, D)

HISTORY 203A. Theories of the State from the Ancient World to the Present—(Same as 303A.) The development and contemporary condition of thinking about the state. Philosophic, rhetorical, and historical contexts. Aristotle's *Politics*; early modern theorists such as Machiavelli, Hobbes, and Rousseau; transformations of the idea through the French Revolution by Sieyes and Hegel; and problematizations of the ideas in the last century by Schmidt and Foucault. GER:DB-Hum

4-5 units, Win (Baker, K; Sheehan, J)

HISTORY 204E. Origins of Totalitarianism—(Same as 307E.) Modern revolutionary and totalitarian politics. Sources include monographs on the medieval, Reformation, French Revolutionary, and Great War eras. Topics: the essence of modern ideology, the concept of the body national, state terror, charismatic leadership, gender assignments, private and public spheres, and identities. GER:DB-SocSci

4-5 units, Aut (Weiner, A)

HISTORY 204G. War, Culture, and Society in the Modern Age—(Same as 304G.) How Western societies and cultures have responded to modern warfare. The relationship between its destructive capacity and effects on those who produce, are subject to, and must come to terms with its aftermath. Literary representations of WW I; destructive psychological effects of modern warfare including those who take pleasure in killing; changes in relations between the genders; consequences of genocidal ideology and racial prejudice; the theory of just war and its practical implementation; and how wars are commemorated. WIM

5 units, Aut (Weiner, A)

HISTORY 205B. Quantitative Methods in Historical Research—(Same as 305B.) Latest techniques applied to research issues in current historical debates. Preparation of data, processing, statistical procedures to examine theoretical historical issues, and how to present quantitative materials in historical writing. Mathematical or statistical training not required. GER:DB-SocSci

4-5 units, Aut (Klein, H)

HISTORY 206. History and Geography of Contemporary Global Issues—(Same as INTNLREL 163.) The historical background and geographical context of contemporary global issues and events. Texts are a world atlas and regular reading of the *New York Times* and *The Economist*. Topics vary according to what is happening in the world. Student presentations. GER:DB-SocSci, WIM

5 units, Aut (Lewis, MW)

HISTORY 208A. Science and Law in History—(Same as 308A.) How the intertwined modern fields of science and law, since the early modern period, together developed central notions of fact, evidence, experiment, demonstration, objectivity, and proof. WIM

4-5 units, Spr (Riskin, J)

COGNATE COURSE

LAW 229. Race and the Law

3 units, Win (Banks, R)

EUROPE SURVEY

HISTORY 110A. Europe from Late Antiquity to 1500—Focus is on religion and politics. Issues include: the rise of Christianity and its impact on Rome; transformations of Catholicism and its institutions including the impact of barbarian tribes and the struggle between church and state; antisemitism, heresy, Crusades, and inquisition; courtly love; and scholasticism. GER:DB-Hum

5 units, not given this year

HISTORY 110B. Machiavellian Moments: Europe's History, 1492-1793—Survey of the intellectual and social currents from the voyages of Columbus to the French Revolution. GER:DB-SocSci, EC-GlobalCom

5 units, Win (Lougee Chappell, C)

HISTORY 110C. Introduction to Modern Europe—From the late 18th century to the present. How Europeans responded to rapid social changes caused by political upheaval, industrialization, and modernization. Political ideologies such as liberalism, socialism, communism, and fascism that Europeans developed in response to revolution, nation building, imperialism, and international competition. GER:DB-Hum

5 units, Aut (Daughton, J)

ANCIENT AND MEDIEVAL EUROPE

HISTORY 212. Holy Wars: Medieval Perspectives—(Same as 312.) Cultural and societal factors at play in Christian holy war from late antiquity to the early modern era. Topics include: the Crusades and their meanings; armed struggle against heresy; and the wars of religion. Prerequisite: consent of instructor. GER:DB-Hum

4-5 units, Aut (Buc, P)

HISTORY 215. Crusades: Interdisciplinary Approaches—(Same as ENGLISH 103, MEDVLST 165, RELIGST 140.) Causes, meanings, meaningfulness, and commemoration of the Christian expeditions against Muslims, pagans, and heretics. Primary and secondary sources.

3-5 units, Spr (Buc, P; Summit, J; Gelber, H)

HISTORY 216. Medieval Antisemitism—(Same as 316.) The religions based on the New Testament, by virtue of having an old to which to refer the new, entertain a complicated relationship with Judaism. Focus is on the relationship of Christianity to Judaism and Jews under Christian rule during the formative medieval centuries. The formation of anti-Semitism as a factor both in this interaction and the self-identity of Christian communities. The connections between medieval anti-Semitism and modern forms of racism. GER:DB-SocSci

5 units, not given this year (Buc, P)

HISTORY 216A. Muslims and Infidels: Islam and the Crusades—(Same as 316A.) The impact of the Crusades on the Muslim world and consciousness from the Middle Ages and to the present. Primary and secondary sources. Themes include: *jihad*; cultural interaction between Muslims and Christians in the Holy Land; and military, political, and ideological developments in the 12th and 13th centuries. Modern interpretations and debates about jihadist theology and global *jiha*d. GER:DB-Hum

4-5 units, not given this year (Miller, K)

HISTORY 217B. Land of Three Religions: Medieval Spain—(Same as 317B.) The history of the Iberian peninsula from the Islamic conquest of 711 to the Christian expulsion of the Jews in 1492. Focus is on forms of confrontation, confluence, and hostile indifference among medieval Jews, Christians, and Muslims. What were undercurrents of aggression that gave rise to persecution of the other; what elements of commonality among groups gave rise to intellectual advancements? WIM

4-5 units, Win (Miller, K)

COGNATE COURSES

CLASSART 61. Introduction to Greek Archaeology

3-5 units, Aut (Krotscheck, U)

CLASSGEN 47. Hannibal
4-5 units, Win (Hunt, P)

CLASSGEN 60. The Life and Death of a Roman City: Pompeii
4-5 units, Win (Pieraccini, L; Janda, S)

CLASSGEN 66. Herodotus
4-5 units, Win (Manning, J)

CLASSHIS 101. The Greeks
4-5 units, Win (Ober, J; Krotscheck, U)

CLASSHIS 250A. Greek Political Economy I,II—(Same as POLISCI 332R,S.)
4-5 units, **A:** *Win,* **B:** *(Manning, J; Ober, J)*

POLISCI 237/337. Models of Democracy—(Same as CLASSHIS 137/237, COMM 212/312.)
3-5 units, Win (Fishkin, J; Cohen, J)

EASTERN EUROPE, RUSSIA, AND EURASIA

See also 23S, 204E, 204G.

HISTORY 120A. Russia, 988-1762—Culture, politics, and society from the beginnings to Catherine the Great. Orthodox Christianity; Vikings in Kievan Rus; the principality of Moscow and the Muscovite political system; church-state relations; the 15th-16th century Muscovite cultural synthesis in art and architecture and the shattering of that synthesis in the 17th century; the 17th-century schism in the church; cultural revolution and W. European elements under Peter the Great; Moscow versus St. Petersburg, or traditional versus westernized Russia; rise of serfdom; Catherine the Great as enlightened despot. GER:DB-Hum, EC-GlobalCom
4-5 units, not given this year (Kollmann, N)

HISTORY 120B. History of Imperial Russia—From the reign of Catherine the Great to the collapse of the monarchy in war and revolution in 1917. Themes include the ruling strategies of the Romanov dynasty, noble culture, serfdom, the expansion of the empire into Europe and Asia, the intelligentsia and radical movements, industrialization and urbanization, the geopolitics of Eurasia, and the challenges of nationalism and other revolutionary ideologies to autocratic Russia as a multi-religious and multi-ethnic empire. Novels, memoirs, visual images, music, architecture, and other primary sources. GER:DB-Hum
5 units, not given this year (Crews, R)

HISTORY 120C. 20th-Century Russian and Soviet History—The Soviet polity from the 1917 Revolution to its collapse in 1991. Essentials of Marxist ideology; the Russian Empire in 1917. Causation in history; interpretations of the Revolution; state building in a socialist polity; social engineering through collectivization of agriculture, force-paced industrialization, and cultural revolution; terror as concept and practice; nationality policies in a multiethnic socialist empire; the routinization, decline, and collapse of the revolutionary ethos; and the legacy of the Soviet experiment in the new Russia. GER:DB-Hum
5 units, not given this year

HISTORY 122. Aristocracies and Absolutism: Early Modern Eastern Europe, 1400-1800—The societies and culture of E. Europe (Byelorussia, Bohemia, Hungary, Poland, Ukraine) in the late medieval and early modern periods. The conflict of aristocratic parliamentary governments with absolutist states (Austria-Hungary, Prussia, Russia). E. Europe's development is contrasted to the Russian historical experience. GER:DB-SocSci
5 units, not given this year

HISTORY 123. Reform and Revolution in Modern Russia, 1856-2008—The reforms under Alexander II and the autocracy's attempts to modernize and maintain Russia's great power status while curbing liberal and radical forces. The 1917 revolution and the Communist system under Lenin and Stalin. The influence of Marxist ideology through the Gorbachev years. What was Russian about the Soviet Union and what is Soviet about post-Soviet Russia.
5 units, Spr (Patenaude, B)

HISTORY 125. 20th-Century Eastern Europe—Major historical trends in 20th-century E. European history. Empires and national movements. The creation of independent Eastern Europe after WW I; social movements and the emergence of dictatorships and fascism in the inter-war period. WW II, Stalinism, and destalinization in contemporary E. Europe. GER:DB-SocSci, EC-GlobalCom
5 units, Win (Jolluck, K)

HISTORY 221A. Men, Women, and Power in Early Modern Russia, 1500-1800—Social values, gender relations, and social change in an era of rapid change; challenges to established norms by new constructions of deviance (witchcraft, religious reform, and revolt) and new standards of civility; encounters with non-Russians and the construction of national consciousness. Social values as political ethos: patrimonial autocracy and the reality of female rule in the late 17th and 18th century. GER:DB-Hum, EC-Gender, WIM
5 units, not given this year (Kollmann, N)

HISTORY 221B. The Woman Question in Modern Russia—Russian radicals believed that the status of women provided the measure of freedom in a society and argued for the extension of rights to women as a basic principle of social progress. The social status and cultural representations of Russian women from the mid-19th century to the present. The arguments and actions of those who fought for women's emancipation in the 19th century, theories and policies of the Bolsheviks, and the reality of women's lives under them. How the status of women today reflects on the measure of freedom in post-Communist Russia. GER:DB-SocSci, EC-Gender
5 units, Aut (Jolluck, K)

HISTORY 221D. Women's Activism in War and Peace—(Same as 321D.) Theoretical issues, historical origins, changing forms of women's activism in response to war throughout the 20th century, and contemporary cases, such as the Russian Committee of Soldiers Mothers, Bosnian Mothers of Srebrenica, Serbian Women in Black, and the American Cindy Sheehan. Focus is on the U.S. and Eastern Europe, with attention to Israel, England, and Argentina. GER:DB-Hum
4-5 units, Spr (Jolluck, K)

HISTORY 222. Honor, Law, and Modernity—How Europe evolved from medieval to modern; focus is on standards for conflict resolution emphasizing insults to honor. How attitudes towards the self and society, and the state's relationship to individuals, changed from the 16th to 18th centuries in Europe and Russia. Traditional concepts of honor and patterns of settling disputes contrasted to early modern concepts of honor, private life, civility, and crime and punishment. GER:DB-Hum
5 units, not given this year (Kollmann, N)

HISTORY 224. Violence, Islam, and the State in Central Asia—(Same as 324.) The uses of violence in projects of empire and national state formation that have competed with Islamic and other political alternatives to shape modern Central Asia from the British and Russian imperial eras through the flight of the Taliban. Shared experiences and geopolitics of the former Soviet republics and Afghanistan. Themes include colonial wars and imperial competition, state formation, mass mobilization, women's emancipation, cultural revolution, developmentalism, anti-Soviet *jihad*, the Taliban movement, and contemporary Islamist, nationalist, and regionalist contests for the state. GER:DB-SocSci, EC-GlobalCom
5 units, not given this year (Crews, R)

HISTORY 224A. Modern Russia, Iran, and Afghanistan—(Same as 324A.) 1800 to the present. The history of interactions between Russia and its Muslim neighbors, and how events in Iran and Afghanistan shaped Russia and the surrounding region. Russian expansion, competition for the Caucasus and the Caspian regions, state modernization, socialist revolutions, the Islamic Republic, the Taliban, and the post-9/11 contest for hegemony in the Caucasus, the Middle East, and Central Asia. GER:DB-SocSci
4-5 units, not given this year (Crews, R)

HISTORY 225. Class and Ethnicity in Modern Eurasia—(Same as 325.) Class and ethnicity in the shaping of the political, social, religious and cultural landscape. The decline and collapse of the Habsburg and Russian Empires; the emergence of national states and multinational unions such as the USSR, the EU, and the CIS; contested borderlands and sovereignty; and the impact of revolutionary regimes and movements. GER:DB-SocSci

5 units, not given this year (Crews, R; Weiner, A)

HISTORY 226E. The Creation and Destruction of Yugoslavia—From the genesis of the Yugoslav idea in the 19th century to the Balkan wars of the 90s: formation of the Yugoslav kingdom during WW I, Yugoslavism, disintegration during WW II occupation, collaboration and resistance movements, the Communist revolution, the Tito-Stalin split, life in socialist Yugoslavia, dissent within Tito's regime, the rise of nationalism in socialist Yugoslavia, and the disintegration of Yugoslavia and ethnic cleansing and genocide in the Balkan Wars of the 90s. GER:DB-SocSci, EC-Global

5 units, Aut (Knezevic, J)

HISTORY 226G. Civilians and War in Modern Europe—(Same as 326G.) From the French Revolution to the present, including the French Revolutionary wars, the Franco-Prussian War, the Balkan wars of 1912-13, WW I and II, the Spanish Civil War, fascist and communist totalitarian regimes, and the Balkan wars of the 90s. Civilians as participants, victims, and bystanders under various conditions of war, including the mobilization of society for total war, occupation, siege, collaboration and resistance, ethnic cleansing, and genocide. GER:DB-SocSci

4-5 units, Spr (Knezevic, J)

HISTORY 226H. Nationalism in the Habsburg Empire, 1848-1918—(Same as 326H.) Was nationalism responsible for the demise of the Habsburg Empire? The development of national identity and national movements. The precepts upon which the multinational empire was based; how these collided with 19th-century nationalism, liberalism, and mass politics. Why Habsburg attempts to reform and modernize failed. Focus is on the decisive role of WW I in the disintegration of the empire. GER:DB-SocSci

4-5 units, Win (Knezevic, J)

HISTORY 227. East European Women and War in the 20th Century—(Same as 327.) Thematic chronological approach through conflicts in the region: the Balkan Wars, WW I, WW II, and the recent wars in the former Yugoslavia. The way women in E. Europe have been involved in and affected by these wars compared to women in W. Europe in the two world wars. Women's involvement in war as members of the military services, the backbone of underground movements, workers in war industries, mothers of soldiers, subjects and supporters of war aims and propaganda, activists in peace movements, and objects of wartime destruction, dislocation, and sexual violation. GER:DB-SocSci, EC-Gender

5 units, not given this year (Jolluck, K)

HISTORY 227A. The History of Genocide—(Same as 327A.) Multidisciplinary. Causes and consequences; conceptual and legal problems in defining genocide. Focus is on the modern period and cases from around the world.

4-5 units, Win (Naimark, N)

HISTORY 228. Circles of Hell: Poland in World War II—(Same as 328.) The experience and representation of Poland's wartime history from the Nazi-Soviet Pact of 1939 to the aftermath of Yalta in 1945. Nazi and Soviet ideology and practice regarding the Poles and the ways Poles responded, resisted, and survived. The self-characterization of Poles as innocent victims, and their involvement or complicity in the Holocaust, thus engaging in a current debate in Polish society. GER:DB-SocSci

5 units, not given this year (Jolluck, K)

HISTORY 229. Poles and Jews—(Same as 329.) Focus is on the period since WW I. The place of the Jews in interwar Poland, WW II, surviving Jews after the war, Polish memorialization of the Holocaust, the reality and mythology of Jews in the communist apparatus, the manipulation of anti-Semitism by the communist government, and post-communist movement toward reconciliation. Memory and national mythology emphasizing Polish wartime behavior and the relationship of Jews to communism. The sources and uses of stereotypes, and the state of Polish-Jewish relations today. GER:DB-Hum

4-5 units, Win (Jolluck, K)

EARLY MODERN AND MODERN EUROPE

See also 10S, 14S, 30S, 31S, 38S, 39S, 41S, 204E, and 204G.

HISTORY 126A. The First World War—How did the experience of WW I shape the 20th century? How modern was this mechanized, total war? Did trench warfare, economic blockade, unrestricted submarine warfare, atrocities, occupation, and the Armenian genocide represent a brutalization of warfare? How did mobilization of entire populations affect women and children? How did people mourn and commemorate the victims of mass death? Military, political, cultural, and social approaches. Sources include scholarly texts, literature, and film.

5 units, Aut (Knezevic, J)

HISTORY 132. Ordinary Lives: A Social History of the Everyday in Early Modern Europe—What war meant for foot soldiers and the peasants across whose fields they marched. Ordinary people's lives in the eras of Machiavelli, Shakespeare, the Reformation, and the scientific revolution. Topics include: birth, marriage, and death; city life and peasant culture; lay encounters with religious and intellectual ideas; war and crime; and gender and sexuality.

5 units, Aut (Stokes, L)

HISTORY 133A. Yorkist and Tudor England—English society and state from the Wars of the Roses to the death of Elizabeth. Political, social, and cultural upheavals of the Tudor period and the changes wrought by the Reformation. The establishment of the Tudor monarchy; destruction of the Catholic church; rise of Puritanism; and 16th-century social and economic changes. GER:DB-Hum

5 units, not given this year (Como, D)

HISTORY 133B. Revolutionary England: The Stuart Age—From the accession of King James I in 1603 to the death of Queen Anne in 1714: a brutal civil war, the execution of one anointed king, and the deposition of another. Topics include the causes and consequences of the English Revolution, the origins of Anglo-American democratic thought, the rise and decline of Puritanism, and the emergence of England as an economic and colonial power. GER:DB-Hum

5 units, not given this year (Como, D)

HISTORY 135. History of European Law, Medieval to Contemporary—(Same as 335.) From the fall of the Roman Empire to the establishment of the EU. How law changed over time. Sources and nature of law, organization of legal systems, and relationships between law and society, law and lawmaker, law and the legal professions. GER:DB-SocSci

5 units, not given this year (Herzog, T)

HISTORY 137. The Holocaust—(Same as 337.) The emergence of modern racism and radical anti-Semitism. The Nazi rise to power and the Jews. Anti-Semitic legislation in the 30s. WW II and the beginning of mass killings in the East. Deportations and ghettos. The mass extermination of European Jewry. GER:DB-Hum

4-5 units, Spr (Felstiner, M)

HISTORY 138A. History of Modern Germany, 1866 to the Present—Civil-military relations in Prussia and Germany; the resolution of the German question under Bismarck; the origins, course, and impact of WW I; Germany and Europe under the Nazis; and German-German relations during the Cold War.

5 units, Spr (Kauffman, J)

HISTORY 139. Modern Britain and the Empire—From American Independence to the latest war in Iraq. Topics include: the rise of the modern British state and economy; imperial expansion and contraction; the formation of class, gender, and national identities; mass culture and politics; the world wars; and contemporary racial politics. Focus is on questions of decline, the fortunes and contradictions of British liberalism in an era of imperialism, and the weight of the past in contemporary Britain. GER:DB-Hum, DB-Hum, EC-GlobalCom

5 units, Win (Satia, P)

HISTORY 232F. The Scientific Revolution—(Same as 332F.) What do people know and how do they know it? What counts as scientific knowledge? In the 16th and 17th centuries, understanding the nature of knowledge engaged the attention of individuals and institutions including Copernicus, Galileo, Descartes, Newton, the early Royal Society, and less well-known contemporaries. New meanings of observing, collecting, experimenting, and philosophizing, and political, religious, and cultural ramifications in early modern Europe. GER:DB-Hum, WIM

4-5 units, Win (Riskin, J)

HISTORY 232G. When Worlds Collide: The Trial of Galileo—(Same as 332G.) Gateway course for History of Science and Medicine track. The 1633 condemnation by the Catholic Church of Galileo for believing the sun to be the center of the Universe, and its 1992 admission that Galileo was right. What do these events reveal about the relationship between science and religion? Why has the Galileo affair been one of the most discussed episodes in Italian history and the history of science? Documents from Galileo's life and trial and related literature on Renaissance Italy. Historians' interpretations of the trial in relation to its documentation. GER:DB-Hum

4-5 units, not given this year (Findlen, P)

HISTORY 233C. Two British Revolutions—(Same as 333C.) Current scholarship on Britain,1640-1700, focusing on political and religious history. Topics include: causes and consequences of the English civil war and revolution; rise and fall of revolutionary Puritanism; the Restoration; popular politics in the late 17th century; changing contours of religious life; the crisis leading to the Glorious Revolution; and the new order that emerged after the deposing of James II. GER:DB-Hum

4-5 units, not given this year (Como, D)

HISTORY 233F. Political Thought in Early Modern Britain—1500 to 1700. Theorists include Hobbes, Locke, Harrington, the Levellers, and lesser known writers and schools. Foundational ideas and problems underlying modern British and American political thought and life. GER:DB-Hum

5 units, not given this year (Como, D)

HISTORY 234. Paris and Politics, 1600-2006—The emergence of the modern city of lights. Paris as a mirror of French politics: top down, capital to country, center to periphery, noble to bourgeois to people. Sources include maps, art, music, essays, and memoirs.

5 units, not given this year (Lougee-Chappell, C)

HISTORY 236. The Ethics of Imperialism—Can a commitment to liberty, progress, and universal rights be reconciled with imperialism? The ethical underpinnings of empire; how modern Europeans provided ethical and political justifications for colonial expansion. How European ideals were used to defend and justify inequality, violence, and genocide. The ethics of American-driven globalization and humanitarianism. Texts include primary sources, philosophical treatises, and historical studies. GER:DB-Hum

5 units, Aut (Daughton, J)

HISTORY 237B. Teaching the Unteachable: Teaching and Representing the Holocaust—(Same as EDUC 253X.) Theodore Adorno asked whether it was possible to write poetry after Auschwitz; whatever the answer, each year witnesses exponential growth in state-sponsored mandates to teach the Holocaust. How and to what end does catastrophe become curriculum? How to assess what students learn from these efforts. The Nazis' efforts to teach for hate, and contemporary parallels. Historical and educational sources, especially films and memoirs.

3-5 units, Win (Wineburg, S)

HISTORY 239D. Capital and Empire—(Same as 339D, HUMNTIES 191S.) Can empire be justified with balance sheets of imperial crimes and boons, a calculus of racism versus railroads? The political economy of empire through its intellectual history from Adam Smith to the present; the history of imperial corporations from the East India Company to Wal-mart; the role of consumerism; the formation of the global economy; and the relationship between empire and the theory and practice of development. GER:DB-SocSci

4-5 units, Spr (Satia, P)

HISTORY 239E. History and the Arts in 20th-Century Britain—Novels, poetry, buildings, images, and music. The works in themselves and what they reveal about the society that produced them. Emphasis is on Bill Brandt's photographs. GER:DB-Hum, WIM

5 units, Aut (Stansky, P)

HISTORY 239F. Empire and Information—(Same as 339F.) How do states see? How do they know what they know about their subjects, citizens, economies, and geographies? How does that knowledge shape society, politics, identity, freedom, and modernity? Focus is on the British imperial state activities in S. Asia and Britain: surveillance technologies and information-gathering systems, including mapping, statistics, cultural schemata, and intelligence systems, to render geographies and social bodies legible, visible, and governable. GER:DB-Hum, EC-GlobalCom

4-5 units, not given this year (Satia, P)

COGNATE COURSES

ECON 115. European Economic History

5 units, Win (Chaudhary, L)

HISTORY OF SCIENCE AND TECHNOLOGY

See also 208A, 232F.

HISTORY 241F. History of the Modern Fact—(Same as 341F.) The early modern emergence and subsequent development and transformation of notions such as fact, evidence, experiment, demonstration, and objectivity that operate at the crux of modern science. Recent historical writing on the history of evidence, objectivity, and the modern fact. GER:DB-SocSci

4-5 units, not given this year (Riskin, J)

HISTORY 241G. History of the Senses—(Same as 341G, STS 134/234.) Technological, medical, philosophical, and scientific history of the five senses, drawing upon readings from antiquity to the present. How physiologists and philosophers have explained the functioning of the senses; how doctors have tampered with them both to help and to hinder; and how technologies including medical devices, scientific instruments, and tools of the arts have continually transformed the nature and experience of sensation. GER:DB-SocSci

4-5 units, not given this year (Riskin, J)

HISTORY 241S. Science and Culture Wars—Social, cultural, and political conflicts over scientific theories, beginning with the trial of Galileo, often presented as clashes between modern science and religious or political ideology. The cultural engagement of the sciences through such moments of conflict.

5 units, not given this year (Riskin, J)

HISTORY 242A. What is Life? The History of a Question—(Same as 342A, HUMNTIES 191R.) History of attempts to understand the nature of life and mind by comparing living creatures with artificial machines and material arrangements. Imitations of animal life and human thought and discussions of relations between creatures and contraptions from antiquity onward, with an eye toward providing historical depth to current attempts to simulate life and mind.

4-5 units, not given this year

HISTORY 243C. 18th-Century Colonial Science and Medicine—(Same as 343C.) The exchange of knowledge, technologies, plants, peoples, disease, and medicines. Focus is on French, British, and Dutch interests in the West Indies; examples from elsewhere. Sources include primary and secondary texts on voyaging, colonialism, slavery, and environmental exchange.

4-5 units, not given this year (Schiebinger, L)

HISTORY 243G. Tobacco and Health in World History—(Same as 343G.) GER:DB-SocSci

4-5 units, Aut (Proctor, R)

HISTORY 243S. Human Origins: History, Evidence, and Controversy—(Same as 443A.) Research seminar. Debates and controversies include: theories of human origins; interpretations of fossils, early art, and the oldest tools; the origin and fate of the Neanderthals; evolutionary themes in literature and film; visual rhetoric and cliché in anthropological dioramas and phyletic diagrams; the significance of hunting, gathering, and grandmothering; climatological theories and neocatastrophic geologies; molecular anthropology; the impact of racial theories on human origins discourse. Background in human evolution not required. GER:DB-SocSci

4-5 units, not given this year (Proctor, R)

HISTORY 244C. The History of the Body in Science, Medicine, and Culture—(Same as 444C.) The human body as a natural and cultural object, historicized. The crosscultural history of the body from the 18th century to the present. Topics include: sciences of sex and race; medical discovery of particular body parts; human experimentation, foot binding, veiling, and other bodily coverings; thinness and obesity; notions of the body politic. GER:DB-SocSci, EC-Gender

4-5 units, not given this year (Schiebinger, L)

COGNATE COURSES

HPS 154. What is Science? Explaining Nature from Pythagoras to Popper

3-5 units, Aut (McCaskey, J)

HPS 156. History of Women and Medicine in the United States

5 units, Aut (Horn, M)

AFRICA

See also 47S and 48Q.

HISTORY 145A. Africa Until European Conquest—Episodes in African history from the earliest records up until European partition of the continent, focusing on how knowledge about the natural, social, and spiritual worlds was linked to the exercise of power. The effects of technological innovations on states and other forms of social complexity; use of religious beliefs and practices to legitimate or critique authority. The effects of slave trades and imperial conquest on these forms of authority. GER:DB-Hum, EC-GlobalCom

5 units, not given this year (Hanretta, S)

HISTORY 145B. Africa in the 20th Century—The transformations in African societies and cultures from the beginning of colonial rule to the 90s. Case studies of colonialism and its impact on Africans. Debates over modernity, modernization, and tradition. The challenges of postcoloniality. Social changes in the organization of labor, family life, markets, and the built environment. Cultural changes in literature, music, representational art, and political thought. GER:DB-SocSci, EC-GlobalCom, WIM

5 units, Win (Hanretta, S)

HISTORY 149C. Slavery and the Slave Trade—Slave trades and forms of slavery in W. Africa from 1000 to 1885; impacts on lives, social organization, and political structures. Slavery in Islam, the slave market in the Mediterranean and Middle East, and the Saharan slave trade. Slavery within Africa, growth of the Atlantic trade, the Middle Passage, and war and trade that produced slaves. Impact of the Industrial Revolution and European abolition movements on the use of slaves and warfare in Africa. The relationship between slaving and the European conquest of Africa.

5 units, Spr (Staff)

HISTORY 245E. Health and Society in Africa—(Same as 347E.) The history of disease, therapeutic and diagnostic systems, and the definition of health in precolonial, colonial, and postcolonial Africa. The social and political histories of specific epidemics, including sleeping sickness, influenza, TB, mental illness, and AIDS. The colonial contexts of epidemics and the social consequences of disease. GER:DB-SocSci, EC-GlobalCom

4-5 units, not given this year (Roberts, R)

HISTORY 245G. Law and Colonialism in Africa—(Same as 348D.) Law in colonial Africa provides an opportunity to examine the meanings of social, cultural, and economic change in the anthropological, legal, and historical approaches. Court cases are a new frontier for the social history of Africa. Topics: meanings of conflicts over marriage, divorce, inheritance, property, and authority. WIM GER:DB-SocSci

4-5 units, not given this year (Roberts, R)

HISTORY 246S. Research Seminar: African Nationalism and Beyond—(Same as 446A.) African intellectual, political, social and cultural institutions confronting issues of sovereignty, authority, heterarchy, and power during the 19th and 20th centuries.

4-5 units, Win (Hanretta, S)

HISTORY 248. Islam in Africa—(Same as 348.) Relations between African Muslims and the broader Islamic tradition over the last 1200 years. The roots of the Islamic tradition, its adoption, endogenization, and elaboration by African Muslims. The interplay of religion, politics, culture and society, and how tradition exercises influence even while being transformed. The worldviews and lives of African Muslims; how and why those worldviews and experiences changed. GER:DB-Hum, EC-GlobalCom, WIM

4-5 units, Spr (Hanretta, S)

HISTORY 248S. African Societies and Colonial States—(Same as 448A.) The encounter between African societies and European colonialism in the colony or region of their choice. Approaches to the colonial state; tours of primary source collections in the Hoover Institution and Green Libraries. Students present original research findings and may continue research for a second quarter. GER:DB-SocSci

4-5 units, not given this year (Roberts, R)

HISTORY 249. History without Documents—(Same as 349.) Can history be written about places and times for which are no written sources, or for people in literate societies who left no written traces? Practical training in historical methods for non-documentary sources, including oral traditions and history, archaeology, ecological sources, historical linguistics, ethnography, rituals, myths, songs, and art. GER:DB-Hum

4-5 units, not given this year (Hanretta, S)

UNITED STATES SURVEY

HISTORY 150A. Colonial and Revolutionary America—Survey of the origins of American society and polity in the 17th and 18th centuries. Topics: the migration of Europeans and Africans and the impact on native populations; the emergence of racial slavery and of regional, provincial, Protestant cultures; and the political origins and constitutional consequences of the American Revolution. GER:DB-SocSci, EC-AmerCul

5 units, Aut (Rakove, J)

HISTORY 150B. 19th-Century America—Territorial expansion, social change, and economic transformation. The causes and consequences of the Civil War. Topics include: urbanization and the market revolution; slavery and the Old South; sectional conflict; successes and failures of Reconstruction; and late 19th-century society and culture. GER:DB-SocSci, EC-AmerCul, WIM

5 units, Win (White, R)

HISTORY 150C. The United States in the Twentieth Century—Major political, economic, social, and diplomatic developments in the U.S. Themes: the economic and social role of government (Progressive, New Deal, Great Society, and Reagan-Bush eras); ethnic and racial minorities in society (mass immigration at the turn of the century and since 1965, the civil rights era of the 50s and 60s); the changing status of women since WW II; shifting ideological bases, institutional structures, and electoral characteristics of the political system (New Deal and post-Vietnam); determinants of foreign policy in WW I and II, and the Cold War. GER:DB-SocSci, EC-AmerCul

5 units, Spr (Camarillo, A; Chang, G)

THE UNITED STATES

See also 54S, 55S, 59, and 201.

HISTORY 154. 19th-Century U.S. Cultural and Intellectual History, 1790-1860—How Americans considered problems such as slavery, imperialism, and sectionalism. Topics include: the political legacies of revolution; biological ideas of race; the Second Great Awakening; science before Darwin; reform movements and utopianism; the rise of abolitionism and proslavery thought; phrenology and theories of human sexuality; and varieties of feminism. Sources include texts and images. GER:DB-Hum, EC-AmerCul

5 units, Spr (Winterer, C)

HISTORY 158. The United States Since 1945—Focus is on foreign policy and politics with less attention to social and intellectual history. Topics include nuclear weapons in WW II, the Cold War, the Korean and Vietnam wars, Eisenhower revisionism, the Bay of Pigs and Cuban missile crisis, civil rights and the black freedom struggle, the women's movement, the Great Society and backlash, welfare policy, conservatism and liberalism, the 60s anti-war movement, Watergate and the growth of executive power, Iran-Contra and Reagan revisionism, Silicon Valley, the Gulf War, the Clinton impeachment controversy, 2004 election, and 9/11 and Iraq war. GER:DB-SocSci, EC-AmerCul

4-5 units, Win (Bernstein, B)

HISTORY 158B. History of Education in the United States—(Same as EDUC 201.) How education came to its current forms and functions, from the colonial experience to the present. Focus is on the 19th-century invention of the common school system, 20th-century emergence of progressive education reform, and the developments since WW II. The role of gender and race, the development of the high school and university, and school organization, curriculum, and teaching.

3-4 units, Spr (Staff)

HISTORY 158C. History of Higher Education in the U.S.—(Same as EDUC 165/265.) Major periods of evolution, particularly since the mid-19th century. Premise: insights into contemporary higher education can be obtained through its antecedents, particularly regarding issues of governance, mission, access, curriculum, and the changing organization of colleges and universities.

3-4 units, Aut (Staff)

HISTORY 161. U.S. Women's History, 1890s-1990s—The transformation of Victorian womanhood in the late 19th century, including the workforce participation of immigrant and black women, educational and professional opportunities for middle class white women, impact of wars and depression on 20th-century women's lives, and rebirth of feminism. GER:DB-SocSci, EC-Gender

5 units, Spr (Freedman, E)

HISTORY 163. A History of North American Wests—The history, peoples, and natural systems of a region that has never been contained within a single empire or nation state, but has been united by the movement of peoples, species, and things. Topics include smallpox, horses, gold, salmon, rivers, coal, and oil. WIM

5 units, Aut (White, R)

HISTORY 166. Introduction to African American History: The Modern African American Freedom Struggle—Focus is on political thought and protest movements after 1930. Individuals who have shaped and been shaped by modern African American struggles for freedom and justice. Sources include audiovisual materials. Research projects required for fifth unit. GER:DB-SocSci, EC-AmerCul

4-5 units, Aut (Carson, C)

HISTORY 251. Creating the American Republic—(Same as 352, LAW 246, POLISCI 321.) Concepts and developments in the late 18th-century invention of American Constitutionalism; the politics of constitution making and ratifying; emergence of theories of constitutional interpretation including originalism; early notions of judicial review. Primary and secondary sources. GER:DB-SocSci

5 units, Win (Rakove, J)

HISTORY 252. Decision Making in International Crises: The A-Bomb, the Korean War, and the Cuban Missile Crisis—(Same as 355.) For advanced undergraduates and graduate students. Primary documents and secondary literature. Topics include: the decision to use the atomic bomb on Japan, the Korean War, and the Cuban missile crisis. GER:DB-SocSci

4-5 units, Aut (Bernstein, B)

HISTORY 252H. Environmental History of the San Francisco Bay Area—How changing ideas on the relationship between human beings, nature, and cities have shaped the Bay Area. Topics include: historical connection between the Bay Area and surrounding environments; grassroots organizations and environmental justice movements; responses to urbanization and the rise of urban conservation initiatives; and regional agencies and legislation influencing the creation of parks and green space, pollution control measures, public health standards, and urban food networks.

4-5 units, Win (Staff)

HISTORY 254. Popular Culture and American Nature—Despite John Muir, Aldo Leopold, and Rachel Carson, it is arguable that the Disney studios have more to do with molding popular attitudes toward the natural world than politicians, ecologists, and activists. Disney as the central figure in the 20th-century American creation of nature. How Disney, the products of his studio, and other primary and secondary texts see environmentalism, science, popular culture, and their interrelationships. GER:DB-Hum

5 units, Spr (White, R)

HISTORY 255. Martin Luther King, Jr.: The Social Gospel and the Struggle for Justice—King's religious and political thought, using the documentary resources of the King Institute at Stanford. His social gospel Christianity and prophetic message of radical social transformation. Readings include the forthcoming *The Papers of Martin Luther King, Jr., Volume VI: Advocate of the Social Gospel*.

5 units, Spr (Staff)

HISTORY 255A. America in Western Civilization—(Same as 355A.) The distinctive American reflection of the Renaissance, Reformation, Enlightenment, Industrial Revolution, and century of total war. Corresponding themes: the imaginative rendering of the New World; religion; politics; the economy; and foreign relations.

4-5 units, Aut (Kennedy, D; Sheehan, J)

HISTORY 256. U.S.-China Relations: From the Opium War to Tiananmen—(Same as 356.) The history of turbulent relations, military conflict, and cultural clashes between the U.S. and China, and the implications for the domestic lives of these increasingly interconnected countries. Diplomatic, political, social, cultural, and military themes from early contact to the recent past. GER:DB-SocSci, EC-GlobalCom, WIM

4-5 units, Win (Chang, G)

HISTORY 257. The Politics and Ethics of Modern Science and Technology—(Same as 347, STS 221.) The WW II decision to build and use the atomic bomb. The controversy over the H-bomb. The Oppenheimer loyalty-security case and the relationship of scientist to the state. Medical experimentation on humans and pitfalls of technology. Relations among science, technology, and university. GER:DB-SocSci

4-5 units, not given this year (Bernstein, B)

HISTORY 258. History of Sexuality in the U.S.—(Same as 358; formerly 265A.) Priority to History and Feminist Studies majors; a limited number of graduate students may be admitted. Readings on the social construction of sexuality, primarily U.S., in the 19th and 20th centuries. Topics: reproduction, sexual identities, and race and sexuality. Prerequisite: consent of instructor. GER:DB-SocSci, EC-Gender

4-5 units, not given this year (Freedman, E)

HISTORY 259A. Poverty and Homelessness in America—Service learning. Students participate in a two quarter internship at a local shelter for homeless individuals or families. Readings include historical, social science, and social commentary literature.

5 units, not given this year (Camarillo, A)

HISTORY 259B. Poverty and Homelessness in America II—Students participate in an internship with the Emergency Housing Consortium, the primary agency providing shelter for homeless people in Santa Clara and San Mateo counties, while learning about homelessness and poverty through readings and discussions. Prerequisite: interview with instructor. Service learning. Students participate in a two quarter internship at a local shelter for homeless individuals or families. Readings include historical, social science, and social commentary literature. Prerequisite: 259A.
3 units, not given this year (Camarillo, A)

HISTORY 260. California's Minority-Majority Cities—Historical development and the social, cultural, and political issues that characterize large cities and suburbs where communities of color make up majority populations. Case studies include cities in Los Angeles, Santa Clara, and Monterey counties. Comparisons to minority-majority cities elsewhere in the U.S. GER:DB-SocSci, EC-AmerCul
5 units, Spr (McKibben, C)

HISTORY 265. New Research in Asian American History—(Same as 365.) Narrative material and methodologies. Possible research work. GER:DB-SocSci, EC-AmerCul
4-5 units, not given this year (Chang, G)

COGNATE COURSES

AMSTUD 160. Perspectives on American Identity
5 units, Win, Spr (Gillam, R)

AMSTUD 203A. Children in American History
5 units, Spr (Horn, M)

AMSTUD 214. The American 1960s: Thought, Protest, and Culture
5 units, Aut (Gillam, R)

ECON 116. American Economic History
5 units, Spr (Wright, G)

ECON 226. U.S. Economic History
2-5 units, Spr (Staff)

URBANST 161. U.S. Urban History since 1920
5 units, Spr (Kahan, M)

LATIN AMERICA

See also 70.

HISTORY 170. Colonial Latin America—(Same as 370.) 16th-19th centuries. Indigenous cultures. The arrival of Europeans and its impact on native and European societies. Culture, religion and institutions, and everyday life. The independence period and the formation of new nations. Readings include primary and secondary sources. GER:DB-SocSci
4-5 units, Aut (Herzog, T)

HISTORY 273. The European Expansion—(Same as 373A.) The relationship between European monarchies and their colonial domains from the 16th-18th centuries. Reasons for expansion, methods, and results. Case studies include the Spanish, Portuguese, Dutch, French, and English domains in Africa, Asia, and the Americas. Readings include primary and secondary sources.
4-5 units, not given this year (Herzog, T)

HISTORY 275F. Social Change in Latin America Since 1900—(Same as 375F, LATINAM 201/301.) Changes in the social and demographic characteristics of Latin American populations since 1900 and the response of national governments in terms of the evolution of social welfare, health, and educational systems. Fulfills requirement for Latin American Studies honors seminar. Required core course for Latin American Studies master's students. GER:DB-SocSci, WIM
4-5 units, Aut (Klein, H)

HISTORY 276. Modern Brazil—(Same as 376.) From independence in 1822 to the present. Social and cultural history. Literary and historical sources. WIM
4-5 units, Spr (Frank, Z)

HISTORY 279. Latin American Development: Economy and Society, 1800-2000—(Same as 379.) The newly independent nations of Latin America began the 19th century with economies roughly equal to, or even ahead of, the U.S. and Canada. What explains the economic gap that developed since 1900? Why are some Latin American nations rich and others poor? Marxist, dependency, neoclassical, and institutionalist interpretive frameworks. The effects of globalization on Latin American economic growth, autonomy, and potential for social justice. GER:DB-SocSci, EC-GlobalCom, WIM
4-5 units, Spr (Frank, Z)

MIDDLE EAST

See also 31S, 81S, 185G, 215, 286, and 287A.

HISTORY 181B. The Middle East in the 20th Century—(Formerly 187B.) The history of the Middle East since WW I, focusing on the eastern Arab world, Egypt, the Fertile Crescent, and the Arabian Peninsula (the *mashrîq*), with attention to Turkey, Iran, and Israel.
5 units, not given this year

HISTORY 181C. Social and Cultural History of Modern Shi'ism—The influence of Shi'ism in colonial and postcolonial Middle Eastern countries such as Iran, Iraq, Lebanon, and Saudi Arabia. Survey of Islamic history and the doctrinal differences among Muslim sects. GER:DB-Hum
5 units, Spr (Kadhim, A)

HISTORY 281A. Twentieth-Century Iraq: A Political and Social History—The colonial experience, creation of the modern Iraqi state, and transition to military dictatorship. Political movements, religious and tribal elements, and their relation to the state. Geopolitical context.
5 units, Win (Kadhim, A)

COGNATE COURSES

CLASSHIS 105. History and Culture of Ancient Egypt
4-5 units, Spr (Manning, J)

JEWISH HISTORY

See also 217B.

HISTORY 185B. Jews in the Modern World—Possible themes: the restructuring of Jewish existence during the Enlightenment and legal emancipation at the end of the 18th century in W. Europe, the transformation of Jewish life in E. Europe under the authoritarian Russian regime, colonialism in the Sephardic world, new ideologies (Reform Judaism and Jewish nationalisms), the persistence and renewal of antisemitism, the destruction of European Jewry under the Nazis, new Jewish centers in the U.S., and the State of Israel. GER:DB-Hum, EC-GlobalCom
5 units, not given this year (Zipperstein, S)

HISTORY 185G. Coexistence and Conflict: Jews in Premodern Christian and Muslim Lands—(Same as 385G.)
4-5 units, Aut (Staff)

HISTORY 286. Jews among Muslims—(Same as 386.) The history of Jewish communities in the lands of Islam and their relations with the surrounding Muslim populations from the time of Muhammad to the 20th century. Topics: the place of Jews in Muslim societies, Jewish communal life, variation in the experience of communities in different Muslim lands, the impact of the West in the Modern period, the rise of nationalisms, and the end of Jewish life in Muslim countries. GER:DB-Hum
4-5 units, Win (Rodrigue, A)

HISTORY 287A. History of the Israeli-Arab Land Conflict—(Same as 387A.) Emphasis is on legal aspects. The Palestinian land ownership system during the Ottoman and British periods. Legislation and national institutions such as the Jewish National Fund and the Jewish Agency. The first decade of Israeli statehood that facilitated the transfer of Palestinian refugee property to Jewish ownership. Aftermath of the1967 War, and settlement policies in E. Jerusalem and the occupied territories. Sociolegal issues underlying the separation wall; the effects of the constitutional revolution in Israel on land struggle.
4-5 units, Spr (Staff)

ASIA

See also 90Q, 91Q, 92A, and 256.

HISTORY 191. East Asia in the Early Buddhist Age—(Same as 391.) Evolution of cities in imperial China through early imperial, medieval, and early modern periods. Topics include physical structure, social order, cultural forms, economic roles, relations to rural hinterlands, and the contrast between imperial capitals and other cities. Comparative examination of cases from European history. GER:DB-Hum, EC-GlobalCom

4-5 units, not given this year (Lewis, ME)

HISTORY 192. China: The Early Empires—How China was transformed as a consequence of its political unification by the Qin dynasty. The geographical reorganization of China in the process of unification. The changing nature of rulership, cities, rural society, military organization, kinship structure, religion, literary practice, law, and relations to the outside world. The nature of empire as a political system. GER:DB-Hum

3-5 units, Spr (Lewis, ME)

HISTORY 193. Late Imperial China—From the Tang-Song transition until the collapse of imperial order. The rise of absolutism and gentry society, and concomitant shifts in culture, gender relations, and the economy. The threat of steppe nomadism which produced the Mongol and Manchu conquest dynasties. The last imperial dynasty, the Qing, which solved traditional problems but was confronted by new ones. How simultaneous disasters of internal rebellion and Western imperialist invasion destroyed the old order. GER:DB-Hum

5 units, not given this year (Sommer, M)

HISTORY 195. Modern Korean History—Topics include: the Choson dynasty; 19th-century reforms and rebellions; Korean nationalism; Japanese colonial rule; decolonization; the Korean diaspora; the Cold War in E. Asia; and the Korean War. The division of the country and the separate state building processes. Industrialization and democratization of the South. GER:DB-Hum, EC-GlobalCom

5 units, Aut (Moon, Y)

HISTORY 195C. Modern Japanese History—Japan's modern transformation from the late 19th century to the present. Topics include: the Meiji revolution; industrialization and social dislocation; the rise of democracy and empire; total war and US occupation; economic miracle and malaise; Japan as soft power; and politics of memory. Readings and films focus on the lived experience of ordinary men and women across social classes and regions. GER:DB-SocSci, EC-GlobalCom

5 units, Spr (Uchida, J)

HISTORY 196. South Asian Modernities: Colonialism, Community, Nationality—Does modernity in S. Asia unavoidably carry the memory of its colonial experience? Are there indigenous modes of being modern? The region's global connections in the realm of ideas and political thought; developments pertaining to community, culture, violence, and nationality; the political trajectories of India's nationalist struggle; and the implications of anticolonial politics for the character of postcolonial national modernities.

5 units, Spr (Kumar, A)

HISTORY 197. Southeast Asia: From Antiquity to the Modern Era—The history of S.E. Asia, comprising Indonesia, the Philippines, Malaysia, Singapore, Thailand, Vietnam, Burma, Cambodia, and Laos, from antiquity to the present. The spread of Indian cultural influences, the rise of indigenous states, and the emergence of globally linked trade networks. European colonization, economic transformation, the rise of nationalism, the development of the modern state, and the impact of globalization. GER:DB-Hum

5 units, Win (Lewis, MW)

HISTORY 198. The History of Modern China—Major historical transformations includling the decline of the last imperial dynasty, the formation of the first Chinese republic, WW II, the rise of Communism, China under Mao, post-Mao reforms, and the Beijing Olympics of 2008. GER:DB-SocSci, EC-Global

5 units, Win (Mullaney, T)

HISTORY 291A. Archaeology and Modernity in Asia: The Excavation of Ancient Civilizations in Modern Times—(Same as 391A.) The interplay in Asia between antiquity and modernity, civilization and nation state, and national versus colonial science. The recent excavation of artifacts and places associated with Asian civilization such as the terracotta warriors in China and Angkor Wat in Cambodia. How Asian states have grappled with modernity and colonialism as they simultaneously dug up their ancient pasts. GER:DB-SocSci

4-5 units, not given this year (Mullaney, T)

HISTORY 291B. The City in Imperial China—(Same as 391B.) The evolution of cities in the early imperial, medieval, and early modern periods. Topics include physical structure, social order, cultural forms, economic roles, relations to rural hinterlands, and the contrast between imperial capitals and other cities. Comparative cases from European history. Readings include primary and secondary sources, and visual materials.

3-5 units, Win (Lewis, ME)

HISTORY 291C. Chinese Science, Technology, and Medicine through the Ages

5 units, Spr (Mullaney, T)

HISTORY 291E. Maps, Borders, and Conflict in East Asia—(Same as 391E.) The nature of borders and border conflicts in N.E. Asia from the 17th to the early 20th century. Focus is on contact zones between China, Russia, Korea, and Japan. The geopolitical imperatives that drove states to map their terrain in variable ways. Cultural, diplomatic, and imperial contexts. European pressures and contributions to E. Asian cartography; the uses of maps in surveillance, diplomacy, identity, and war. Student projects focus on a contested border zone. GER:DB-SocSci

4-5 units, not given this year (Wigen, K)

HISTORY 292D. Japan in Asia, Asia in Japan—(Same as 392D.) How Japan and Asia mutually shaped each other in the late 19th and 20th centuries. Focus is on Japanese imperialism in Asia and its postwar legacies. Topics include: pan-Asianism and orientalism; colonial modernization in Korea and Taiwan; collaboration and resistance; popular imperialism in Manchuria; total war and empire; comfort women and the politics of apology; the issue of resident Koreans; and economic and cultural integration of postwar Asia. GER:DB-SocSci

4-5 units, Win (Uchida, J)

HISTORY 293. Law and Society in Late Imperial China—(Same as 392B.) Connections between legal and social history. Ideology and practice, center and periphery, and state-society tensions and interactions. Readings introduce the work of major historians on concepts and problems in Ming-Qing history. GER:DB-Hum

4-5 units, not given this year (Sommer, M)

HISTORY 294. Violence, Ethics, Colonialism: Gandhi, Liberalism, and the Politics of Friendship—How postcolonial ethics might rearrange conventional histories of communitarian politics, civil society, modernity, and anticolonialism. Liberal theorists such as Mill and Macaulay; rhetoric of contract, freedom, and ethical responsibility; Burke's critique of empire; the Indian question; impeachment of Warren Hastings; and implications of liberalism for colonial politics. Patriotism and native translations of liberalism; Gandhi's hermeneutic departure from individual to community; his politics of friendship and gift; and his inversion of liberal contract and historicism. GER:EC-EthicReas

5 units, Win (Kumar, A)

HISTORY 295J. Chinese Women's History—The lives of women in the last 1,000 years of Chinese history. Focus is on theoretical questions fundamental to women's studies. How has the category of woman been shaped by culture and history? How has gender performance interacted with bodily disciplines and constraints such as medical, reproductive, and cosmetic technologies? How relevant is the experience of Western women to women elsewhere? By what standards should liberation be defined? GER:DB-Hum, EC-Gender

5 units, Spr (Sommer, M)

COGNATE COURSES

CLASSHIS 106/206. Life and Death in China's Late Antiquity
4-5 units, Win (Hsu, H)

INDIVIDUAL WORK

HISTORY 299A. Senior Research I
1-5 units, Aut, Win, Spr (Staff)

HISTORY 299B. Senior Research II
1-5 units, Aut, Win, Spr (Staff)

HISTORY 299C. Senior Research III
1-5 units, Aut, Win, Spr (Staff)

HISTORY 299H. Junior Honors Colloquium—Required of junior History majors planning to write a History honors thesis during senior year.
5 units, Win (Winterer, C)

HISTORY 299M. Undergraduate Directed Research: Martin Luther King, Jr., Research and Education Institute—May be repeated for credit.
1-4 units, Aut (Staff), Win (Carson, C), Spr (Staff)

HISTORY 299S. Undergraduate Directed Research and Writing—May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

HISTORY 299W. Undergraduate Directed Writing—May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

HISTORY 299X. Design and Methodology for International Field Research—(Same as 399A.)
1 unit, Spr (Kollmann, N; Roberts, R)

GRADUATE

Graduate History courses are listed in the following subsection order:

Required Colloquia, Workshops, and Seminars: 300-305, 400-405
International, Global, and Thematic: 306-310, 406-410
Ancient and Medieval Europe: 311-319, 411-419
Eastern Europe, Russia, and Eurasia: 320-329, 320-329
Early Modern and Modern Europe: 330-339
History of Science and Technology: 340-344, 440-444
Africa: 345-349, 445-449
United States: 351-369, 451-469
Latin America: 370-379, 470-479
Middle East: 380-384, 480-484
Jewish History: 385-389, 485-489
Asia: 390-398, 490-498
Individual Study: 399, 499

REQUIRED COLLOQUIA, WORKSHOPS, SEMINARS

HISTORY 304. Approaches to History—Required of first-year History Ph.D. students.
4-5 units, Aut (Baker, K)

HISTORY 305. Graduate Workshop in Teaching—Teaching, lecturing, and curriculum development.
1 unit, Spr (Kollmann, N; Roberts, R)

INTERNATIONAL, GLOBAL, AND THEMATIC

See also 327A and 399A.

HISTORY 301. Public Service through Public History—(Same as 201.) Gateway course for the History and Public Service interdisciplinary track. How public service and the study of history are connected. Opportunities for students to apply history to public service. Theory and practice of public service.
5 units, Aut (Camarillo, A; McKibben, C)

HISTORY 303A. Theories of the State from the Ancient World to the Present—(Same as 203A.)
4-5 units, Win (Baker, K; Sheehan, J)

HISTORY 304G. War, Culture, and Society in the Modern Age—(Same as 204G.)
5 units, Aut (Weiner, A)

HISTORY 305B. Quantitative Methods in Historical Research—(Same as 205B.)
4-5 units, Aut (Klein, H)

HISTORY 306E. International History and International Relations Theory—(Same as 202, POLISCI 316.)
5 units, not given this year (Holloway, D)

HISTORY 307E. Origins of Totalitarianism—(Same as 204E.)
4-5 units, Aut (Weiner, A)

HISTORY 308A. Science and Law in History—(Same as 208A.)
4-5 units, Spr (Riskin, J)

HISTORY 309A. Colonial Force and the Postcolonial Subject—How the subaltern's ambiguous narrative style complicates colonial history and anticolonial politics. How a nationalist rhetoric of ethical calmness is interrupted by insurgent traces. How a complex matrix of speech genres, including mimicry, rumor, testimony, irony, repetition, and soliloquy, disturbs colonial force, law, time, and political ethics. Theorizing resistance, archive, and language. The rhetorical tension among nation, community, and subject. Readings include Abamben, Benjamin, Bhabha, Blanchot, Derrida, Fanon, Kierkegaard, Levinas, Ricoeur, Spivak, Taussig, and subalternists.
4-5 units, Win (Kumar, A)

HISTORY 309E. History Meets Geography—Focus is on developing competence in GIS computer applications and applying it to historical problems. Previous experience with GIS not required. Recommended: complete the GIS tutorial in Branner Library before the course starts.
4-5 units, not given this year (Frank, Z)

HISTORY 309F. Historical Geography Colloquium: Maps in the Early Modern World—The significance of cartographic enterprise across the early modern world. Political, economic, and epistemological imperatives that drove the proliferation of nautical charts, domain surveys, city plans, atlases, and globes; the types of work such artifacts performed for their patrons, viewers, and subjects. Contributions of indigenous knowledge to imperial maps; the career of the map in commerce, surveillance, diplomacy, conquest, and indoctrination. Sources include recent research from Asia, Europe, and the Americas.
3-5 units, Aut (Wigen, K)

ANCIENT AND MEDIEVAL EUROPE

HISTORY 311A. Family, Gender, and Production in Ancient Rome—(Same as CLASSGEN 220.) Seminar. The household as the basic unit of production in Rome in the context of family relations and ideologies of gender. Methodological challenges of doing social and economic history from literary, epigraphic, and literary texts. Demography of family and kinship in ancient Rome. Ideologies of gender and family roles and their influence on economic production. Economic theories of the family and human capital.
4-5 units, Win (Saller, R)

HISTORY 312. Holy Wars: Medieval Perspectives—(Same as 212.)
4-5 units, Aut (Buc, P)

HISTORY 313. Core Colloquium in Medieval European History
4-5 units, not given this year (Buc, P)

HISTORY 314. Graduate Core Colloquium in Medieval European History
4-5 units, Win (Miller, K)

HISTORY 316. Medieval Antisemitism—(Same as 216.)
5 units, not given this year (Buc, P)

HISTORY 316A. Muslims and Infidels: Islam and the Crusades—(Same as 216A.)
4-5 units, not given this year (Miller, K)

HISTORY 317B. Land of Three Religions: Medieval Spain—(Same as 217B.)
4-5 units, Win (Miller, K)

HISTORY 414A, B. Medieval History
4-5 units, **A:** *Win,* **B:** *Spr (Buc, P)*

COGNATE COURSE

CLASSHIS 365. The First Great Divergence: Late Antique and Early Medieval Europe and China
4-5 units, Aut (Morris, I; Scheidel, W)

EASTERN EUROPE, RUSSIA, AND EURASIA

See also 304G and 307E.

HISTORY 321A. Early Modern Russian Historiography
5 units, not given this year (Kollmann, N)

HISTORY 321B. Imperial Russian Historiography
4-5 units, not given this year (Crews, R)

HISTORY 321C. Historiography of the Soviet Union—Major schools of interpretation of the Soviet phenomenon through works representative of a specific school, in chronological order, from the first major interpretation of the Soviet polity by Trotsky to postmodernist theories.
4-5 units, not given this year (Weiner, A)

HISTORY 321D. Women's Activism in War and Peace—(Same as 221D.)
4-5 units, Spr (Jolluck, K)

HISTORY 324. Violence, Islam, and the State in Central Asia—(Same as 224.)
5 units, not given this year (Crews, R)

HISTORY 324A. Modern Russia, Iran, and Afghanistan—(Same as 224A.)
4-5 units, not given this year (Crews, R)

HISTORY 325. Class and Ethnicity in Modern Eurasia—(Same as 225.)
5 units, not given this year (Crews, R; Weiner, A)

HISTORY 326G. Civilians and War in Modern Europe—(Same as 226G.)
4-5 units, Spr (Knezevic, J)

HISTORY 326H. Nationalism in the Habsburg Empire, 1848-1918—(Same as 226H.)
4-5 units, Win (Knezevic, J)

HISTORY 327. East European Women and War in the 20th Century—(Same as 227.)
5 units, not given this year (Jolluck, K)

HISTORY 327A. The History of Genocide—(Same as 227A.)
4-5 units, Win (Naimark, N)

HISTORY 328. Circles of Hell: Poland in World War II—(Same as 228.)
5 units, not given this year (Jolluck, K)

HISTORY 329. Poles and Jews—(Same as 229.)
4-5 units, Win (Jolluck, K)

HISTORY 421A. Early Modern Russia
4-5 units, not given this year (Kollmann, N)

HISTORY 422A. Research Seminar on the History of the Russian Empire
4-5 units, not given this year (Crews, R)

HISTORY 422B. Research Seminar in Imperial Russia
4-5 units, not given this year (Crews, R)

HISTORY 424A,B. The Soviet Civilization—Socialist visions and practices of the organization of society and messianic politics; the Soviet understanding of mass violence, political and ethnic; and living space. Primary and secondary sources. Research paper or historiographical essay.
4-5 units, **A:** *Win,* **B:** *Spr (Weiner, A)*

EARLY MODERN AND MODERN EUROPE

See also 332F.

HISTORY 330. Core Colloquium on Early Modern Europe: Ancient Regime—Topics in the social, political, and religious history of Western Europe, 1550-1789, emphasizing France. May be repeated for credit.
4-5 units, Spr (Lougee Chappell, C)

HISTORY 330A. Core Colloquium on Early Modern Europe—Historiographical survey from the Renaissance to the Enlightenment. Topics include the Reformations, European expansion, state and nation building, invention and scientific discovery, intellectual history, and gender. In-depth reviews determined by student interests.
4-5 units, Aut (Stokes, L)

HISTORY 331B. Core Colloquium on Modern Europe: The 19th Century—The major historical events and historiographical debates of the long 19th century from the French Revolution to WW I.
4-5 units, not given this year (Daughton, J)

HISTORY 331C. Core Colloquium on Modern Europe—The historiography of 20th-century Europe. Topics include WW I, the Russian Revolution, National Socialism, and the EU.
4-5 units, Win (Satia, P)

HISTORY 331D. Core Colloquium on Modern Europe: Intellectual History
4-5 units, Aut (Robinson, P)

HISTORY 332A. Power, Art, and Knowledge in Renaissance Italy—Defining features of the world of Leonardo, Machiavelli, and Michelangelo. Intersections of history, politics, art, and literature. The relationship between the Renaissance and the Reformation.
4-5 units, not given this year (Satia, P)

HISTORY 332C. Graduate Research Seminar: The French Revolution—(Same as 432A.) May be repeated for credit.
4-5 units, Win (Baker, K)

HISTORY 332G. When Worlds Collide: The Trial of Galileo—(Same as 232G.)
4-5 units, not given this year (Satia, P)

HISTORY 333. Religion and Politics in Early Modern England—English political and religious culture from the end of the Wars of the Roses to the Civil War of the 1640s. Themes include the growth of the size and power of the state, Reformation, creation of a Protestant regime, transformation of the political culture of the ruling elite, emergence of Puritanism, and causes of the Civil War.
4-5 units, not given this year (Como, D)

HISTORY 333C. Two British Revolutions—(Same as 233C.)
4-5 units, not given this year (Como, D)

HISTORY 335. History of European Law, Medieval to Contemporary—(Same as 135.)
5 units, not given this year (Herzog, T)

HISTORY 336. Modern France
4-5 units, not given this year (Daughton, J)

HISTORY 336E. Violence in History and Theory—Methodological challenges associated with defining and analyzing violence in late-19th- and 20th-century contexts. How people witnessed, coped with, and survived violent episodes. Cases of state violence, ethnic and religious conflict, warfare, genocide, and decolonization. The notion of everyday suffering in the contemporary world. Sources include anthropology, sociology, and history.
4-5 units, Spr (Daughton, J)

HISTORY 337. The Holocaust—(Same as 137.)
4-5 units, Spr (Felstiner, M)

HISTORY 338A. Modern Britain: Facing Europe and Empire, Part I—Influential approaches to problems in British, European, and imperial history. The 19th-century British experience and its relationship to Europe and empire. National identity, the industrial revolution, class formation, gender, liberalism, and state building. Goal is to prepare specialists and non-specialists for oral exams.
4-5 units, not given this year (Satia, P)

HISTORY 338B. Modern Britain, Part II—Themes include empire and racism, the crisis of liberalism, the rise of the welfare state, national identity, the experience of total war, the politics of decline, and modernity and British culture.
4-5 units, not given this year (Satia, P)

HISTORY 339D. Capital and Empire—(Same as 239D, HUMNTIES 191S.)
4-5 units, Spr (Satia, P)

HISTORY 339F. Empire and Information—(Same as 239F.)
4-5 units, not given this year (Satia, P)

HISTORY 432A. Graduate Research Seminar: The French Revolution—(Same as 332C.)
4-5 units, Win (Baker, K)

HISTORY 432B. The Enlightenment and the French Revolution, Part II
4-5 units, Spr (Baker, K)

HISTORY 433A,B. European History
4-5 units, not given this year (Sheehan, J)

HISTORY 438. European History Workshop—All European history graduate students in residence register for this weekly workshop, at which dissertation chapters and prospectuses, papers, and grant proposals by students and faculty are read and discussed.
1 unit, Spr (Robinson, P)

HISTORY 439A,B. Graduate Research Seminar: Modern Britain and the British Empire
4-5 units, **A:** *Aut,* **B:** *Win (Satia, P)*

HISTORY OF SCIENCE AND TECHNOLOGY

See also 308A.

HISTORY 332F. The Scientific Revolution—(Same as 232F.)
4-5 units, Win (Riskin, J)

HISTORY 341F. History of the Modern Fact—(Same as 241F.)
4-5 units, not given this year (Riskin, J)

HISTORY 341G. History of the Senses—(Same as 241G, STS 134/234.)
4-5 units, not given this year (Riskin, J)

HISTORY 342A. What is Life? The History of a Question—(Same as 242A, HUMNTIES 191R.)
4-5 units, not given this year

HISTORY 343C. 18th-Century Colonial Science and Medicine—(Same as 243C.)
4-5 units, not given this year (Schiebinger, L)

HISTORY 343G. Tobacco and Health in World History—(Same as 243G.)
4-5 units, Aut (Proctor, R)

HISTORY 443A. Human Origins: History, Evidence, and Controversy—(Same as 243S.)
4-5 units, not given this year (Proctor, R)

HISTORY 444C. The History of the Body in Science, Medicine, and Culture—(Same as 244C.)
4-5 units, not given this year (Schiebinger, L)

AFRICA

HISTORY 345A. Core Colloquium: Precolonial Africa
4-5 units, not given this year (Roberts, R)

HISTORY 345B. Core Colloquium African History: The Colonial Period
4-5 units, not given this year (Roberts, R)

HISTORY 345C. Graduate Core Colloquium: Sub-Saharan Africa—Structure and processes of government in sub-Saharan colonial Africa. Historiography of colonial rule; what it meant for rulers and ruled. Why Europeans were in Africa and how alien societies were governed. Partition and conquest; the role of African intermediaries in governance; colonial administrators, the impact of writing; French, British, and Belgian models of governance; and postcolonialism. The abolition of slavery as a window into early colonialism; labor and late colonialism.
4-5 units, Spr (Staff)

HISTORY 347. The Politics and Ethics of Modern Science and Technology—(Same as 257, STS 221.)
4-5 units, not given this year

HISTORY 347E. Health and Society in Africa—(Same as 245E.)
4-5 units, not given this year (Roberts, R)

HISTORY 348. Islam in Africa—(Same as 248.)
4-5 units, Spr (Hanretta, S)

HISTORY 348D. Law and Colonialism in Africa—(Same as 245G.)
4-5 units, not given this year (Roberts, R)

HISTORY 349. History without Documents—(Same as 249.)
4-5 units, not given this year (Hanretta, S)

HISTORY 445A,B. Research Seminar in African History
4-5 units, not given this year

HISTORY 446A,B. Research Seminar: African Nationalism and Beyond—(Same as 246S.)
4-5 units, **A:** *Win,* **B:** *Spr (Hanretta, S)*

HISTORY 448A,B. African Societies and Colonial States—(Same as 248S.)
4-5 units, not given this year (Roberts, R)

THE UNITED STATES

HISTORY 351A. Core in American History, Part I
4-5 units, Aut (Rakove, J)

HISTORY 351B. Core in American History, Part II
4-5 units, Aut (Winterer, C)

HISTORY 351C. Core in American History, Part III
4-5 units, Win (White, R)

HISTORY 351D. Core in American History, Part IV
4-5 units, Win (Freedman, E)

HISTORY 351E. Core in American History, Part V
4-5 units, Spr (Camarillo, A)

HISTORY 351F. Core in American History, Part VI
4-5 units, Spr (Bernstein, B)

HISTORY 352. Creating the American Republic—(Same as 251, LAW 246, POLISCI 321.)
5 units, Win (Rakove, J)

HISTORY 352B. History of American Law—(Same as LAW 318.) From the colonial period to the present. Topics include: slavery and race relations; the evolution of criminal justice and correctional systems; the growth of the legal profession; and the role of the legal system in the development of the economy. The relationship between developments in law and in the larger society. Undergraduates by consent of instructor.
5 units, Win (Friedman, L)

HISTORY 355. Decision Making in International Crises: The A-Bomb, the Korean War, and the Cuban Missile Crisis—(Same as 252.)
4-5 units, Aut (Bernstein, B)

HISTORY 355A. America in Western Civilization—(Same as 255A.)
4-5 units, Aut (Kennedy, D; Sheehan, J)

HISTORY 356. U.S.-China Relations: From the Opium War to Tiananmen—(Same as 256.)
4-5 units, Win (Chang, G)

HISTORY 358. History of Sexuality in the U.S.—(Same as 258; formerly 265A.)
4-5 units, not given this year (Freedman, E)

HISTORY 365. New Research in Asian American History—(Same as 265.)
4-5 units, not given this year (Chang, G)

HISTORY 366. Theoretical Debates in the History of Education—(Same as EDUC 301B.) How and to what purpose should students be educated in America? What is an appropriate curriculum? Do all students deserve or need the same curriculum?
3-4 units, not given this year

HISTORY 460. America in the World—Ways to place American history in an international context. Comparative, transnational, diplomatic, and world systems are approaches to complete a research paper based on research into primary materials. Historical methodologies, research strategies, and essay projects.
4-5 units, Win (Chang, G)

LATIN AMERICA

HISTORY 370. Colonial Latin America—(Same as 170.)
4-5 units, Aut (Herzog, T)

HISTORY 373A. The European Expansion—(Same as 273.)
4-5 units, not given this year (Herzog, T)

HISTORY 375F. Social Change in Latin America Since 1900—(Same as 275F, LATINAM 201/301.)
4-5 units, Aut (Klein, H)

HISTORY 376. Modern Brazil—(Same as 276.)
4-5 units, Spr (Frank, Z)

HISTORY 378A. The Logic of Authoritarian Government, Ancient and Modern—(Same as POLISCI 346S.) If authoritarianism is less economically efficient than democracy, and if authoritarianism is a less stable form of political organization than democracy, then why are there more authoritarian governments than democracies? To address this paradox, focus is on theoretical and empirical literature on authoritarian governments, and related literatures on the microeconomic analysis of property rights and credible commitments.
5 units, Aut (Haber, S)

HISTORY 378E. Political Economy of Development—(Same as POLISCI 440B.) Required of Political Science Ph.D. students with comparative politics as a first or second concentration; others by consent of the instructor. The origins of political and economic institutions and their impact on long run outcomes for growth and democracy. Emphasis is on the analysis of causal models, hypothesis testing, and the quality of evidence.
5 units, Aut (Haber, S)

HISTORY 379. Latin American Development: Economy and Society, 1800-2000—(Same as 279.)
4-5 units, Spr (Frank, Z)

HISTORY 470A,B. Research Seminar in Latin American Social History—How to use primary sources such as government records, estate inventories, and parish records for social history. 470A: methodological readings in social history and the development of a research project. 470B: research and writing of a seminar paper. Prerequisite: consent of instructor.
4-5 units, **A:** *Aut,* **B:** *Win (Frank, Z)*

MIDDLE EAST

See also 385G, 386, 387A.

HISTORY 383. The New Global Economy, Oil, and Islamic Movements in the Middle East—The integration of the Middle East into the world capitalist market on a subordinate basis and the impact on economic development, class formation, and politics. Alternative theoretical perspectives on the rise and expansion of the international capitalist market combined with case studies of Egypt, Iraq, and Palestine.
4-5 units, not given this year (Beinin, J)

JEWISH HISTORY

HISTORY 385A. Core in Jewish History, 17th-19th Centuries
4-5 units, not given this year (Rodrigue, A)

HISTORY 385B. Core in Jewish History, 20th Century
4-5 units, not given this year (Zipperstein, S)

HISTORY 385G. Coexistence and Conflict: Jews in Premodern Christian and Muslim Lands—(Same as 185G.)
4-5 units, Aut (Staff)

HISTORY 386. Jews among Muslims—(Same as 286.)
4-5 units, Win (Rodrigue, A)

HISTORY 387A. History of the Israeli-Arab Land Conflict—(Same as 287A.)
4-5 units, Spr (Staff)

HISTORY 486A,B. Graduate Research Seminar in Jewish History
4-5 units, **A:** *Spr,* **B:** *Sum (Rodrigue, A)*

ASIA

See also 309F.

HISTORY 390. Han Chinese and the Global White: The Production of Ethnoracial Majorities, East and West
4-5 units, not given this year (Mullaney, T)

HISTORY 390A. Major Topics in Modern Chinese History—Historical transformations and the development of key temporal, spatial, and categorical concepts, such as nationhood, citizenship, gender, ethnicity, and revolution, through which historical agents in China framed their actions and imbued them with meaning. May be repeated for credit.
4-5 units, Win (Mullaney, T)

HISTORY 391. East Asia in the Early Buddhist Age—(Same as 191.)
4-5 units, not given this year (Lewis, ME)

HISTORY 391A. Archaeology and Modernity in Asia: The Excavation of Ancient Civilizations in Modern Times—(Same as 291A.)
4-5 units, not given this year (Mullaney, T)

HISTORY 391B. The City in Imperial China—(Same as 291B.)
3-5 units, Win (Lewis, M)

HISTORY 391E. Maps, Borders, and Conflict in East Asia—(Same as 291E.)
4-5 units, not given this year (Wigen, K)

HISTORY 392B. Law and Society in Late Imperial China—(Same as 293.)
4-5 units, not given this year (Sommer, M)

HISTORY 392C. Key Topics in Qing History—Graduate colloquium. Goal is to prepare for Ph.D. oral examinations; M.A. students also welcome. Issues include: the ethnic dimension of Qing imperialism; the imperial state's relationship with the peasantry; economic and demographic dynamics; and the impact of Western imperialism.
4-5 units, not given this year (Sommer, M)

HISTORY 392D. Japan in Asia, Asia in Japan—(Same as 292D.)
4-5 units, Win (Uchida, J)

HISTORY 393. Frontier Expansion and Ethnic Statecraft in the Qing Empire—The legacy of the Qing dynasty in the territorial boundaries claimed by the People's Republic of China including the frontier zones that lie outside China proper. How the Qing acquired and ruled its frontier territories. Growth and migration of the Han Chinese population. How the dynasty's Manchu rulers managed ethnic difference. Consequences of Qing expansionism and ethnic statecraft for subject peoples and for the dynasty itself. At what point and by what processes did the Qing become China.
4-5 units, Spr (Sommer, M)

HISTORY 396D. Modern Japan—Fourth in a four-part core colloquium series for graduate students. Major historical problems and historiographic trends in from the Meiji period to the present. Themes include late Meiji culture and politics, the formation of imperial subjects and citizens, agrarian society and politics, gender in modern Japan, empire and modernity, total war and transwar state and society, U.S. occupation, and postwar Japan.
4-5 units, Spr (Uchida, J)

HISTORY 492. Society in Ancient and Medieval China—Proseminar on conducting research in ancient or medieval China. Focus is on the theme of the emotions of the period. Sources include theoretical and comparative materials in secondary literature and primary sources. Students present research paper to class.
5 units, not given this year (Lewis, ME)

HISTORY 495A,B. Qing Legal Documents—How to use Qing legal documents for research. Winter: sample documents that introduce the main genres including: the Qing code and commentaries; magistrates' handbooks and published case collections; and case records from Chinese archives. Spring: class meets occasionally; students complete research papers. Prerequisite: advanced reading ability in Chinese.
4-5 units, **A:** *Win,* **B:** *Spr (Sommer, M)*

INDIVIDUAL STUDY

HISTORY 399A. Design and Methodology for International Field Research—(Same as 299X.)
1 unit, Spr (Kollmann, N; Roberts, R)

HISTORY 399W. Graduate Directed Reading
1-10 units, Aut, Win, Spr, Sum (Staff)

HISTORY 499X. Graduate Research—Units by arrangement. May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

OVERSEAS STUDIES

These courses are approved for the History major and taught overseas at the campus indicated. Students should discuss with their major advisers which courses would best meet individual needs. Descriptions are in the "Overseas Studies" section of this bulletin or at the Overseas Studies office, 126 Sweet Hall.

BEIJING

OSPBEIJ 44. Discovering Modern Chinese History in Beijing
4 units, Spr (Zhao, D)

CAPE TOWN

OSPGEN 23. History and Politics of South Africa in Transition
4 units, Spr (Simons, M)

OSPGEN 64. A Decade of Majority Rule: Contested Transitions in South Africa
2 units, Aut (Samoff, J)

FLORENCE

OSPFLOR 33. The Americanization of Italy
4 units, Win (Scarpellini, E)

OSPFLOR 49. The Cinema Goes to War: Fascism and World War II as Represented in Italian and European Cinema
5 units, Win (Campani, E)

OSPFLOR 106V. Italy: From Agrarian to Postindustrial Society
4 units, Aut (Mammarella, G)

KYOTO

OSPKYOTO 42. Scenes In and Around Kyoto
5 units, Spr (Wigen, K)

MOSCOW

OSPMOSC 20. The Soviet Union in World War II
5 units, Aut (Holloway, D)

OSPMOSC 22. Russia and the World
3 units, Aut (Holloway, D)

OXFORD

OSPOXFRD 20. Biography and History: Literary Biography and the Study of the Past
5 units, Spr (Zipperstein, S)

OSPOXFRD 51. Britain in the Era of the Two World Wars
5 units, Win (Tyack, G)

OSPOXFRD 141V. European Imperialism and the Third World, 1870-1970
5 units, Spr (Jackson, A)

OSPOXFRD 221Y. Art and Society in Britain
4-5 units, Aut (Tyack, G)

PARIS

OSPPARIS 26. France: Present and Future
2 units, Aut (Lougee Chappell, C)

OSPPARIS 27. Paris and Politics
5 units, Aut (Lougee Chappell, C)

OSPPARIS 81. France During the Second World War: Between History and Memory
5 units, Win (Virgili, F)

SANTIAGO

OSPSANTG 18. Africans and Afro-Latinos in the Southern Andes
4-5 units, Spr (Cussen, C)

OSPSANTG 23. Colonial Latin America
5 units, Win (Herzog, T)

OSPSANTG 62. Topics in Chilean History
4-5 units, Win (Jaksic, I)

OSPSANTG 68. The Emergence of Nations in Latin America
4-5 units, Aut, Spr (Jaksic, I)

PROGRAM IN HISTORY AND PHILOSOPHY OF SCIENCE AND TECHNOLOGY

Co-chairs: Michael Friedman (Philosophy), Jessica Riskin (History)
Committee-in-Charge: Barton Bernstein (History), Joe Corn (History, emeritus), Paula Findlen (History), Michael Friedman (Philosophy), Helen Longino (Philosophy), Reviel Netz (Classics), Robert Proctor (History)
Program Committee: Paula Findlen (History), Michael Friedman (Philosophy), Helen Longino (Philosophy), Reviel Netz (Classics), Robert Proctor (History), Jessica Riskin (History), Londa Schiebinger (History, Clayman Institute for Gender Research)
Professors: Keith Baker (History), Barton Bernstein (History), Paula Findlen (History), Michael Friedman (Philosophy), David Holloway (History, Institute for International Studies, Political Science), Reviel Netz (Classics), Robert Proctor (History), Londa Schiebinger (History, Clayman Institute for Gender Research), Richard White (History), Helen Longino (Philosophy)
Associate Professors: Jessica Riskin (History)
Assistant Professors: Sarah Jain (Anthropology), Caroline Winterer (History), Thomas Mullaney (History)
Professor (Research): Rega Wood (Philosophy)
Senior Lecturer: Joseph Corn (History, emeritus)
Lecturers: Tom Ryckman (Philosophy), Margo Horn , John McCaskey
Other Affiliation: Henry Lowood (Stanford University Libraries), Audrey Shafer (Anesthesiology), Larry Zaroff (Anesthesiology, Biomedical Ethics)
Visiting Scholars: Adrienne Mayor (Classics), Darrel Rutkin

Mail Code: 94305-2024
Email: rrogers@stanford.edu
Web Site: http://HPST.stanford.edu

Courses in History and Philosophy of Science and Technology have the subject code HPS. For a complete list of subject codes, see Appendix.

The Program in History and Philosophy of Science and Technology (HPST) is an interdisciplinary program focusing on historical and contemporary aspects of science, medicine, and technology. Graduate degrees at the doctoral level are offered through the departments of History and Philosophy; master's degrees are offered through affiliated departments and programs, principally Classics, Anthropology, English, and Modern Thought and Literature. The program's courses span the period from antiquity to the late 20th century, with emphasis on: ancient science; Renaissance science; the scientific revolution; Enlightenment and transatlantic science; history of medicine and the body; history and philosophy of biology; history and philosophy of modern physics; history of the philosophy of science in the modern period; and gender, science, and technology. These courses are designed for students looking for a humanistic perspective on the sciences and for those trying to understand the relationship of the sciences to humanistic knowledge.

Stanford is surrounded by archives for the recent history of science and technology. Stanford University Libraries has rich holdings in Special Collections for the Scientific Revolution, as well as the modern and contemporary study of science and technology. The University is in close proximity to the California Academy of Sciences, the Exploratorium, the Computer History Museum, and the Tech Museum. Graduate students can take advantage of faculty, classes, and archives at UC Berkeley through Stanford's exchange program.

The core of the community is the colloquium series which brings together faculty and students several times a quarter to discuss the work of invited speakers on topics of broad concerns to science and technology studies.

UNDERGRADUATE DEGREES

Students who wish to pursue the history and philosophy of science and technology should consider a major in one of the following: the Department of History which offers an interdisciplinary track in History, Science, and Medicine; the Department of Philosophy which offers a degree field in History and Philosophy of Science; or the Program in Human Biology where a student can craft an individual area of concentration in the History of Science and Medicine. Course work in science, technology, and medicine or in ancient science and philosophy can be arranged with the departments of Anthropology and Classics respectively. Alternatively, students may consult with a member of the committee-in-charge to construct an Individually Designed Major. The major must conform to the requirements for Individually Designed Majors; see the "Individually Designed Majors" section of the bulletin.

GRADUATE DEGREES

Students can pursue a Ph.D. specializing in the history and philosophy of science and technology through the departments of History and Philosophy. Students can pursue an M.A. specializing in the history and philosophy of science and technology through any of the participating departments and programs. In addition, students may also participate in the HPST program on a non-degree basis. Students should consult departmental descriptions for the details of graduate degree requirements specific to their main department. They are also encouraged to design an interdisciplinary component in their program of studies, drawing on the most relevant classes across the humanities, sciences, and engineering which allow them to connect their discipline-specific work to a broader understanding of science and technology as historical and contemporary phenomena. Prospective students should work closely with their advisers in developing this aspect of their program of studies.

COURSES

INTRODUCTORY

HPS 60. Introduction to Philosophy of Science—(Same as PHIL 60.) 20th-century views on the nature of scientific knowledge. Logical positivism and Popper; the problem of induction; Kuhn, Feyerbend, and radical philosophies of science; subsequent attempts to rebuild moderate empiricist and realist positions. GER:DB-Hum
5 units, Aut (Longino, H)

HPS 61. Science, Religion, and the Birth of Modern Philosophy—(Same as PHIL 61.) Galileo's defense of the Copernican world-system that initiated the scientific revolution of the 17th century, led to conflict between science and religion, and influenced the development of modern philosophy. Readings focus on Galileo and Descartes. GER:DB-Hum
5 units, Win (Friedman, M)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

PHIL 16N. Values and Objectivity
3 units, Aut (Ryckman, T)

SCIENCE IN HISTORY

This sequence is designed to introduce students to the history of science from antiquity to the 20th century. Students are advised to take most or all of this sequence as a core foundation.

COGNATE COURSES

CLASSGEN 22N. Technologies of Civilization: Writing, Number, and Money
4-5 units, Spr (Netz, R)

HISTORY 31. Science, Technology, and Art: The Worlds of Leonardo
5 units, Spr (Rutkin, D)

MEDICINE IN HISTORY

This sequence is designed to introduce students to the history of medicine from antiquity to the 20th century. Students are advised to take most or all of this sequence as a core foundation.

HPS 156. History of Women and Medicine in the United States—Women's bodies in sickness and health, and encounters with lay and professional healers from the 18th century to the present. Historical construction of thought about women's bodies and physical limitations; sexuality; birth control and abortion; childbirth; adulthood; and menopause and aging. Women as healers, including midwives, lay physicians, the medical profession, and nursing. GER:EC-Gender
5 units, Aut (Horn, M)

COGNATE COURSES

HISTORY 243G/343G. Tobacco and Health in World History
4-5 units, Aut (Proctor, R)

PHILOSOPHICAL PERSPECTIVES ON SCIENCE, MEDICINE, AND TECHNOLOGY

This sequence is designed to introduce students to the philosophy of science. Students are advised to take HPS 60 above as a starting point, and combine a number of the electives listed below in conjunction with courses in the other concentrations that address their specific interests.

COGNATE COURSES

PHIL 107/207. Plato and Heraclitus
3 units, not given this year

PHIL 115/215. Foundations of Medieval Psychology
3-5 units, Spr (Wood, R)

PHIL 163/263. Significant Figures in Philosophy of Science
4 units, not given this year

PHIL 164/264. Central Topics in the Philosophy of Science: Theory and Evidence
4 units, Aut (Ryckman, T)

PHIL 165/265. Philosophy of Physics
4 units, Spr (Ryckman, T)

PHIL 167A/267A. Philosophy of Biology
4 units, not given this year

PHIL 167B/267B. Philosophy, Biology, and Behavior
4 units, Win (Longino, H)

PHIL 184F/284F. Feminist Theories of Knowledge—(Same as FEMST 166.)
4 units, not given this year

PHIL 224. Kant's Philosophy of Physical Science
4 units, Win (Friedman, M)

PHIL 360. Core Seminar in Philosophy of Science
4 units, alternate years, not given this year

PHIL 365. Seminar in Philosophy of Science: Structural Realism
4 units, not given this year

ADVANCED

HISTORICAL PERSPECTIVES ON SCIENCE

The following courses focus on specific episodes in or approaches to the history of science.

HPS 154. What is Science? Explaining Nature from Pythagoras to Popper—How many great changes in science were accompanied by changes in method. Case studies of scientific practice from ancient Greece to the 20th century; how theory and practice have influenced each other. What kinds of science and technology emerged under different methods; how science influenced ideas about knowledge, discovery, and truth. What is or is not science, such as the debate over intelligent design.
3-5 units, Aut (McCaskey, J)

COGNATE COURSES

FRENGEN 295. Science, Technology, and Society in Europe and the U.S.: Ethical Debates and Controversies
3-5 units, Win (Dupuy, J)

HISTORY 208A/308A. Science and Law in History
4-5 units, Spr (Riskin, J)

HISTORY 232F/332F. The Scientific Revolution
4-5 units, Win (Riskin, J)

HISTORY 232G/332G. When Worlds Collide: The Trial of Galileo
4-5 units, not given this year

HISTORY 241F/341F. History of the Modern Fact
4-5 units, not given this year

HISTORY 241G/341G. History of the Senses—(Same as STS 134/234.)
4-5 units, not given this year

HISTORY 241S. Science and Culture Wars
5 units, not given this year

CONTEMPORARY PERSPECTIVES ON SCIENCE, MEDICINE, AND TECHNOLOGY

The following courses focus on contemporary cultural and social science approaches to science, technology, and medicine.

HPS 199. Directed Reading
1-15 units, Aut, Win, Spr, Sum (Staff)

HPS 201. HPST Colloquium—Several meetings per quarter to discuss the work of invited speakers on topics of broad concerns to science and technology studies. Required of students participating in the program. See http://hpst.stanford.edu/colloquia.html for times and locations. May be repeated for credit.
1 unit, Aut, Win, Spr (Riskin, J)

HPS 299. Graduate Individual Work—May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

CASA 132. Science, Technology, and Gender
3-5 units, not given this year

HISTORY 243C/343C. 18th-Century Colonial Science and Medicine
4-5 units, not given this year (Schiebinger, L)

HISTORY 243S/443A. Human Origins: History, Evidence, and Controversy
4-5 units, not given this year

HISTORY 244C/444C. The History of the Body in Science, Medicine, and Culture
4-5 units, not given this year

HUMBIO 175. Health Care as Seen Through Medical History, Literature, and the Arts
3 units, Aut (Zaroff, L)

OVERSEAS STUDIES

These courses are approved for the History and Philosophy of Science and Technology major and taught overseas at the campus indicated. Students should discuss with their major advisers which courses would best meet individual needs. Descriptions are in the "Overseas Studies" section of this bulletin or at the Overseas Studies office, 126 Sweet Hall.

FLORENCE

OSPFLOR 44. The Revolution in Science: Galileo and the Birth of Modern Scientific Thought
5 units, Win (Galluzzi, P)

PROGRAM IN HUMAN BIOLOGY

Emeriti: (Professors) Clifford Barnett (Anthropological Sciences), Luigi Cavalli-Sforza (Genetics), Carl Djerassi (Chemistry), Sanford Dornbusch (Sociology), Albert H. Hastorf (Psychology), Dale Kaiser (Biochemistry), Herant Katchadourian (Human Biology), Donald Kennedy (Biological Sciences), Carol Winograd (Medicine)
Director: Carol Boggs (Biological Sciences)
Associate Director: Shirley Feldman (Psychiatry and Behavioral Sciences)
Professors: William H. Durham (Anthropology), Russell D. Fernald (Biological Sciences), Uta Francke (Genetics), Margaret Fuller (Developmental Biology), Lawrence H. Goulder (Economics), H. Craig Heller (Biological Sciences), Richard Klein (Anthropology, Biological Sciences), Michael Marmor (Ophthalmology), Gordon Matheson (Orthopedic Surgery), Roeland Nusse (Developmental Biology), Natalie Rasgon (Psychiatry and Behavioral Sciences), Robert Sapolsky (Biological Sciences), Stephen Schneider (Biological Sciences), Matthew Scott (Developmental Biology), Marcia Stefanick (Medicine), Shripad Tuljapurkar (Biological Sciences), Irving Weissman (Pathology), Jeffrey Wine (Psychology), Paul Wise (Pediatrics), Arthur B. Wolf (Anthropological Sciences)
Associate Professors: Firdaus Dhabhar (Psychiatry and Behavioral Sciences), Anne Fernald (Psychology), Paul Fisher (Neurology and Neurological Sciences, Pediatrics), James Fox (Anthropology), John Rick (Anthropology), Thomas Robinson (Pediatrics, Medicine), Randall Stafford (Medicine), William Talbot (Developmental Biology)
Assistant Professors: Melissa Brown (Anthropology), David DeGusta (Anthropology), Daniel Garza (Orthopedic Surgery, Emergency Medicine), James H. Jones (Anthropology), Norman G. Miller (Medicine), Michael Ramscar (Psychology)
Associate Professors (Research): David Katzenstein (Medicine), David Lyons (Psychiatry and Behavioral Sciences)
Assistant Professor (Research): Christopher Gardner (Medicine)
Professor (Teaching): Carol Boggs (Biological Sciences)
Associate Professors (Teaching): Donald Barr (Sociology), Catherine Heaney (Psychology, Medicine), David Magnus (Pediatrics), Ellen Porzig (Developmental Biology), Robert Siegel (Microbiology and Immunology)
Other Teaching Faculty and Staff: William Abrams, Wesley F. Alles (Medicine), James Boyd, Judy Chu (Education), Gerda Endemann (Biological Sciences), Anne Firth-Murray, Anne Friedlander (Stanford Center on Longevity), Geoffrey Heller, Renu Heller, Katherine Ann Horsburgh (Anthropology), Mary Therese Jacobson (Obstetrics and Gynecology), Michaela Kiernan (Medicine), Nicole Dudukovic Kuhl (Core Course Coordinator), Michael Mastrandrea (Earth Sciences), Lynn Rothschild, Norman Ruby (Biological Sciences), Merritt Ruhlen (Anthropology), Darvin Scott Smith, James Truncer (Anthropology), Katherine E. Williams (Psychiatry and Behavioral Sciences), Jennifer Wolf (Education), Laraine Zappert (Psychiatry and Behavioral Sciences), Larry Zaroff (Anesthesiology, Biomedical Ethics), Abigail Zuger (English)
Course Associates: Dana Goverman, Stacey Kallem, Lauren Rimoin, Andrew Rogers, Joseph Sanford, Isabel Shelton-Mottsmith, Jenny Staves, Michelle Wilson
Advising Chairs: Catherine Heaney, Robert Siegel
Honors Chair: Shirley Feldman

Program Offices: Building 20
Mail Code: 94305-2080
Phone: (650) 725-0336
Email: cacciari@stanford.edu (Student Services)
Web Site: http://humbio.stanford.edu/

Courses given in Program in Human Biology have the subject code HUMBIO. For a complete list of subject codes, see Appendix.

The Program in Human Biology is an interschool, interdepartmental, undergraduate major. The program's mission is to provide an interdisciplinary approach to understanding the human being from biological, behavioral, social, and cultural perspectives.

The program seeks: (a) to provide a broad and rigorous introduction to the biological and behavioral sciences and their interrelationships, and (b) to explore how this knowledge, in conjunction with studies in other fields, can be applied to formulate and evaluate health, environmental, and other public policies that influence human welfare. To achieve these goals, all students complete a 30-unit core sequence, normally in the sophomore year, that provides the foundation for the major. Also during the sophomore year, students consult with student advisers to choose a faculty adviser and complete the declaration process. Together they plan a roadmap of course work designed to help each student focus on an area of interest within Human Biology. Early planning and subsequent refining of an individualized course of study, in consultation with student and faculty advisers, is a strength and requirement of the program. The curriculum draws on faculty from across the University. To complete a B.A. in Human Biology, students must take courses from within the program and from other University departments. Most Human Biology majors go on to advanced training in professional schools, or graduate programs in the behavioral, natural, and social sciences, including coterminal master's degree programs in other University departments. Additional information about the major may be obtained from the program's offices or at http://humbio.stanford.edu/.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The B.A. in Human Biology (HUMBIO) requires a minimum of 84 units in the major divided among four levels of courses:

1. *Fundamental Program*: at least 38 units, to include
   Human Biology Core (30 units)
   Statistics (4-5 units)
   Internship (HUMBIO 197; 4 units)

   The Human Biology Core refers to HUMBIO 2A and 2B, 3A and 3B, and 4A and 4B. See "Required Core" below for more information. HUMBIO 4B fulfills the policy requirement of the major. Statistics may be selected from courses such as STATS 60 or 141, PSYCH 10, SOC 181B, and BIOSCI 141. For questions about other statistics courses that might fulfill this requirement, see the program office. The core and statistics courses must be taken for a letter grade by majors. The internship requirement, an independent field experience project, is graded satisfactory/no credit only.
2. *Foundation Courses*: 20-unit minimum. Total units vary, depending on the focus of study selected by the student for the area of concentration. They may include introductory-level courses from across the University and lab courses. A maximum of 10 premed units (from the chemistry, physics, and calculus series, and biology lab courses) are allowed.
3. *Area of Concentration*: a minimum of five courses totaling at least 20 units. This in-depth area of study enables the student to focus on educational and post-baccalaureate goals. Courses are non-introductory, theory-based, and are usually numbered over 100. Three or more departments must be represented in the concentration. Each course must be taken for a minimum of 3 units. Final approval of the concentration rests with the student advisers and faculty adviser. All area of concentration courses must be taken for a letter grade. Examples of numerous possible areas of concentration are available in the program's student advisers' office or at http://humbio.stanford.edu/student_areas.html.
4. *Upper-Division Courses:* students must take three Human Biology upper-division courses numbered 100 to 189. These courses should be used to explore subjects outside the area of concentration. One upper-division course may be taken satisfactory/no credit. Each course must be taken for a minimum of 3 units. All non-laboratory advanced HUMBIO courses (those numbered 100 to 189) fulfill the Human Biology upper-division requirement, including those listed as cognate courses from another department.

A prospective major must consult with the student and faculty advisers to obtain detailed information about the program and guidance in the development of an individual course of study. At the time the major is declared, the student must submit a written statement (3-5 pages) of academic and long-term goals and the proposed list of courses satisfying the requirements for the major. The proposal is then reviewed by the student advisers who help identify an appropriate faculty adviser. Final approval of the proposed course of study rests with the faculty adviser. It is important to declare early, preferably by the end of Spring Quarter of the sophomore year, but not later than the end of Autumn Quarter of the junior year; students must petition the director to declare later than Autumn Quarter of the junior year. Petitions to declare late require additional documentation and are less likely to be approved.

Students who plan to pursue graduate work should be aware of the admission requirements of the schools to which they intend to apply. Early planning is advisable to guarantee completion of major and graduate school requirements.

MINORS

A minor in Human Biology provides an introductory background to the relationship between the biological and social aspects of humanity's origin, development, and prospects. Many of the major problems facing human civilization today involve both biological and social aspects. Scientific approaches to these problems are essential, but they must be broadly conceived, integrating what we know of the biological with an understanding of the social and cultural setting in which they exist. Students with a minor in Human Biology will have a strong background in the integration between the biological and social aspects of humans. To minor in Human Biology, students must take the core curriculum (HUMBIO 2A, 2B, 3A, 3B, 4A, and 4B) and one additional upper-division course (for example, any course offering by Human Biology numbered 100-189. These must be taken for a minimum letter grade of 'C-'. Courses that count towards the fulfillment of major requirements may not be counted towards the minor. Students declaring a minor in Human Biology must do so no later than two quarters prior to their intended quarter of degree conferral (for example, a student must declare a minor before the end of the Autumn Quarter to graduate the following Spring Quarter).

HONORS PROGRAM

The honors program in Human Biology affords qualified majors the opportunity to work closely with faculty on an individual research project, culminating in an honors thesis. Students may begin honors research from a number of starting points including: topics introduced in the core or upper-division courses; independent interests stemming from an internship experience; or collaborating with faculty from the natural, social, or behavioral sciences. Students may apply to the honors program once they have completed the Human Biology core, have an overall Stanford grade point average (GPA) of 3.2, and meet other requirements detailed in the honors handbook. Interested students should consult resources in the Human Biology office including the *Human Biology Honors Handbook,* the honors program application available from the student services office, and appointments during office hours with the Human Biology honors chair. Courses of interest to honors students include: HUMBIO 193, Research in Human Biology, and HUMBIO 194, Honors. Most honors projects involve a total of 10-15 units of course work in HUMBIO 193 and 194. Admission to the honors program is by submission of an intention to undertake honors research in early March, followed by the application in April of the junior year. Students planning to undertake honors begin research or preparation as early as completion of the sophomore year. The honors thesis is normally completed by the middle of Spring Quarter of the senior year. Each honors student then presents a brief summary of honors research at the Human Biology Honors Poster Symposium in May. Human Biology also holds a Summer Honors College just prior to Autumn Quarter each year for students who have applied to the honors program. Students apply to Summer Honors College in April of the junior year. For applications, contact the program office.

STOREY HOUSE

Storey House, 544 Lasuen Mall, is an undergraduate residence for the Human Biology Academic Theme House, devoted to developing an intellectual community among Human Biology majors at Stanford, and allowing faculty and students to become acquainted and share their Human Biology interests and research. Its goals are to foster intellectual discussion in the residential lives of the students living in Storey House, mentoring relationships between upperclassmen and core students in the house, and stimulating events for all Human Biology majors facilitated by academic theme associates. Assignment is made through the regular undergraduate housing draw.

STUDENT ADVISERS

Human Biology has an advising program comprising faculty and student advisers. Before declaring Human Biology as their undergraduate major, each student must meet with one of six student advisers who assist them in developing a coherent study plan based on an individualized area of concentration, and the selection of foundation, concentration, and upper-division courses. They also assist students in selecting an appropriate faculty adviser and a suitable internship for their area of concentration and career goals. Student advisers offer drop-in services during scheduled office hours every weekday and some evenings. The student advisers also sponsor events including the Internship Faire, the Advising Extravaganza, Beyond Hum Bio, and declaration workshops. To maintain high standards of advising that respond to the needs of individual students, student advisers meet weekly with the program's faculty advising chairs and the student services coordinator to review the program's policies and specific student inquiries and petitions concerning the program.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. AU indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

The faculty and staff of Human Biology prepare a student handbook, on the web at http://humbio.stanford.edu/, that provides a detailed description of the Human Biology major and outlines possible areas of concentration. It reflects the most up-to-date information for the academic year and is the definitive guide for Human Biology majors.

REQUIRED CORE

Required core sequences (2A,B, 3A,B, and 4A,B) introduce the biological and social sciences, and most importantly, relationships between the two. Classes meet throughout the academic year. Students must register concurrently for the A and B series and take the core in sequence. Students should initiate the core in Autumn Quarter of the sophomore year. Freshmen are not permitted to enroll. Majors must earn a minimum letter grade of 'C-' in core courses.

HUMBIO 2A,B. Genetics, Evolution, and Ecology: Culture, Evolution, and Society

HUMBIO 2A. Genetics, Evolution, and Ecology—Introduction to the principles of classical and modern genetics, evolutionary theory, and population biology. Topics: micro- and macro-evolution, population and molecular genetics, population dynamics, and community ecology, emphasizing the genetics of the evolutionary process and applications to human populations. GER:DB-NatSci

5 units, Aut (Boggs, C; Durham, W; Francke, U)

HUMBIO 2B. Culture, Evolution, and Society—Introduction to the evolutionary study of human diversity. Hominid evolution, the origins of social complexity, social theory, and the emergence of the modern world system, emphasizing the concept of culture and its influence on human differences. GER:DB-SocSci

5 units, Aut (Klein, R; Brown, M)

HUMBIO 3A,B. Cell and Developmental Biology: Behavior, Health, and Development

HUMBIO 3A. Cell and Developmental Biology—The principles of the biology of cells: principles of human developmental biology, biochemistry of energetics and metabolism, the nature of membranes and organelles, hormone action and signal transduction in normal and diseased states (diabetes, cancer, autoimmune diseases), drug discovery, immunology, and drug addiction. GER:DB-NatSci

5 units, Win (Fuller, M; Kaiser, A; Nusse, R; Scott, M; Talbot, W)

HUMBIO 3B. Behavior, Health, and Development—Research and theory on human behavior, health, and life span development. How biological factors and cultural practices influence cognition, emotion, motivation, personality, and health in childhood, adolescence, and adulthood. GER:DB-SocSci

5 units, Win (Lyons, D; Fernald, A)

HUMBIO 4A,B. The Human Organism: Environmental and Health Policy Analysis

HUMBIO 4A. The Human Organism—Organ system physiology: the principles of neurobiology and endocrinology, and the functions of body organs. The mechanisms of control, regulation, and integration of organ systems function. GER:DB-NatSci

5 units, Spr (Heller, C; Fernald, R)

HUMBIO 4B. Environmental and Health Policy Analysis—Connections among the life sciences, social sciences, public health, and public policy. The economic, social, and institutional factors that underlie environmental degradation, the incidence of disease, and inequalities in health status and access to health care. Public policies to address these problems. Topics include pollution regulation, climate change policy, biodiversity protection, health care reform, health disparities, and women's health policy. GER:DB-SocSci, WIM

5 units, Spr (Goulder, L; Barr, D)

ADDITIONAL INTRODUCTORY OFFERINGS

HUMBIO 3Y. Practicum in Child Development—Practical experience at Bing Nursery School for 3.5 hours per week. Pre- or corequisite: 3B. (AU)

1 unit, Win (Staff)

HUMBIO 6. Human Origins—(Same as ANTHSCI 6/206, BIOSCI 106.) The human fossil record from the first non-human primates in the late Cretaceous or early Paleocene, 80-65 million years ago, to the anatomically modern people in the late Pleistocene, between 100,000 to 50,000 B.C.E. Emphasis is on broad evolutionary trends and the natural selective forces behind them. GER:DB-NatSci

5 units, Win (Klein, R)

HUMBIO 14. Introduction to Anthropological Genetics—(Same as ANTHSCI 14.) How genetic methods address anthropological questions. Examples include the evolutionary relationships between humans and the apes, the place of the Neanderthals in human evolution, the peopling of the New World, ancient DNA, the genetics of ethnicity, forensic genetics, genomics, behaviorial genetics, and hereditary diseases. GER:DB-NatSci

3-5 units, Win (Jobin, M), Spr (Horsburgh, K)

HUMBIO 21. Introduction to Brain and Behavior—(Same as BIOSCI 20.) Evolutionary principles to understand how the brain regulates behavior, described in physiological terms, and is influenced by behavioral interactions. Topics include neuron structure and function, transmission of neural information, anatomy and physiology of sensory and motor systems, regulation of body states, the biological basis of learning and memory, and behavioral abnormalities. GER:DB-NatSci

3 units, alternate years, not given this year (Fernald, R)

HUMBIO 25. Human Ecology of the Amazon—(Same as ANTHSCI 25.) The diversity of peoples and cultures in the Amazon Basin and the ecosystems in which they live. Themes in ecological anthropology of Amazonia including limiting factors, the protein debate, indigenous knowledge and resource management, and anthropogenic modification. Ethnographic, historical, and archeological evidence. GER:DB-SocSci, EC-GlobalCom

5 units, not given this year

HUMBIO 27. Traditional Chinese Medicine—The philosophy and history behind traditional Chinese medicine. Concepts such as Qi, Yin/Yang, meridians, Chinese organs, and the five elements. How these concepts are applied through techniques such as acupuncture, herbal medicine, Qi gong, and massage. How traditional Chinese medicine is understood from a scientific standpoint. Political and socioeconomic implications. Observation of an acupuncturist. Readings on the integration of Eastern and Western medicine and on traditional Chinese medicine.

1 unit, Spr (Golianu, B)

HUMBIO 82A. Qualitative Research Methodology—Goal is to develop knowledge and skills for designing and conducting qualitative research studies including purposes, conceptual contexts, research questions, methods, validity issues, and interactions among these facets. Each student designs a qualitative research study.

3 units, Win, Spr (Wolf, J)

HUMBIO 82B. Advanced Data Analysis in Qualitative Research—For students writing up their own qualitative research. Students prepare a complete draft presenting their own qualitative research study including results, with reports drafted section by section, week by week. Class provides feedback, guidance, support.

3 units, Aut (Wolf, J)

STANFORD INTRODUCTORY SEMINARS

HUMBIO 84Q. Social Justice, Responsibility, Health—Stanford Introductory Seminar. Preference to sophomores. Reducing health disparities among segments of the US population is an over-arching goal of the Centers for Disease Control and Prevention (CDC). Evidence for and cause of existing health disparities; criteria for calling a health disparity unjust; and assignment of responsibility for maintaining or recovering good health.

4 units, Aut (Heaney, C)

HUMBIO 86Q. Love: An Exploration—Stanford Introductory Seminar. Preference to sophomores. Biological, psychological, religious, social and cultural perspectives on the concept of love. How love is conceptualized across cultures; love as the basis of many religions; different kinds of love; the biology of love; love as sickness; love and sex; the languages of love including art, literature, music, and poetry. Emphasis is on writing. Oral presentation.

3 units, Win (Murray, A)

HUMBIO 87Q. Women and Aging—(Same as MED 87Q.) Stanford Introductory Seminar. Preference to sophomores. Biology, clinical issues, social and health policies of aging; relationships, lifestyles, and sexuality; wise women and grandmothers. Sources include scientific articles, essays, poetry, art, and film. Service-learning experience with older women. GER:EC-Gender

5 units, Win (Winograd, C)

HUMBIO 91Q. Neuroethology: The Neural Control of Behavior—Stanford Introductory Seminar. Preference to sophomores. Animal behavior offers insights about evolutionary adaptations. The origins of the study of animal behavior and its development to the present. Discussion of original research papers. The use and misuse of parallels between animal and human behavior. Possible field trip to observe animals in their natural habitat. GER:DB-NatSci

3 units, Aut (Fernald, R)

HUMBIO 97Q. Sport, Exercise, and Health: Exploring Sports Medicine—(Same as ORTHO 97Q.) Stanford Introductory Seminar. Preference to sophomores. Sports medicine is the practice of clinical medicine at the interface between health and performance, competition and well-being. While sports medicine had its origins in providing care to athletes, medical advances developed in care of athletes exerted a great effect on the nature and quality of care to the broader community. Topics include sports injuries, medical conditions associated with sport and exercise, ethics, coaching, women's issues, fitness and health, and sports science. Case studies. Write-2

3 units, Aut, Spr (Matheson, G)

HUMBIO 99Q. Becoming a Doctor: Readings from Medical School, Medical Training, Medical Practice—Stanford Introductory Seminar. Preference to sophomores. For students considering medicine as a career. Goal is to acquaint students with medical school, training in medicine and surgery, and the practice of medicine and surgery. Topics include: how to pick a medical school and a residency; how medicine affects family life, especially children; the differences between surgical and medical specialties; the advantages and disadvantages among academic/teaching, pure research, group practice, HMO, hospital staff, or private practice; malpractice concerns; and financial considerations.

4 units, Aut (Zaroff, L)

ADVANCED

Open to non-majors with the proper prerequisites. Human Biology majors have preference when enrollment is restricted. Courses numbered 100 through 189 fulfill the Human Biology upper-division requirement.

HUMBIO 111. 21st-Century Environmental Problems, Policies, Conflict, and Progress—Interdisciplinary. What environmental problems has society solved and how? What problems resist solutions and why? Ecological, legal, economic, and political analysis. Students work on a policy problem of their own choosing. Prerequisite: Human Biology core or equivalent, or consent of instructor. Recommended: courses in environmental economics, policy, and management.

3 units, Aut (Boyd, J)

HUMBIO 112. Conservation Biology—(Same as BIOSCI 144.) Principles and application of the science of preserving biological diversity. Topics: sources of endangerment of diversity; the Endangered Species Act; conservation concepts and techniques at the population, community, and landscape levels; reserve design and management; conflict mediation. 4 units if taken with a service learning component. Prerequisite: BIOSCI 101, or BIOSCI 43 or HUMBIO 2A with consent of instructor. GER:DB-NatSci

3-4 units, Win (Boggs, C; Launer, A)

HUMBIO 113. Environmental Performance: Measuring Nature's Benefits—How to measure and report environmental outcomes. Biophysical and economic approaches to performance measurement. How environmental data and models are used in science and public policy. Students develop methods to track and communicate the benefits of nature. Prerequisite: Human Biology core or equivalent, or consent of instructor. Recommended: courses in landscape or conservation ecology, and environmental management and economics.

3 units, Spr (Boyd, J)

HUMBIO 114. Environmental Change and Emerging Infectious Diseases—(Same as ANTHSCI 179/279.) The changing epidemiological environment. How human-induced environmental changes, such as global warming, deforestation and land-use conversion, urbanization, international commerce, and human migration, are altering the ecology of infectious disease transmission, and promoting their re-emergence as a global public health threat. Case studies of malaria, cholera, hantavirus, plague, and HIV. GER:DB-SocSci

3-5 units, Aut (Durham, W; Jones, J)

HUMBIO 116. Controlling Climate Change in the 21st Century—(Same as BIOSCI 147/247, EARTHSYS 147/247.) The science, economics, and environmental diplomacy of global climate change. Topics: the science of climate change, climate change and global environmental law; global economic approaches to carbon abatement, taxes, and tradable permits; joint implementation, consensus, and division in the EU; gaining the support of China, other developing countries, and U.S. corporations; alternative energy and energy efficiencies for less carbon-intensive electric power and transport. GER:DB-NatSci

3 units, alternate years, not given this year

HUMBIO 117. Human Behavioral Ecology—(Same as ANTHSCI 163/263.) Theory, method, and application in anthropology. How theory in behavioral ecology developed to understand animal behavior is applied to questions about human economic decision making in ecological and evolutionary contexts. Topics include decisions about foraging and subsistence, competition and cooperation, mating, and reproduction and parenting. GER:DB-SocSci

3-5 units, Aut (Bird, R)

HUMBIO 118. Ecological Anthropology—(Same as ANTHSCI 164/264.) Dynamics of culturally inherited human behavior and its relationship to social and physical environments. Topics include a history of ecological approaches in anthropology, subsistence ecology, sharing, risk management, territoriality, warfare, and resource conservation and management. Case studies from Australia, Melanesia, Africa, and S. America. GER:DB-SocSci

3-5 units, not given this year

HUMBIO 119. Demography: Health, Development, Environment—(Same as BIOSCI 102.) Demographic methods and their application to understanding and projecting changes in human infant, child, and adult mortality and health, fertility, population, sex ratios, and demographic transitions. Progress in human development, capabilities, and freedoms. Relationships between population and environment. Prerequisites: numeracy and basic statistics; Biological Sciences or Human Biology core; or consent of instructor. GER:DB-SocSci

3 units, not given this year

HUMBIO 120. Health Care in America: Organizations and Institutions that Shape the Health Care System—Focus on health policy and health care delivery. Options for health care reform. Prerequisite: Human Biology core or equivalent, or consent of instructor.

4 units, not given this year

HUMBIO 120A. American Health Policy—Issues in health care policy making, the evolution of current systems, and theories underlying efforts for change. The national search for solutions to the problems of the uninsured, and the feasibility, options, and ramifications of universal health insurance in light of past experience and stakeholder views. Student presentations. Prerequisites: Human Biology core or equivalent, and 120, or consent of instructor. GER:DB-SocSci

3 units, Spr (Heller, G)

HUMBIO 121. Economics of Health Improvement in Developing Countries—(Same as ECON 127, MED 262.) Application of economic paradigms and empirical methods to health improvement in developing countries. Emphasis is on unifying analytic frameworks and evaluation of empirical evidence. How economic views differ from public health, medicine, and epidemiology; analytic paradigms for health and population change; the demand for health; the role of health in international development. Prerequisites: background in economics and statistics, and consent of instructor.

5 units, Win (Miller, N)

HUMBIO 122. International Health Policy: Comparative National Health Care Systems—The structure and policies of national health care systems in Europe, Canada, China, and Japan. How other countries have addressed issues of organization, finance, and allocation of scarce health care resources. Limited enrollment. Prerequisite: 120 or consent of instructor.

4 units, Win (Heller, G)

HUMBIO 122S. Social Class, Race, Ethnicity, Health—Socioeconomic, racial, and ethnic differences in health status. Access to care of racial and ethnic minorities and those from lower social classes. Institutional factors such as government programs, and individual factors such as unconscious racial bias on the part of care providers or distrust of providers on the part of patients. The intersection of lower social class and ethnic minority status in health status and health care access.

4 units, given next year

HUMBIO 123. Obesity in America: Clinical and Public Health Implications—Interdisciplinary clinical, research, and policy approaches. The prevalence, predictors, and consequences of obesity and diabetes; biological and physiological mechanisms; clinical treatments including medications and surgery; and the relevance of behavioral, environmental, economic, and policy approaches to obesity prevention and control. Case studies. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Win (Stafford, R; Kiernan, M)

HUMBIO 124. Fat Nutrition and Current Health Concerns—Relationships between dietary fats and heart disease, cancer, obesity, diabetes, and fitness. Proposed benefits of omega-3 fats and antioxidants. Historical and economic influences on fat nutrition. Prerequisite: 3A; pre- or corequisite: 4A; preference to students who have completed 4A. Recommended: 130.

3 units, Spr (Endemann, G)

HUMBIO 125. Current Controversies in Women's Health—(Same as INDE 256.) Interdisciplinary. Focus is on the U.S. Topics include: health research; bioethical, legal, and policy issues; scientific and cultural perspectives; social influences; environmental and lifestyle effects on health; and issues related to special populations. Guest lecturers; student debates. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Spr (Jacobson, M; Stefanick, M)

HUMBIO 126. Promoting Health Over the Life Course: Multidisciplinary Perspectives—Disease prevention and health promotion topics pertinent to different stages of the life span emphasizing healthy lifestyle and reducing risk factors in both individuals and communities. Focus is on scientific investigation, the application of behavioral science to risk reduction strategies, and the importance of health promotion as a social and economic imperative. Topics include: epidemiology of chronic diseases; social determinants of health, behavior change; obesity, nutrition, and stress; young adult, mid-life and aging health issues; health care delivery and public health system; workplace wellness programs; and environmental and international issues. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Aut (Stefanick, M)

HUMBIO 127A. Community Health: Assessment and Planning I-Major determinants of health in a community. Working with community partners to identify health issues and plan programs and policies to prevent disease and promote health. Service learning component involving students in community health assessment techniques. Prerequisite: 4B or equivalent, or consent of instructor.

4 units, alternate years, not given this year

HUMBIO 127B. Community Health: Assessment and Planning II—Continuation of 127A. Service learning course with emphasis on conducting community health assessment and planning projects in collaboration with community-based organizations. Prerequisite: 4B or equivalent, 127A, or consent of instructor.

4 units, alternate years, not given this year

HUMBIO 128. Community Health Psychology—(Same as PSYCH 101.) Social ecological perspective on health emphasizing how individual health behavior is shaped by social forces. Topics include: biobehavioral factors in health; health behavior change; community health promotion; and psychological aspects of illness, patient care, and chronic disease management. Prerequisites: HUMBIO 3B or PSYCH 1, or equivalent.

4 units, Win (Heaney, C)

HUMBIO 129. Critical Issues in International Women's Health—Women's lives, from childhood through adolescence, reproductive years, and aging. Economic, social, and human rights factors, and the importance of women's capacities to have good health and manage their lives in the face of societal pressures and obstacles. Emphasis is on life or death issues of women's health that depend on their capacity to negotiate or feel empowered, including maternal mortality, violence, HIV/AIDS, reproductive health, and sex trafficking. Organizations addressing these issues. Prerequisites: Human Biology core or equivalent or consent of instructor. GER:EC-Gender

4 units, Win (Murray, A)

HUMBIO 129S. International Health—Concepts of health and wellness and major descriptors and determinants of health status. International organizations and control programs, disease-related problems within population groups from an epidemiologic viewpoint, health care delivery methods, efforts to improve health through examination of current and previous programs and projects. Cultural, economic, and political contexts in international health. Prerequisites: Human Biology core or equivalent or consent of instructor.

4 units, Win (Wise, P)

HUMBIO 130. Human Nutrition—The study of food, and the nutrients and substances therein. Their action, interaction, and balance in relation to health and disease. Emphasis is on the biological, chemical, and physiological processes by which humans ingest, digest, absorb, transport, utilize, and excrete food. Dietary composition and individual choices are discussed in relationship to the food supply, and to population and cultural, race, ethnic, religious, and social economic diversity. The relationships between nutrition and disease; eating disorders; ethnic diets; vegetarianism; nutritional deficiencies; nutritional supplementation; phytochemicals; and food safety. Prerequisite: Human Biology core or consent of instructor.

4 units, Spr (Gardner, C)

HUMBIO 131. Interdisciplinary Design for Agile Aging—(Same as CS 379Y, MED 279Y.) Perspectives from computer science, design, social and behavioral sciences, physiology, geriatrics, and biodesign to develop projects that address the potential of people to maintain vitality and mobility as they age. New ways to integrate computer and device technologies with behavioral and social interventions. Focus is on small projects. Enrollment limited. Prerequisite: application.

3-4 units, Win (Winograd, C; Winograd, T; Friedlander, A; Yock, P)

HUMBIO 132. Functional Anatomy of Exercise—Interdisciplinary: physiology, pathology, and biomechanics. Anatomy of the body's major joints in the context of exercise and movement emphasizing adaptations that occur with intensity and nature of exercise, age, and disease. Students work in cooperative groups with students at the Gothenburg School of Sports Science in Sweden to produce original research on an aspect of biomechanics and sport. Sources include the Stanford Human Performance Laboratory. Enrollment limited to 40. Prerequisites: 139 or consent of instructor.

4 units, Spr (Garza, D)

HUMBIO 133. Human Physiology—(Same as BIOSCI 112/212.) The functioning of organ systems emphasizing mechanisms of control and regulation. Topics: structure and function of endocrine and central nervous systems, cardiovascular physiology, respiration, salt and water balance, exercise, and gastrointestinal physiology. Prerequisite: Biological Sciences or Human Biology core. GER:DB-NatSci
4 units, Win (Garza, D)

HUMBIO 135. Exercise Physiology—How body systems respond to the stress of acute exercise and adapt to chronic exercise training. How the cardiovascular system adapts to optimize oxygen delivery and utilization, how muscles generate force and hypertrophy in response to training, how metabolic/biochemical pathways are regulated to support the increased energy demand of exercise. Theories on the causes of fatigue and muscle soreness, and on what limits human performance. Applied topics such as the effects of aging, gender, and environmental conditions (high altitude, heat, cold) on exercise capacity will also be discussed. Prerequisite: Human Biology core, Biology core, or equivalent, or consent of instructor.
4 units, Aut (Friedlander, A)

HUMBIO 135S. Applied Topics in Exercise Physiology and Metabolism—Reading and discussion of scientific research on student-selected topics. Emphasis is on study design. Student presentations. Summary paper. Enrollment limited to 12. Prerequisites: 135 and consent of instructor.
3 units, not given this year

HUMBIO 139. Sports Medicine—(Formerly 159.) Sports, exercise, health, and medicine throughout the human performance continuum. Exercise as therapy; injuries and illnesses that result from sports and exercise; and the use of technology in modern sports science. Sources include physiology, nutrition, and biomechanics. Medical problems exacerbated or caused by exercise and sport; maximizing performance in elite athletes; and population-based issues such as exercise and its relationship to health, drugs in sport, and aging. Prerequisite: Biological Sciences or Human Biology core, or consent of instructor.
4 units, Aut (Garza, D)

HUMBIO 140. Sex Differences in Human Physiology and Disease—(Same as MED 240, OBGYN 240.) Chromosomal and hormonal influences on cells, tissues, and organs that underlie the development of reproductive organs and sexual dimorphism of the neuroendocrine system. Consequences of sex hormones and environmental factors that differ between men and women in systems including the musculoskeletal, neurological, cardiovascular, and immunological. Guest lecturers. Prerequisite: Human Biology core or equivalent, or consent of instructor.
3 units, Win (Stefanick, M)

HUMBIO 141. Human Developmental Biology and Medicine—(Same as DBIO 156.) The biological, medical, and social aspects of normal and abnormal human development. Topics: in vitro fertilization and embryo transfer; gene and cell therapy; gametogenesis; pattern formation in the nervous system and limb development; gene and grand multiple pregnancies; prematurity, in utero effects of teratogens; sex determination and differentiation; growth control; gigantism and dwarfism; neural tube defects; cardiac morphogenesis; progress in the developmental biology of humans. Limited enrollment. Prerequisites: Human Biology or Biological Sciences core, or consent of instructor.
4 units, not given this year

HUMBIO 142. Adolescent Development—Underlying changes and their consequences in everyday functioning. Physical, cognitive, social, and sexual development; how these changes influence the emerging sense of identity, autonomy, and intimacy. Contexts in which adolescents move such as family, friends and peers, school, and workplace. Focus is on normal development of boys and girls; attention to problem outcomes including eating disorders, depression, and teen pregnancy. Prerequisite: 3B or PSYCH 1, or consent of instructor.
4 units, Win (Feldman, S; Chu, J)

HUMBIO 142A. Seminar on Problem Behavior in Adolescence—Why adolescence has such a high casualty rate. Risk and protective factors for problem outcomes; prevention and treatment programs. Focus is on externalizing behaviors (violence, delinquency, drug abuse, risk taking), internalizing problems (depression, eating disorders, suicide), and sex-related problems (teen pregnancy, date violence, STDs). Enrollment limited to 20. Prerequisite: 126 or consent of instructor.
4 units, Spr (Feldman, S)

HUMBIO 144. Boys' Psychosocial Development—(Same as EDUC 143.) From early childhood through adolescence. Emphasis is on how boys' lives and experiences are embedded within their interpersonal relationships and social and cultural contexts. Interdisciplinary approach including perspectives from fields such as psychology, sociology, anthropology, family studies, and education. Prerequisite: Human Biology core or equivalent, or consent of instructor. GER:EC-Gender
4 units, Spr (Chu, J)

HUMBIO 145. Birds to Words: Cognition, Communication, and Language—(Same as PSYCH 137/239A.) Although the communicative abilities of animals are determined by their genetic endowment, and human communicative skills dwarf those of other species, the relation between language and genetics remains the subject of debate. Is human language genetically specified? Or are human communicative powers just one facet of human cognitive advantage? Focus is on the nature and origins of language, using evidence from studies of animals, children, and adults. GER:DB-SocSci
4 units, Aut (Fernald, A; Ramscar, M)

HUMBIO 147. Population and Family History in Europe and China—Comparison of social and physical aspects of reproduction. Emphasis is on identifying and explaining differences in age at marriage, acceptable forms of marriage, marital fertility, and illegitimacy. Prerequisite: Human Biology core or equivalent, or consent of instructor.
4 units, Aut (Wolf, A)

HUMBIO 148. Kinship and Marriage—Marriage as the site at which biology and culture meet and contend, and kinship as the variable outcome of the encounter. Comparative examination of societies in Oceania, Africa, and E. Asia. Prerequisite: Human Biology core or equivalent, or consent of instructor.
4 units, Spr (Wolf, A)

HUMBIO 149. Aging: From Biology to Social Policy—(Same as ANTHSCI 171.) What people can expect when they join the ranks of the elderly. Issues include social security, medical care, lifespan, and the cultural, social, and economic consequences of a large elderly population in the U.S. and other countries. Films, service learning component. GER:DB-SocSci
5 units, Win (Barnett, C)

HUMBIO 153. Parasites and Pestilence: Infectious Public Health Challenges—Parasitic and other pestilence of public health importance. Pathogenesis, clinical syndromes, complex life cycles, and the interplay among environment, vectors, hosts, and reservoirs in historical context to understand public health policy initiatives aimed at halting disease transmission. Focus is on World Health Organization tropical disease targets including: river blindness, sleeping sickness, leishmaniasis, schistosomiasis, mycobacterial disease (tuberculosis and leprosy), malaria, toxoplasmosis, dracunculiais, and intestinal helminthes. Guest lecturers with expertise in disease control. Prerequisite: Human Biology core or equivalent, or consent of instructor.
4 units, Spr (Smith, D)

HUMBIO 154. Cancer Epidemiology—Epidemiological methods relevant to human research in cancer. The concepts of risk; case control, cohort, and cross-sectional studies; clinical trials; bias; confounding; interaction; screening; and causal inference. Social, political, economic, and ethical controversies surrounding cancer screening, prevention, and research. Prerequisite: Human Biology core or equivalent, or consent of instructor.
4 units, Win (Fisher, P)

HUMBIO 155B. The Vaccine Revolution—(Same as MI 115B.) Advanced seminar. Human aspects of viral disease, focusing on recent discoveries in vaccine development and emerging infections. Journal club format: students select articles from primary scientific literature, write formal summaries, and synthesize them into a literature review. Emphasis is on analysis, experimental design, and interpretation of data. Oral presentations. Enrollment limited to 10. Prerequisite: 155H, 155V (formerly 115A).

6 units, alternate years, not given this year

HUMBIO 155H. Humans and Viruses I—(Same as MI 155H.) Introduction to human virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis is on host pathogen interactions and policy issues. Topics: polio and vaccination, smallpox and eradication, yellow fever and history, influenza and genomic diversity, rubella and childhood infections, adenovirus and viral morphology, ebola and emerging infection, lassa fever and immune response.

6 units, Aut (Siegel, R)

HUMBIO 156. Global HIV/AIDS—(Same as MED 256.) Public health, policy, and research issues. Resources at Stanford and institutions such as government, NGOs, and pharmaceutical, advocacy, and international organizations. Sources include biomedical, social, and behavioral sciences. Student projects. Guest lectures. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Aut (Katzenstein, D)

HUMBIO 157. The Stem Cell: Science, Ethics, and Politics—(Same as DBIO 257.) The biology of stem cells. Their role in human development and potential for treating disease. Guest lectures by biologists, ethicists, and legal scholars. Prerequisite: 2A,B or consent of instructor.

3 units, Spr (Nusse, R; Fuller, M; Porzig, E)

HUMBIO 158. The Human Genome and Disease—(Same as BIOSCI 109A/209A.) The variability of the human genome and the role of genomic information in research, drug discovery, and human health. Concepts and interpretations of genomic markers in medical research and real life applications. Human genomes in diverse populations. Original contributions from thought leaders in academia and industry and interaction between students and guest lecturers. GER:DB-NatSci

3 units, Win (Heller, R)

HUMBIO 160. Human Behavioral Biology—(Same as BIOSCI 150/250.) Multidisciplinary. How to approach complex normal and abnormal behaviors through biology. How to integrate disciplines including sociobiology, ethology, neuroscience, and endocrinology to examine behaviors such as aggression, sexual behavior, language use, and mental illness. GER:DB-NatSci

5 units, Spr (Sapolsky, R), alternate years, not given next year

HUMBIO 161. The Neurobiology of Sleep—(Same as BIOSCI 149/249.) Preference to seniors and graduate students. The neurochemistry and neurophysiology of changes in brain activity and conscious awareness associated with changes in the sleep/wake state. Behavioral and neurobiological phenomena including sleep regulation, sleep homeostasis, circadian rhythms, sleep disorders, sleep function, and the molecular biology of sleep. Enrollment limited to 16. GER:DB-NatSci

4 units, not given this year

HUMBIO 162. The Neuroscience and Psychology of Women's Health—Mental health from the perspectives of neuroscience, psychology, and human physiology. Major depression, bipolar, and obsessive compulsive disorders; how the female reproductive system affects the clinical presentation and course of these disorders. Eating disorders, substance abuse and dependence, and sexual trauma within a biopsychosocial model. Pharmacologic and therapeutic treatment of illnesses. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Win (Williams, K; Rasgon, N; Zappert, L)

HUMBIO 163. Neural Systems and Behavior—(Same as BIOSCI 163/263.) The field of neuroethology and its vertebrate and invertebrate model systems. Research-oriented. Readings include reviews and original papers. How animal brains compare; how neural circuits are adapted to species-typical behavior; and how the sensory worlds of different species represent the world. Prerequisites: BIOSCI 42, HUMBIO 4A, or equivalents. GER:DB-NatSci

4 units, Aut (Fernald, R), alternate years, not given next year

HUMBIO 165. Promoting Behavior Change—(Same as EARTHSYS 165.) How to apply principles of behavioral change to a real world public health problem: climate change and environmental sustainability. Sources include theory, research, and practice from perspectives such as social and cognitive psychology, media and communication, education, behavioral medicine, social marketing, and consumer behavior. Student groups create an intervention to help high school students reduce their environmental footprint. Research performed in local high schools to develop optimally feasible, acceptable, and effective interventions. Prerequisite: Human Biology core or equivalent, or consent of instructor.

4 units, Spr (Robinson, T)

HUMBIO 171. The Death Penalty: Human Biology, Law, and Policy—Combines academic study with student participation in forensic research and case investigation, including DNA evidence, psychological and physiological development, mental and physical disabilities, and witness interviews. The philosophy, structure, and application of capital punishment in the U.S. Goal is to examine and challenge the issues involved in the death penalty from the perspective of involvement in a real case. Course not taught from a preconceived belief or political or philosophical agenda except to involve students in an intellectual challenge of policy and philosophy. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Spr (Abrams, W)

HUMBIO 172A. Children, Youth, and the Law—How the legal rights of children and adolescents in America are defined, protected, and enforced through the legal process within the context of their developmental needs and competing societal interests. Topics: origins and definitions of children's rights; adoption; custody; the juvenile justice system; education; informed consent; health care; protection from harm and child welfare; due process; and privacy and freedom of expression. Interactive, using hypotheticals for discussion and analysis. A and B alternate annually; students may take one or both. Prerequisite: Human Biology core or equivalent, or consent of instructor.

5 units, alternate years, not given this year

HUMBIO 172B. Children, Youth, and the Law—How the legal rights of children and adolescents in America are defined, protected, and enforced through the legal process within the context of their developmental needs and competing societal interests. Topics: origins and definitions of children's rights; adoption; custody; the juvenile justice system; education; informed consent; health care; protection from harm and child welfare; due process; and privacy and freedom of expression. Interactive, using hypotheticals for discussion and analysis. A and B alternate annually; students may take one or both. Prerequisite: Human Biology core or equivalent, or consent of instructor.

5 units, Win (Abrams, W), alternate years, not given next year

HUMBIO 173. Science, Business, Law: How Scientific Discovery and Innovation are Protected and Brought to Market—The interaction of science, business and law: how scientific ideas are protected by law; the rights of those who invent, develop, and finance scientific discovery; and how ideas are commercialized and brought to market. What kinds of research, discovery, and innovation are protected; who has rights that can be protected; what kinds of rights can be protected, and the kinds of protections that apply; how inventions are commercialized; and the success and failure of businesses based on scientific discovery. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Aut (Abrams, W)

HUMBIO 174. Foundations of Bioethics—Classic articles, legal cases, and foundational concepts. Theoretical approaches derived from philosophy. The ethics of medicine and research on human subjects, assisted reproductive technologies, genetics, cloning, and stem cell research. Ethical issues at the end of life. Prerequisite: Human Biology core or equivalent, or consent of instructor. GER:EC-EthicReas
3 units, Win (Magnus, D)

HUMBIO 175. Health Care as Seen Through Medical History, Literature, and the Arts—The differences between disease as pathology and as the patient's experience. Topics include: patient-doctor relationships; medical technology; the changing focus on illness; gender issues; love, sex, and illness; mental illness; sick children; and death and dying. Prerequisite: Human Biology core or equivalent, or consent of instructor.
3 units, Aut (Zaroff, L)

HUMBIO 175S. Novels and Theater of Illness—Illness and disease through novels and plays by authors including Shakespeare, Miller, Sophocles, Hemingway, and Camus. How sickness involves the patient, family, community, and state. Prerequisite: Human Biology core or equivalent, or consent of instructor.
4 units, Spr (Zaroff, L)

HUMBIO 176. Writing Medicine—(Same as ENGLISH 185A.) Classic and contemporary narrative prose about medicine. Focus is on illness and recovery, and good writing. Topics include being a patient, being a doctor, chronic illness, pain, modern medicine, and the modern hospital. Authors include Didion, Fadiman, Styron, Tolstoy, Williams, and contemporary doctors and patients.
3 units, Win (Zuger, A)

HUMBIO 178. Medical Anthropology—(Same as ANTHSCI 170.) The crosscultural study of the health beliefs and healing systems around the world. How social processes shape human health. GER:DB-SocSci, EC-GlobalCom
3 units, not given this year

HUMBIO 180. Human Osteology—(Same as ANTHSCI 133A/233A.) The human skeleton. Focus is on identification of fragmentary human skeletal remains. Analytical methods include forensic techniques, archaeological analysis, paleopathology, and age/sex estimation. Students work independently in the laboratory with the skeletal collection. GER:DB-NatSci
5 units, Win (DeGusta, D)

HUMBIO 181. The Evolution of Human Diet—(Same as ANTHSCI 173A/273A.) Human dietary choices and their consequences from ecological, epidemiological, and evolutionary perspectives. Topics include foraging theory, human community ecology, evidence for evolutionary design in physiological and motivational systems relating to feeding and nutrition, epidemiology of nutritional disorders, subsistence economies and modes of production, reduction diets, and health diets. GER:DB-SocSci
5 units, not given this year

HUMBIO 183. Astrobiology and Space Exploration—Evolution in the context of space and time, focusing on the emergence of life, intelligence, and civilization on Earth and possibly elsewhere. The biological, psychological, sociological, and philosophical issues of human space exploration. Integrates information from astrophysics, biochemistry, chemistry, evolutionary biology, geology, paleontology, physiology, psychology, and sociology. Guest lectures by scientists and astronauts from NASA Ames Research Center, Stanford, SETI, and Bay Area universities. Prerequisite: two college-level science courses such as Human Biology core, or consent of instructor.
3-4 units, Win (Rothschild, L)

HUMBIO 186. Biological Clocks—(Same as BIOSCI 135.) The biological basis for endogenous timekeeping in organisms from flies to human beings. How biological clocks are constructed at the molecular, tissue, and behavioral levels; how these clocks interact with other physiological systems and allow animals to anticipate changes in their environment. Applications of circadian rhythm principles to treating human disorders and diseases such as cancer. Prerequisite: Biological Sciences or Human Biology core, or consent of instructor. GER:DB-NatSci
3 units, Spr (Heller, C; Ruby, N)

HUMBIO 187. Human Diversity: A Linguistic Perspective—(Same as ANTHSCI 112.) The diversity and distribution of human language and its implications for the origin and evolution of the human species. The origin of existing languages and the people who speak them. Where did current world languages come from and how can this diversity be used to study human prehistory? Evidence from related fields such as archaeology and human genetics. Topics: the origin of the Indo-European languages, the peopling of the Americas, and evidence that all human languages share a common origin. GER:DB-SocSci, EC-GlobalCom
3 units, Spr (Ruhlen, M)

HUMBIO 189A. The Evolution of Darwin—Intellectual and physical milieus that produced Darwin. Intellectual foundations of the development of the theory of evolution. Darwin's travels aboard the Beagle and within the UK and their impact on his ideas.
3 units, not given this year

HUMBIO 193. Research in Human Biology—Independent research conducted under faculty supervision, in junior or senior year, normally but not necessarily in pursuit of an honors project. May be repeated for credit; petition required for more than 5 units. Prerequisite: application available in student services office.
1-5 units, Aut, Win, Spr (Staff)

HUMBIO 194. Honors—Completion of the honors project, normally taken in the student's final quarter. First component: the honors thesis, a final paper providing evidence of rigorous research, fully referenced, and written in an accepted scientific style. Second component: participation in the honors symposium, including a 10-minute oral presentation followed by a brief question and answer session. Prerequisites: 193 or 199, and acceptance into the honors program.
1-10 units, Aut, Win, Spr (Staff)

HUMBIO 197. Human Biology Internship—Limited to and required of Human Biology majors. The internship is a supervised field, community, or lab experience of student's choosing, pre-approved by Human Biology faculty and student advisers, and initiated at least three quarters prior to graduation. May be repeated for credit. Prerequisite: Human Biology core.
1-4 units, Aut, Win, Spr (Staff)

HUMBIO 198. Senior Tutorial in Human Biology—Reading for Human Biology majors in exceptional circumstances and under sponsorship of Human Biology associated faculty. Students must apply through Human Biology student services before registering. Reading list, paper, and evaluation required. May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

HUMBIO 199. Directed Reading/Special Projects—Human Biology majors must obtain a sponsor from the Human Biology associated faculty or the Academic Council. Non-majors and students who have not declared must obtain a sponsor only from the Human Biology associated faculty. Students must complete application in student services office.
1-4 units, Aut, Win, Spr (Staff)

HUMBIO 200. Teaching of Human Biology—For upper division undergraduates and graduate students. Practical experience in teaching Human Biology or serving as an assistant in a lecture course. May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOSCI 146. Population Studies
1 unit, Win (Feldman, M)

DBIO 202. Assisted Reproductive Technologies—(Same as OBGYN 202.)
1-3 units, Win (Porzig, E; Behr, B)

EDUC 369. Human Cognitive Abilities—(Same as PSYCH 133.)
3 units, not given this year

ME 280. Skeletal Development and Evolution
3 units, Spr (Carter, D)

PHIL 60. Introduction to Philosophy of Science—(Same as HPS 60.)
5 units, Aut (Longino, H)

PHIL 78. Medical Ethics—(Same as ETHICSOC 78.)
4 units, Win (Jaworska, A)

POLISCI 131. Children's Citizenship: Justice Across Generations—(Same as EDUC 158.)
5 units, not given this year

POLISCI 133. Ethics and Politics of Public Service—(Same as ETHICSOC 133.)
5 units, Aut (Reich, R)

OVERSEAS STUDIES

Descriptions of these courses are in the "Overseas Studies" section of this bulletin, at http://osp.stanford.edu/, or at the Overseas Studies office, 126 Sweet Hall. Students overseas are also encouraged to participate in internships and independent research.

AUSTRALIA

OSPAUSTL 10. Coral Reef Ecosystems
3 units, Aut (Hoegh-Guldberg, O; Ward, S; Arrigo, K; Anthony, K)

OSPAUSTL 20. Coastal Resource Management
3 units, Aut (Johnstone, R; Chiffings, T)

OSPAUSTL 30. Coastal Forest Ecosystems
3 units, Aut (Hall, J; Duke, N)

CAPE TOWN

OSPGEN 21. Public Health and Primary Health Care in a Changing Community Context
4 units, Spr (Stanton, T)

PARIS

OSPPARIS 153X. Health Systems and Health Insurance: France and the U.S., a Comparison across Space and Time
4-5 units, Win (Fessler, J)

PROGRAM FOR INDIVIDUALLY DESIGNED MAJORS

The Individually Designed Major program (IDM) is overseen by the Office of Graduate and Undergraduate Studies in the School of Humanities and Sciences. See the "School of Engineering" section of this bulletin for information about the IDM in Engineering.

The program is intended for currently registered undergraduates in good academic standing interested in pursuing an area of scholarly inquiry that falls outside the purview of an established academic department or program of the University. Proposals for the IDM should be intellectually coherent majors designed by the students themselves with the assistance of faculty members of their choice. The primary adviser must be an Academic Council member. The IDM major requires a minimum of 75 units, all in courses at or above the 100 level, and a minimum GPA of 3.5. The proposed major must not duplicate or be achievable through a major already offered by another degree-granting department or program. IDM students are required to complete a capstone requirement in the form of an honors project. The application deadline for IDM proposals is the fifth week of Spring Quarter of the sophomore year. Applications are reviewed only once a year. Detailed information about proposal procedures and the procedure for an honors project is available at the Office of Graduate and Undergraduate Studies in the School of Humanities and Sciences, Building 1.

INTERDISCIPLINARY STUDIES IN HUMANITIES

Director: Gregory Freidin

Steering Committee: (Chair) Gregory Freidin (Slavic Languages and Literatures); Lanier Anderson (Philosophy), Jean-Marie Apostolidès (French and Italian, Drama), Keith Baker (History), Helen Brooks (English, Interdisciplinary Studies in Humanities), Carrie Denning (Humanities Honors Program student representative), Al Duncan (Graduate Program in Humanities student representative), Branislav Jakovljevic (Drama), Joshua Landy (French and Italian), Hilton Obenzinger (English, VPUE), Pavle Levi (Art and Art History), Rush Rehm (Drama and Classics), Stephanie Schmidt (Graduate Program in Humanities student representative), Joan Resina (Spanish and Portuguese), Anne Schiff (Humanities Honors Program student representative), Brent Sockness (Religious Studies)

Department Offices: Building 240
Mail Code: 94305-2152
Department Phone: (650) 723-3413
Email: idstudies.moore@stanford.edu
Web Site: http://www.stanford.edu/group/HSP/GPH/

Courses given in Interdisciplinary Studies in Humanities have the subject code HUMNTIES. For a complete list of subject codes, see Appendix.

Humanities, including humanistic social sciences, concern themselves with human cultures, their histories and varieties of cultural expression, and the analysis of these phenomena. At the basis of the humanities is the awareness of the tradition of humanistic discourse, its arts and letters, philosophical and social thought, and major texts from ancient to modern times. Students in the program are introduced to foundational works in their historical context from the perspective of disciplines such as literary and historical studies including cultural, intellectual, social, and art history, philosophy, religious studies, and the humanistic social sciences. The program's mission is to help students locate their disciplinary perspectives and subject matter within the humanistic tradition at large, to provide them with mentoring and advising, and to make available to them a community of peers pursuing similar interests regardless of disciplinary concentrations.

Interdisciplinary Studies in Humanities is responsible for the following programs:

1. Honors Program in Humanities
2. Interdisciplinary Major in Humanities
   a) Interdisciplinary Major
   b) Interdisciplinary Major for Premeds
   c) Interdisciplinary Major in Digital Humanities
   d) Interdisciplinary Major in Philosophical and Literary Thought
3. Graduate Program in Humanities
   a) Master of Arts
   b) Joint Ph.D.

The following programs share the administrative facilities with Interdisciplinary Studies in Humanities:

1. American Studies (see the "American Studies" section of this bulletin)
2. Medieval Studies (see the "Medieval Studies" section of this bulletin)
3. Program in Modern Thought and Literature (see the "Modern Thought and Literature" section of this bulletin)

UNDERGRADUATE PROGRAMS

To declare the major in Humanities, a student must first have been accepted into the Humanities Honors Program. See the "Honors Program" section below.

BACHELOR OF ARTS

THE MAJOR IN INTERDISCIPLINARY STUDIES IN HUMANITIES

A student who is a member of the Humanities Honors Program may choose to pursue the B.A. degree in Humanities through one of four concentration options: (1) the standard student designed thematic concentration; (2) the concentration designed for students who also plan to complete the established premedical curriculum for careers in the health sciences; (3) the concentration in digital humanities; or (4) the concentration in philosophical and literary thought. For all options, the B.A. degree conferred is in Humanities. Each student chooses a field that reflects the focus of study, which is noted on the transcript after degree conferral. Students who complete a thesis with a grade of 'B' or higher receive Honors in Humanities, which is noted on the transcript and on the diploma. More detailed information may be found in the Procedures and Guidelines documents, available at the program office. Admission information and recommended academic schedule follow below.

Each applicant to the major submits a study plan and statement of purpose which outlines the rationale for a particular field of study. The study plan should be worked out in consultation with the student's faculty mentor. Students who wish to major in Humanities should receive approval of their fields from the program before the end of the junior year.

Students may complete fields of study in the following; these fields are declared on Axess and appear on the transcript but not on the diploma.

1. Culture and Politics
2. Digital Humanities (see below)
3. Early Modern Studies
4. Film, Literature, and Society
5. Medieval Studies
6. Modern Thought and Literature
7. Performance, Culture, and Society
8. Philosophical and Literary Thought (see below)
9. Philosophy and the Visual Arts
10. Philosophy, Literature, and Ecology

REQUIREMENTS FOR THE MAJOR

Majors must first enroll in the Humanities Honors Program. With the exception of the premed option, each program of study must include at least 12 courses for a minimum of 60 units over and above the requirements of the Humanities honors program (28-30 units).

INTERDISCIPLINARY MAJOR AND RECOMMENDED ACADEMIC SCHEDULE

The program of study for the thematic concentration includes:

1. A statement of purpose designating the field and outlining the rationale for the program of study.
2. Six courses in one of the three areas: literary, historical, or philosophical study.
3. Three courses in each of the other two areas above.
4. The requirements for the Humanities honors program.

If additional courses are needed to make up the 60 unit minimum, the student may take those courses in any of the three categories. Each program of study must be signed by a Stanford faculty member who has agreed to act as the student's academic adviser; the proposed program must then be approved by the director. Changes in the study plan must be approved by the student's adviser and kept on file in the program office.

For some fields of study, such as film studies or modern thought and literature, specific courses or types of courses may be recommended. Consult the student handbook for such recommendations.

INTERDISCIPLINARY MAJOR FOR PREMEDS

The Interdisciplinary Major in Humanities offers an option for students who are preparing to attend medical school, but who wish to focus their studies in the humanities. This program of study gives students a coherent way to organize interdisciplinary interests by theme, nationality, or historical period. In addition, students choosing this track take all the courses usually required by medical schools (two years of organic and inorganic chemistry with labs, one year of physics, one year of biology with labs, and one or two courses to provide proficiency in quantitative skills as determined by a premed adviser), as well as course work in various humanities disciplines (eight courses and a minimum of 40 units) distributed as follows:

1. A statement of purpose choosing one of the fields listed above.
2. Four courses in the student's chosen field. Generally these four courses address different aspects of literature, history, and philosophy.
3. Three courses in medical ethics, history or philosophy of science, or science and the humanities.
4 One course in the arts.
5. The courses recommended by Undergraduate Advising and Research to fulfill medical school entrance requirements.
6. The requirements for the Humanities honors program.

INTERDISCIPLINARY MAJOR IN DIGITAL HUMANITIES

The development of new technologies has produced new topics for scholarly discussion in the humanities as well as new forms of cultural expression. The Interdisciplinary Major in Humanities offers a field of study for students who wish to concentrate study in the Digital Humanities with the following course requirements:

1. A statement of purpose outlining a narrowly defined field of study and approved by a digital humanities adviser.
2. HUMNTIES 198 as one of the core seminars for the Humanities honors program.
3. CS 105, Introduction to Computers, or CS 106A, Programming Methodology, or equivalent.
4. Seven humanities courses relevant to the student's focus as articulated in the statement of purpose.
5. Three computer science or technology courses relevant to the student's focus; one course should have a technical focus, and one should deal with societal issues.
6. HUMNTIES 201, Digital Humanities Practicum, in preparation for the student's honors project.
7. The requirements for the Humanities honors program.

INTERDISCIPLINARY MAJOR IN PHILOSOPHICAL AND LITERARY THOUGHT

The field of study in philosophical and literary thought is available in association with the crossdisciplinary Program for the Study of Philosophical and Literary Thought. Students wishing to major in Humanities with this focus must consult with the director of that program, as well as the director of Interdisciplinary Studies in Humanities. Students prepare a program of study including at least 12 courses in literary, philosophical, and historical study, of which six courses are in philosophical or literary thought, and three in each of the other two categories. Requirements:

1. A statement of purpose defining a focus in philosophical or literary thought.
2. HUMNTIES 181, Philosophy and Literature Gateway, which can be counted toward the course requirements for philosophical study or toward the requirements for literary study.
3. PHIL 80, Mind, Matter, and Meaning.
4. Courses in philosophical study normally include at least one course from the PHIL 170 sequence and one course from the PHIL 180 sequence.
5. Courses in literary study should focus on one national literature.
6. Courses in historical study should include at least one course in the history of philosophy.
7. The requirements of the Humanities honors program.
8. Students in this track are strongly encouraged, where possible, to select one or two Interdisciplinary Core Seminars which are approved as courses of special relevance for philosophical and literary thought.

Interested students should consult the director of undergraduate studies in the Program for the Study of Philosophical and Literary Thought for a listing of courses of special relevance to the study of philosophy and literature (which includes some of the HUMNTIES interdisciplinary core seminars).

HONORS PROGRAM

The Honors Program in Humanities aims to heighten a sense of the relations among various humanistic disciplines, and to study issues in intellectual and cultural history through aesthetic, literary, historical, religious, social, and ethical perspectives.

ADMISSION

Any qualified undergraduate at Stanford, regardless of major, may apply to the Humanities Honors Program. Interested students may obtain information from the program office. Students are encouraged to register for the program at the earliest opportunity and to take HUMNTIES 100, Text and Context in Humanities, in the sophomore year. However, students may join the program as late as the junior year under certain circumstances such as in the case of transfer students. Students enrolled in the crossdisciplinary majors affiliated with the Program for the Study of Philosophical and Literary Thought, whether through the Philosophy major or one of the literature majors, are encouraged to write their honors essays through the Humanities honors program. Students must meet the following entrance requirements before being admitted to the program:

1. Completion of at least two quarters of the Area One requirement, except in the case of transfer students, who are granted an exception.
2. A grade point average (GPA) of at least 3.3 (B+) in all course work in the humanities. Such course work includes any Area One sequence and all Program in Writing and Rhetoric sections; all courses in the departments of Art and Art History, Drama, and Music (except studio or performance courses); all courses in the departments of Asian Languages, Classics, English, French and Italian, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese (except first-year language courses); all courses in the departments of Comparative Literature, History, Philosophy, and Religious Studies; and all courses in the programs in Feminist Studies and Modern Thought and Literature.

REQUIREMENTS

1. Completion of HUMNTIES 100, Text and Context in Humanities, 3 units, preferably in the sophomore year.
2. Two different seminars in the series 160-163 or 190-198: 8-10 units, sophomore or junior year. Both seminars must be completed by the end of the tenth quarter of undergraduate study in order for students to remain members in good standing.
3. At least one survey course in intellectual or cultural history, 4-5 units, in a field relevant to the anticipated topic of the senior essay, choosing from the 160-163 series or among courses in history, philosophy, religious studies, literature, and the arts. Students should consult the course list in the program office.
4. In order to develop the requisite knowledge and methodological background to write a Humanities honors essay, students must take, during their sophomore and junior years, the required Humanities honors courses and additional humanities courses in disciplines germane to their honors essays.
5. Enrollment in 200A, one unit each, Winter and Spring quarters of the junior year.
6. An honors essay on a topic approved by the Steering Committee (usually 5 units Autumn Quarter and 5 units Winter Quarter, senior year).
7. A minimum GPA of 3.3 (B+) in all courses taken for the Honors Program, as well as an overall minimum GPA of 3.0 (B) in all course work in order to remain in the program.

GRADUATE PROGRAMS

University requirements for the M.A. and Ph.D. degrees are described in the “Graduate Degrees” section of this bulletin.

MASTER OF ARTS

The Master of Arts program within the Graduate Program in Humanities is designed to broaden the student’s academic background and cultural knowledge through a series of seminars that study intellectual history from the classical period to the modern era. Students gain added depth by taking four advanced courses within a defined field of study.

Application is made through the Interdisciplinary Studies in Humanities office. Application procedures and deadlines are available on the web at http://gradadmissions.stanford.edu. The M.A. program in Humanities is ideally completed as a half-time, two-year program, but under some circumstances it may be completed in one year as a full-time program. The program does not offer financial aid for the master’s program.

REQUIREMENTS

1. Complete graduate-level course work in the five required areas: classical age, the middle ages, Renaissance and early modern period, the Enlightenment, and modernity, with at least three of the five areas to be covered by the GPH seminars (321-325). The remaining two may be covered by GPH seminars or, by petition, by courses in the student’s approved concentration (see below).
2. Complete four graduate-level courses in an approved concentration to be determined in consultation with the director. At least one of these must be a graduate-level research seminar for which a research paper is required. Under “Statement of Purpose” on the application form, the candidate must indicate the field of study (for example, art history, early modern studies, philosophy, etc.) from which the graduate-level courses are drawn. The candidate must also note his or her qualifications for undertaking graduate study in that designated field. Once admitted, the student submits a proposed program of study to the director, specifying the particular courses to be taken. The proposed program is approved on its own merits to ensure that the chosen graduate courses are suited to the M.A. in Humanities.
3. Participate in the program-sponsored Special Colloquium during all quarters of study toward the M.A.
4. Complete HUMNTIES 298, Graduate Program in Humanities Symposium, Spring Quarter. Prior completion of the Symposium Paper may be substituted with special consent.

The minimum number of units for the M.A. degree is 45. Additional elective units may be taken at the option of the student.

Undergraduates wishing to pursue the M.A. as part of a coterminal program should speak with the program administrator about the application procedures for coterminal students.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

JOINT PH.D.

The Graduate Program in Humanities (GPH) provides graduate students in different disciplines an opportunity to broaden their knowledge of intellectual and cultural history by focusing on texts and ideas which have been central to all humanistic disciplines from the ancient world to the present. The program's seminars usually focus on specific topics or issues in the context of historical, literary, philosophical, religious, and other disciplinary and theoretical orientations. The program provides a unique opportunity to study highly influential texts with a view to their relevance to the student's own disciplinary field.

GPH members must be students earning the Ph.D. in an academic department at Stanford. Doctoral students who complete the requirements for their departments and the GPH are awarded joint doctoral degrees.

Students may register for the program at any time, usually during the first quarter of graduate study. Members of the program are given first preference in registration for all of its offerings. Students complete the five GPH seminars (321-325). The course of study culminates in the GPH student symposium, which is developed and organized by the students in the program.

Although students in the GPH generally complete the program course work in their first two years of graduate study, requirements of some participating departments may necessitate completion of the GPH over three years. In some instances, one or more of the GPH seminars may fit within the requirements of the student's home department.

The following are participating departments in the program: Art and Art History, Classics, Comparative Literature, Drama, Education, English, French and Italian, German Studies, History, Modern Thought and Literature, Music, Philosophy, Religious Studies, Slavic Languages and Literatures, and Spanish and Portuguese. Doctoral students from other departments may participate with permission of their home departments and approval of the Director of Interdisciplinary Studies in Humanities.

REQUIREMENTS

1. Continue satisfactory work in the student's major field, in accordance with department requirements.
2. Complete graduate-level course work in the five required areas: classical age, the middle ages, Renaissance and early modern period, the Enlightenment, and modernity, with at least three of the five areas to be covered by the GPH Seminars (321-325). The remaining two may be covered by GPH seminars or, by petition, by courses in the student's Ph.D. program or cognate field.
3. Participate in the program-sponsored Special Colloquium during the quarters the student is enrolled in the required seminars, up through completion of the Symposium requirement.
4. Participate in the GPH student symposium, usually at the end of the second year of GPH course work (298; registration for units is optional).
5. One quarter of interdisciplinary teaching. Students may apply to TA an undergraduate Humanities course, or may petition to count a departmental teaching assistantship if the course reaches beyond the scope of a single discipline.
6. Reading knowledge of at least one foreign language, ancient or modern, to be certified in the first two years of graduate work.
7. Passing the University oral examination according to the schedule prescribed by the major department with one GPH representative, approved by the director, as a member of the examining committee.
8. Submission of a Ph.D. dissertation acceptable to a committee which includes one representative of the GPH, approved by the director.

COURSES

See quarterly *Time Schedule* for changes in listings.

HUMNTIES 100. Text and Context in Humanities—Core colloquium. Required of students in the Humanities Honors Program. Introduction to Interdisciplinary Studies in Humanities through the study and application of theoretical approaches to major texts. Textual analysis and writing assignments to prepare students to write honors essays. GER:DB-Hum

3 units, Win (Freidin, G)

HUMNTIES 161. Texts in History: Classics from Greece to Rome—(Same as CLASSGEN 163, DRAMA 161R.) Priority to students in the Humanities honors program. Ancient texts situated in their intellectual and cultural contexts. Readings include Homer's *Iliad* and *Odyssey*, plays of Aeschylus, Sophocles' *Antigone*, Euripides' *Medea*, Thucydides *Peloponnesian War*, Plato's *Symposium*, Aristotle's *Poetics*, Virgil's *Aeneid*, Seneca's *Trojan Women* and *Agamemnon*, and Augustine's *On Christian Doctrine*. GER:DB-Hum

5 units, not given this year (Rehm, R.)

HUMNTIES 162. Texts in History: Medieval to Early Modern—(Same as ENGLISH 184C.) Priority to students in the Humanities honors program. The impact of change from the Middle Ages to the early modern world; how historical pressures challenged conceptions of artistic form, self, divine, and the physical universe. Interdisciplinary methods of interpretation. Texts include: Aristotle, *On the Soul*; Attar, *The Conference of the Birds*; Dante, *Inferno*; Chaucer, *Canterbury Tales*; Christine de Pizan, *The Book of the City of Ladies*; *Letters of Columbus*; Machiavelli, *The Prince*; Luther, *The Bondage of the Will*; Montaigne, *Essays*; Marlowe, *Doctor Faustus*; poems by John Donne and Lady Mary Wroth; Shakespeare, *Othello*; and works of art. GER:DB-Hum

5 units, Win (Brooks, H)

HUMNTIES 163. Texts in History: Enlightenment to the Present—(Same as FRENGEN 163.) Priority to students in the Humanities honors program and French majors. The relationship between intellectual, political, and cultural history, and literary creativity in the modern period. Texts include Voltaire, *Philosophical Letters*; Rousseau, second *Discourse*; Kant, *What is Enlightenment?* and the *Critique of Judgment*; documents and speeches from the French Revolution; Hölderlin, *The Rhein*; Schlegel, *Dialogue on Poesy*; Balzac, *Père Goriot*; Dostoevsky, *Notes from Underground*; Sorel, *Reflections on Violence*; T.S. Eliot, *The Waste Land*; Woolf, *Mrs. Dalloway*; Artaud, *Theater and its Double*; and Kane, *Ambiguous Adventure*. GER:DB-Hum

5 units, Spr (Edelstein, D)

HUMNTIES 170. Media Studies Internship—Practical experience working with a film or media company for six to eight weeks. Students make arrangements with companies individually and receive the consent of the director of the Humanities Honors Program. Credit awarded for submitting a paper after completing the internship, focused on a topic relevant to the student's studies.

2-3 units, Aut, Win, Spr (Freidin, G), Sum (Staff)

HUMNTIES 175. Individual Work

1-5 units, Aut, Win, Spr, Sum (Staff)

HUMNTIES 181. Philosophy and Literature—(Same as CLASSGEN 81, COMPLIT 181, ENGLISH 81, FRENGEN 181, ITALGEN 181, GERGEN 181.) Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum

4 units, Win (Anderson, L; Landy, J)

HUMNTIES 191-198. Interdisciplinary Core Seminars in Humanities—Students in the Humanities honors program must complete two different seminars from different areas before the end of the tenth quarter of undergraduate study. Other students may enroll if space allows and with the instructor's consent.

HUMNTIES 191S. Capital and Empire—(Same as HISTORY 239D/339D.) Can empire be justified with balance sheets of imperial crimes and boons, a calculus of racism versus railroads? The political economy of empire through its intellectual history from Adam Smith to the present; the history of imperial corporations from the East India Company to Walmart; the role of consumerism; the formation of the global economy; and the relationship between empire and the theory and practice of development. GER:DB-SocSci

4-5 units, Spr (Satia, P)

HUMNTIES 193W. Nietzsche, Doestoevsky, and Sartre—(Same as PHIL 193W.) Literary works in which philosophical ideas and issues are put forward, such as prose poems, novels, and plays. Ideas and issues and the dramatic or narrative structures through which they are presented. Texts include: Nietzsche, *Thus Spoke Zarathustra*; Dostoevsky, *The Brothers Karamazov*; and Sartre, *Nausea* and *No Exit*. GER:DB-Hum

4 units, Aut (Wood, A)

HUMNTIES 194G. William Blake: Poet and Painter—(Same as ENGLISH 135E.) Introduction to the illuminated poetry of William Blake, romantic visionary, poet, artist, religious renegade, political revolutionary, philosopher, mythological historiographer, social misfit, and critic. GER:DB-Hum

5 units, Win (Gigante, D)

HUMNTIES 196B. Religion, Reason, and Romanticism—(Same as RELIGST 245.) The late 18th-century European cultural shift from rationalist to romantic modes of thought and sensibility. Debates about religion as catalysts for the new Zeitgeist. Readings include: the Jewish metaphysician, Mendelssohn; the dramatist, Lessing; the philosopher of language and history, Herder; the critical idealist, Kant; and the transcendental idealist, Fichte. GER:DB-Hum

5 units, Aut (Sockness, B)

HUMNTIES 197F. Tolstoy's *Anna Karenina* and the Social Thought of Its Time—(Same as SLAVGEN 190/290.) Preference to juniors and seniors in Interdisciplinary Studies in Humanities and Russian majors. A slow reading of *Anna Karenina* in historical and cultural context. The novel as a case study in antagonism between two cultural systems, modernity and tradition, and their distinct ethical orders, assumptions, and codes. Cultural semiotics of Clifford Geertz. Focus is on paradigms and images of society and humanity in Tolstoy's contemporaries including Marx, Mill, Nietzsche, Weber, Durkheim, and Freud. Limited enrollment. See http://www.stanford.edu/~gfreidin/courses/AK/. GER:DB-Hum, EC-EthicReas

4-5 units, not given this year

HUMNTIES 198J. Digital Humanities: Literature and Technology—(Same as ENGLISH 153H.) How electronic texts, literary databases, computers, and digital corpora offer unique ways of reading, analyzing, and understanding literature. Intellectual and philosophical problems associated with an objective methodology within a traditionally subjective discipline.

5 units, Aut (Jockers, M)

HUMNTIES 200A,B,C. Senior Research—Limited to Humanities honors students. A critical essay of about 15,000 words. Students develop a proposal beginning in Winter Quarter of the junior year, and research a topic and write the essay during senior year with the guidance of a faculty member, taking a total of 5 units each of 200B and 200C, spread out during senior year as best suits their schedules. Deadline for submitting essays is the first working day on or after May 15.

HUMNTIES 200A. Research Proposal—Preliminary planning and study. Student drafts a proposal in Winter Quarter of the junior year to submit to the committee in charge for suggestions regarding focus and bibliography. After revisions, the student resubmits a fully developed proposal to the committee for additional comment and/or final approval. 60 hours over two quarters are expected of students developing their essay proposals for 2 units, usually 1 unit each in Winter and Spring of the junior year. Students usually make revisions of some kind in either scope or formulation of the topic. Students overseas submit proposals and receive feedback by fax or email. WIM

1-2 units, Aut, Win, Spr (Staff)

HUMNTIES 200B. Senior Research—Regular meetings with tutor (thesis adviser). Prerequisite: 200A. WIM at 3 unit level.

1-5 units, Aut, Win, Spr (Staff)

HUMNTIES 200C. Senior Research—Regular meetings with tutor; submission of complete first draft at least two weeks before final deadline. Prerequisite: 200B. WIM

1-5 units, Aut, Win, Spr, Sum (Staff)

HUMNTIES 201. Digital Humanities Practicum—For Humanities majors concentrating in digital humanities. Work related to the honors thesis under the supervision of a Stanford faculty or staff member usually affiliated with the Stanford Humanities Lab. Must be approved by the Director of Interdisciplinary Studies in Humanities.

2-5 units, Aut, Win, Spr (Staff)

GRADUATE

HUMNTIES 275. Individual Work

1-5 units, Aut, Win, Spr, Sum (Staff)

HUMNTIES 298. Graduate Program in Humanities Symposium—Required of GPH doctoral and master's students. Participation in the student-organized symposium; presentation of a paper informed by texts addressed in GPH seminars.

1-3 units, Spr (Freidin, G)

HUMNTIES 299. Interdisciplinary Teaching—For doctoral students in the GPH. Supervised interdisciplinary teaching to satisfy the program teaching requirement.

1-2 units, Aut, Win, Spr (Freidin, G)

HUMNTIES 321. Classical Seminar—(Same as CLASSGEN 321.) Topic this year is interpreting antiquity: methodologies and interpretations of ancient texts. The dialogue between literature and philosophy in Greek and Roman cultures. Sources include Homer, Greek tragedy, Plato, Aristotle, Virgil, Petronius, Augustine, and Nietzsche's *Birth of Tragedy*.

3-5 units, Aut (Nightingale, A)

HUMNTIES 322. Medieval Seminar—(Same as ENGLISH 370A.) The cultural, literary, and artistic evolution of the Middle Ages. The barbarian invasions and the Germanic ethos, the Celtic heritage, and the monastic tradition. Romanesque art and architecture, pilgrimages, and the Crusades. Gothic aesthetics, chivalry and courtly love, scholasticism, and the rise of universities. The late Middle Ages, humanism, and the threshold of the Renaissance. Texts include: *Beowulf*, *Mabinogion*, *Song of Roland*, Chretien de Troyes' *Lancelot* and *Yvain*, Dante's *Divine Comedy*, Boccaccio's *Decameron*, and Chaucer's *Canterbury Tales*.

3-5 units, Win (Steidle, E)

HUMNTIES 323. Renaissance/Early Modern Seminar—Focus is on this period as it records the impact of major historical forces: the advent of printing; the reappropriation of classical thought; the expansion of trade; revolutions in religion; the exploration of uncharted realms of the self, the world, and the heavens; and the rise of historiography. Authors: Attar, de Pizan, Pico della Mirandola, Columbus, De Las Casas, Machiavelli, Luther, Montaigne, Marlowe, Donne, Shakespeare, and Galileo.

3-5 units, Spr (Brooks, H)

HUMNTIES 324. Enlightenment Seminar—(Same as MUSIC 324H.) How 18-century opera and literature reflect changing conceptions of the self, reason, and emotion; the proper basis of social and political authority; natural and supernatural justice; women's nature and status. Texts include: Gluck's *Iphigenia in Tauris*; Mozart's *The Marriage of Figaro* and *Don Giovanni*; *Manon Lescaut*; and *Les liaisons dangereuses*.

3-5 units, Aut (Hadlock, H)

HUMNTIES 325. Modern Seminar—(Same as FRENGEN 325.) The postmodern condition as post-WW II rupture in Western tradition; moral, political, cultural, and aesthetical dimensions. Sources include literature, philosophy, essays, films, and painting. Authors and artists include: Primo Levi, Hannah Arendt, Alain Resnais, Samuel Beckett, Georges Bataille, Michel Foucault, Theodor Adorno, David Riesman, Georges Perec, Juliet Mitchell, and Francis Bacon.

3-5 units, Win (Apostolidès, J)

DIVISION OF INTERNATIONAL COMPARATIVE AND AREA STUDIES

Director: Judith Goldstein

Advisory Committee: Keith Baker (History), Judith Goldstein (Political Science), Robert Gregg (Religious Studies), Stephen Haber (Political Science), Nicholas Hope (Stanford Institute for Economic Policy Research), Ian Morris (Classics), Jeremy Weinstein (Political Science)

Directors' Committee: Keith Baker (History), Carl Bielefeldt (Religious Studies), Philippe Buc (History), Charlotte Fonrobert (Religious Studies), Judith Goldstein (Political Science), Robert Gregg (Religious Studies), Linda Hess (Religious Studies), Herbert Klein (History), Anjini Kochar (Stanford Institute for Economic Policy Research), Abbas Milani (Hoover), Aron Rodrigue (History), Gabriella Safran (Slavic Languages and Literatures), Kenneth Schultz (Political Science), Vered Shemtov (Language Center), Stephen J. Stedman (Freeman Spogli Institute for International Studies), Chao Fen Sun (Asian Languages), Amir Weiner (History), Jeremy Weinstein (Political Science)

Division Office: Encina Hall West, second floor
Mail Code: 94305-6045
Web Site: http://ica.stanford.edu

The Division of International Comparative and Area Studies (ICA) supports research and teaching in the cultures and societies of the world, and studies the problems facing developing societies as they seek to end their poverty and social and economic inequalities. ICA promotes new centers of teaching excellence in traditional areas of historical and cultural concerns, as well as promoting interdisciplinary activities related to developing new ideas for dealing with fundamental issues of justice, equality, and growth within nation states, cultures, and regions.

The Division of International Comparative and Area Studies is comprised of research centers, degree granting programs, and religion and cultural centers: Center for African Studies*; Center for East Asian Studies*; Center for Latin American Studies*; France-Stanford Center for Interdisciplinary Studies; Center for Russian, East European and Eurasian Studies*; Ford Dorsey Program in International Policy Studies*; International Relations*; Mediterranean Studies Forum; Hamid and Christina Moghadam Program in Iranian Studies; Asian Religions and Cultures; Stanford Center for Buddhist Studies; Sohaib and Sara Abbasi Program in Islamic Studies; Taube Center for Jewish Studies*; Center for European Studies; and the Center for South Asian Studies. Degree granting programs are denoted with an asterisk (*); the Taube Center for Jewish Studies oversees an Individually Designed Major.

CENTER FOR AFRICAN STUDIES

Director: Jeremy Weinstein
Office: Encina Hall West, second floor
Web Site: http://africanstudies.stanford.edu

The Center for African Studies (CAS) is an interdisciplinary research program. CAS offers an undergraduate minor and certificate, and a Master of Arts (M.A.) degree. For further information, see the "Center for African Studies" section of this bulletin.

STANFORD CENTER FOR BUDDHIST STUDIES

Director: Carl Bielefeldt
Office: Encina Commons
Web Site: http://scbs.stanford.edu

The Stanford Center for Buddhist Studies (SCBS) serves to coordinate, support, and develop the University's resources for Buddhist Studies in scholarly research, academic communication, teaching, and public outreach. The center supports individual and team research projects for faculty, students, and visiting fellows. It houses a reference collection and reading room and sponsors lectures, conferences, symposia, workshops, and seminars. The center works closely with the Department of Religious Studies, the Buddhism in the Modern World Program, and the Group in Buddhist Studies at UC Berkeley. SCBS oversees the Asian Religions and Cultures Initiative (ARC) which is dedicated to the enhancement of Stanford's resources in Asian humanities. ARC consists of research, curricular support, and academic and public events.

CENTER FOR EAST ASIAN STUDIES

Director: Chao Fen Sun
Web Site: http://ceas.stanford.edu

The Center for East Asian Studies (CEAS) seeks to increase interdisciplinary communication among faculty, students, and outside scholars whose research, teaching, or study focuses on East Asia. CEAS offers bachelor's and master's degree programs. It sponsors programs that enhance public knowledge and access to the University's East Asia resources.

For further information, see the "Center for East Asian Studies" section of this bulletin.

CENTER FOR EUROPEAN STUDIES

Directors: Philippe Buc, Amir Weiner
Office: Encina Hall West, second floor
Web Site: http://europeanstudies.stanford.edu/

The Center for European Studies is a multidisciplinary institute committed to the examination of European society, culture, politics, diplomacy, and security. The center's goal is to develop Stanford's contribution to the study of Europe's history and contemporary position as a global power by bringing together students and scholars from the humanities and the social sciences, policy makers, diplomats, and journalists. The center sponsors visiting professors, intellectuals, and personalities from Europe. Besides research, an important side-product of these exchanges is the development of Stanford undergraduate and graduate courses on themes related to European history, culture, and current events.

FRANCE-STANFORD CENTER FOR INTERDISCIPLINARY STUDIES

Director: Keith Baker
Office: Building 260, room 105
Web Site: http://francestanford.stanford.edu

The France-Stanford Center for Interdisciplinary Studies, founded in partnership with the French Ministry of Foreign Affairs, aims to bridge the disciplines of the humanities, social sciences, sciences, engineering, business, and law, addressing historical and contemporary issues of significance for France and the United States. The center brings together Stanford faculty and students and academics in France to advance collaborative research and foster interdisciplinary inquiry. Its programs include conferences, support for collaborative research projects, internships, exchanges, lectures, and seminars.

FORD DORSEY PROGRAM IN INTERNATIONAL POLICY STUDIES

Director: Stephen J. Stedman
Office: Encina Hall West, second floor
Web Site: http://ips.stanford.edu

Ford Dorsey International Policy Studies (IPS) is a two-year master's program that seeks to train the next generation of policy analysts to solve key global problems.

For further information, see the "International Policy Studies" section of this bulletin.

PROGRAM IN INTERNATIONAL RELATIONS

Director: Kenneth Schultz
Office: Encina Hall West, second floor
Web Site: http://internationalrelations.stanford.edu

International Relations (IR) is an interdisciplinary undergraduate major focusing on changing political, economic, and cultural relations within the international system in the modern era.

For further information, see the "International Relations" section of this bulletin.

HAMID AND CHRISTINA MOGHADAM PROGRAM IN IRANIAN STUDIES

Director: Abbas Milani
Office: Encina Hall West, second floor
Web Site: http://iranian-studies.stanford.edu

The Hamid and Christina Moghadam Program in Iranian Studies at Stanford fosters the interdisciplinary study of Iran as a civilization, one of the oldest in the world. The program combines pedagogy, policy analysis, and research on all aspects of Iran's past, present, and future. The program organizes lectures and student research conferences on Iran.

SOHAIB AND SARA ABBASI PROGRAM IN ISLAMIC STUDIES

Director: Robert Gregg
Office: Encina Hall West, second floor
Web Site: http://islamicstudies.stanford.edu

The mission of the Sohaib and Sara Abbasi Program in Islamic Studies is to serve as a forum for interdisciplinary research and teaching in Islamic studies, complemented by seminars, colloquia and public lectures. The program seeks to illuminate Islamic history from its beginnings to the 21st century, the religion of Islam in its many aspects, and the diversity of Muslim cultures and societies, past and present, not only in the Middle East but also including South and Southeast Asia, Africa, Europe, and America. In addition to geographical breadth, the program promotes the use of scholarly resources from both the humanities and the social sciences. Participating faculty and students bring perspectives and methods from academic fields including anthropology, art, economics, history, international relations, languages, law, literature, philosophy, political science, and religious studies.

TAUBE CENTER FOR JEWISH STUDIES

Directors: Charlotte Fonrobert, Vered Shemtov
Web Site: http://jewishstudies.stanford.edu

The interdisciplinary Taube Center for Jewish Studies coordinates and promotes the study of all aspects of Jewish life. The center offers an undergraduate minor and an interdisciplinary major coordinated by the Humanities and Sciences dean's office.

For further information, see the "Taube Center for Jewish Studies" section of this bulletin.

CENTER FOR LATIN AMERICAN STUDIES

Director: Herbert S. Klein
Web Site: http://las.stanford.edu

The Center for Latin American Studies at Stanford University (CLAS) offers academic programs for students, coordinates academic conferences and lectures, and fosters interdisciplinary research for students and faculty through fellowships and funding opportunities. The center offers an undergraduate minor, an interdisciplinary honors certification for undergraduates, and a master's degree.

For further information, see the "Center for Latin American Studies" section of this bulletin.

MEDITERRANEAN STUDIES FORUM

Director: Aron Rodrigue
Office: Encina Hall West, second floor
Web Site: http://mediterraneanstudies.stanford.edu

The Mediterranean Studies Forum encourages scholars to explore the interplay among societies, cultures, and communities around the Mediterranean Basin from the Middle Ages to the present. Its focus is on all aspects of co-existence and conflict that have marked these encounters in the empires, port cities, nation states, and transregional and transnational social, religious, cultural, and economic contexts of N. Africa, the Levant, the Balkans, and southern Europe. It is also interested in the relations of the Mediterranean with other regions and areas of the world. The central goal of the forum is to contribute to interfield and interdisciplinary dialogue among scholars of these areas through lectures, colloquia, workshops, conferences, and publications.

CENTER FOR RUSSIAN, EAST EUROPEAN AND EURASIAN STUDIES

Director: Gabriella Safran
Office: Encina Hall West, second floor
Web Site: http://creees.stanford.edu

The Center for Russian, East European and Eurasian Studies (CREEES) offers an undergraduate minor and a one-year master's program in interdisciplinary area studies.

For further information, see the "Russian, East European and Eurasian Studies" section of this bulletin.

CENTER FOR SOUTH ASIAN STUDIES

Directors: Linda Hess, Anjini Kochar
Office: Encina Hall West, second floor
Web Site: http://southasia.stanford.edu

The Center for South Asian Studies serves to coordinate and develop Stanford's resources for the study of South Asia across all the disciplines in the School of Humanities and Sciences. It works closely with departments and other units of the University to increase faculty strength, support research, enhance the curriculum, build the library collection, and sponsor programs and events.

INTERNATIONAL POLICY STUDIES

Director: Stephen Stedman (Freeman Spogli Institute for International Studies)
Executive Committee Co-chairs: Coit D. Blacker (Freeman Spogli Institute for International Studies), Judith L. Goldstein (Political Science)
Executive Committee: Jenny Martinez (School of Law), Michael McFaul (Political Science), Rosamund Naylor (Freeman Spogli Institute for International Studies), Norman Naimark (History), Bruce Owen (Public Policy), Julie Parsonnet (School of Medicine), John Pencaval (Economics), David Victor (Freeman Spogli Institute for International Studies)
Lecturers: Chonira Aturupane, Keith Hansen, Eric Morris
Affiliated Faculty: Mike Armacost (Freeman Spogli Institute for International Studies), Jonathan Bendor (Business), Byron Bland (Freeman Spogli Institute for International Studies), Paul Brest (Law), Jeremy Bulow (Economics), Gordon Chang (History), John Cogan (Hoover Institution), Larry Diamond (Hoover Institution), Lynn Eden (Sociology), Walter P. Falcon (Freeman Spogli Institute for International Studies), James Fearon (Political Science), Lawrence Goulder (Economics), Stephen H. Haber (Political Science), David J. Holloway (History, Political Science), Simon Jackman (Political Science), Timothy Josling (Freeman Spogli Institute for International Studies), Terry Karl (Political Science), Stephen D. Krasner (Political Science), Gail Lapidus (Freeman Spogli Institute for International Studies), Susanna Loeb (Education), Isabela Mares (Political Science), Michael McFaul (Political Science), Ronald I. McKinnon (Economics), Norman Naimark (History), Rosamond Naylor (Freeman Spogli Institute for International Studies), Roger G. Noll (Economics, emeritus), Jean Oi (Political Science), Daniel Okimoto (Political Science), William Perry (Management Science and Engineering), Rob Reich (Political Science), Douglas Rivers (Political Science), Richard Roberts (History), Lee Ross (Psychology), Scott D. Sagan (Political Science), Debra Satz (Philosophy), Jeff Strnad (Law), Michael Tomz (Political Science), David Victor (Freeman Spogli Institutute for International Studies), Andrew Walder (Sociology), Jeremy Weinstein (Political Science), Allen Weiner (Law), Ann Wren (Political Science)
Visiting Professor: Edward Miguel

Program Office: Encina Hall West, Room 216
Mail Code: 94305-6045
Phone: (650) 723-4547
Web Site: http://ips.stanford.edu

Courses given in International Policy Studies have the subject code IPS. For a complete list of subject codes, see Appendix.

GRADUATE PROGRAM

MASTER OF ARTS

International Policy Studies (IPS) is an analytical interdisciplinary program focusing on international policy analysis. Its goal is to provide students with exposure to issues that they face in international business and public policy, and to develop skills and knowledge to address those issues. The program allows students to specialize in: international political economy; international security and cooperation; democracy, development, and the rule of law; global health; global justice; or energy, environment, and resources.

IPS requires completion of the core and concentration requirements which amount to 90 units of credit. Additional units are required for students who have not fulfilled prerequisites for these requirements.

University requirements for the M.A. degree are described in the "Graduate Degrees" section of this bulletin.

ADMISSION

IPS is designed for students who have a strong undergraduate background in economics and political science. To enroll in the program, students must have taken calculus-based undergraduate courses in statistics, microeconomics, and macroeconomics. Stanford courses satisfying these requirements are ECON 51, 52, and ECON 102A or POLISCI 150A. In addition, students must have completed one advanced undergraduate course in international economics; the Stanford course that meets this requirement is ECON 165.

Applicants from schools other than Stanford or applicants from Stanford who did not apply in their senior year should submit a graduate admission application including a statement setting forth relevant personal, academic, and career plans and goals; official transcripts; three letters of recommendation; Graduate Record Examination (GRE) scores; a writing sample of at least ten pages; an area of concentration form; and resume. TOEFL scores are required of applicants for whom English is not their first language or who did not attend an undergraduate institution where English is the language of instruction. To apply or for information on graduate admission, see http://gradadmissions.stanford.edu. Applicants are expected to have a B.A. or B.S. degree from an accredited school. Applications for admission in Autumn Quarter must be filed with supporting credentials by January 8, 2008.

Undergraduates at Stanford may apply for admission to the coterminal master's program in IPS when they have earned a minimum of 120 units toward graduation, including AP and transfer credit, and no later than the quarter prior to the expected completion of their undergraduate degree. The coterminal application requires the following supporting materials: two letters of recommendation from University faculty, a writing sample of at least ten pages, and a statement of relevant personal, academic, and career plans and goals. Applications must be filed together with supporting materials by January 8.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

DEGREE REQUIREMENTS

To receive the M.A. degree in International Policy Studies, students must complete the items below. These requirements entail 4 units of core courses, 36 units of policy skills, a 10-unit practicum, a 5-unit writing and rhetoric seminar, a 5-unit course in international economics, and an additional 30 units from the concentration curriculum. These courses have the following prerequisites: ECON 51, 52, 102A or POLISCI 150A, and ECON 165.

Core Courses—

1. IPS 200. Issues in International Policies (1 unit)
2. IPS 201. Managing Global Complexity (3 units)

Policy Skills—

1. IPS 204A. Microeconomics (4 units)
2. IPS 204B. Cost-Benefit Analysis and Evaluation (4 units)
3. IPS 205A. Principles of Research Design and Analysis: Methods (4 units)
4. IPS 205B. Principles of Research Design and Analysis: Tools (4 units)
5. IPS 206A. Politics and Collective Action (4 units)
6. IPS 206B. Organizations (4 units)
7. IPS 207A. Judgment and Decision Making (4 units)
8. IPS 207B. Public Policy and Social Psychology: Implications and Applications (4 units)
9. IPS 208. Justice (4 units)
10. IPS 209. Practicum (10 units)

Writing and Rhetoric Seminar—One of the following (5 units):

1. IPS 210. Politics of International Humanitarianism
2. IPS 211. The Transition from War to Peace: Peacebuilding Strategies
3. IPS 212. Issues in Development
4. IPS 219. Roles of Intelligence in U.S. Foreign Policy
5. IPS 314S. Decision Making in U.S. Foreign Policy

International Economics—IPS 202, Topics in International Macroeconomics; or IPS 203, Issues in International Economics (5 units)

Practicum—IPS 209, Practicum (10 units)

Concentration Curriculum—Students are required to complete 30 units of IPS approved courses for their area of concentration (see list below). A gateway course in the area of concentration must be taken prior to enrolling in subsequent courses. A complete list of the courses in these areas is available in the IPS program office.

Democracy, Development, and Rule of Law
Energy, Environment, and Natural Resources
Global Health
Global Justice
International Negotiation and Conflict Management
International Political Economy
International Security and Cooperation

Language Requirement—Proficiency in a foreign language is required and may be demonstrated by completion of three years of university-level course work in a foreign language or by passing an oral and written proficiency examination prior to graduation.

Grade Requirements—All courses to be counted toward the degree, except IPS 200, must be taken for a letter grade.

Financial Aid—Financial aid is available for graduate students entering the IPS program.

COURSES

See the IPS degree requirements in the IPS program office or at http://ips.stanford.edu for updated information on additional courses.

IPS 200. Contemporary Issues in International Policies—For IPS students only. Lecture series. Scholars present their analysis of major international public policy issues. May be repeated for credit.
1 unit, Aut (Stedman, S)

IPS 201. Managing Global Complexity—(Same as POLISCI 212.) The value of major theories and concepts in international relations for understanding and addressing global policy issues. Country case study with policy challenges such as development, democracy promotion, proliferation, and terrorism; the challenge of creating coherent policies that do not run at cross purposes. Case study of a policy challenge that cuts across academic disciplines and policy specializations to provide the opportunity to bring together skills and policy perspectives.
3 units, Spr (Krasner, S; Stedman, S)

IPS 202. Topics in International Macroeconomics—Topics: standard theories of open economy macroeconomics, exchange rate and stabilization policies, the economics of monetary unification and the European Monetary Union, and emerging markets and financial and currency crises.
5 units, Aut (Aturupane, C)

IPS 203. Issues in International Economics—Topics in international trade and international trade policy: trade and growth, regionalism versus multilateralism, the political economy of trade policy, trade and labor, trade and the environment, and trade policies for developing and transition economies. Prerequisite: ECON 165.
5 units, Win (Aturupane, C)

IPS 204A. Microeconomics—(Same as PUBLPOL 201A.) Microeconomic concepts relevant to decision making. Topics include: competitive market clearing, price discrimination; general equilibrium; risk aversion and sharing, capital market theory, Nash equilibrium; welfare analysis; public choice; externalities and public goods; hidden information and market signaling; moral hazard and incentives; auction theory; game theory; oligopoly; reputation and credibility.
4 units, Aut (Bulow, J)

IPS 204B. Cost-Benefit Analysis and Evaluation—(Same as PUBLPOL 201B.) Ex ante and ex post evaluation of projects and policies, value of life calculations, and welfare evaluation of public and private decisions. Welfare measures; tradeoffs between efficiency and equity. Second best. Behavioral economics: psychological mechanisms behind static choice, intertemporal choice, choice under risk and uncertainty, choice in social situations, and hedonics. Statistical decision theory. Use of incentives in implementing policies. Relationship between microeconomic analysis and public policy making. Economic rationales for policy interventions. Economic models of politics and application to policy making. Relationship of income distribution to policy choice.
4 units, Spr (Kessler, D)

IPS 205A. Principles of Research Design and Analysis: Methods—(Same as PUBLPOL 203A.) How professionals in non-research fields can be informed consumers of policy-related empirical research. Qualitative and quantitative research techniques and methodological requirements for sound research results. Formulating research questions. Experimental design. Choosing appropriate research strategies. Survey research design. Case study methods. Interviewing and observational techniques. Measurement including financial, cost, national income, and regulatory accounting.
4 units, Aut (Louie, T)

IPS 205B. Principles of Research Design and Analysis: Tools—(Same as PUBLPOL 203B, LAW 366.)Policy analysis tools for government, research institutes, and academic settings, and for empirical issues in litigation, investment banking, consulting, and finance. Multiple regression analysis, multilevel modeling, and Bayesian analysis. Topics include hypothesis testing, regression specification, logistic regression, probit, heteroscedasticity, serial correlation, errors in the variables, instrumental variables, simultaneous equations, generalized linear models, simulation, model checking, causal inference, and missing data imputation. Hands-on analysis using popular statistical packages.
4 units, Win (Strnad, J)

IPS 206A. Politics and Collective Action—(Same as POLISCI 331S, PUBLPOL 204A.) How public policies are formulated and implemented; preference formation. The role of electoral politics, nongovernmental organizations, ideologies, and social protests. The theory of collective action. Principal agent relationships. How elected officials, bureaucrats, and interest groups shape government policies in areas including tax, environmental, trade, and social welfare policy, given their goals and available tactics. How to evaluate policies and policy making processes.
4 units, Win (Satz, D)

IPS 206B. Organizations—(Same as PUBLPOL 204B.) Policy reform and organizational resistance. Organizations include government and other bureaucracies such as not-for-profit schools, universities, hospitals, international organizations, political parties, and agencies. Hubris and policy making, including pathologies of decision making and planning, abuse of intelligence, biased information, overselling to publics, lack of knowledge about context, and unintended consequences.
4 units, Spr (Stedman, S; Eden, L)

IPS 207A. Judgement and Decision Making—(Same as PUBLPOL 205A.) Theories and research on heuristics and biases in human inference, judgement, and decision making. Experimental and theoretical work in prospect theory emphasizing loss and risk aversion. Support theory. Challenges that psychology offers to the rationalist expected utility model; attempts to meet this challenge through integration with modern behavioral economics. Decision making biases and phenomena of special relevance to public policy such as group polarization, group think, and collective action.
4 units, Aut (Brest, P)

IPS 207B. Public Policy and Social Psychology: Implications and Applications—(Same as PSYCH 216, PUBLPOL 205B.) Theories, insights, and concerns of social psychology relevant to how people perceive issues, events, and each other, and links between beliefs and individual and collective behavior. Topics include: situationist and subjectivist traditions of applied and theoretical social psychology; social comparison, dissonance, and attribution theories; social identity, stereotyping, racism, and sources of intergroup conflict and misunderstanding; challenges to universality assumptions regarding human motivation, emotion, and perception of self and others; the problem of producing individual and collective changes in norms and behavior.
4 units, Spr (Ross, L)

IPS 208. Justice—(Same as ETHICSOC 171, PHIL 171/271, POLISCI 136S, PUBLPOL 207.) Focus is on the ideal of a just society, and the place of liberty and equality in it, in light of contemporary theories of justice and political controversies. Topics include protecting religious liberty, financing schools and elections, regulating markets, assuring access to health care, and providing affirmative action and group rights. Issues of global justice including human rights and global inequality.
5 units, Aut (Cohen, J)

IPS 209. Practicum—(Same as PUBLPOL 209.) Applied policy exercises in various fields. Multidisciplinary student teams apply skills to a contemporary problem in a major policy exercise with a public sector client such as a government agency. Problem analysis, interaction with the client and experts, and presentations. Emphasis is on effective written and oral communication to lay audiences of recommendations based on policy analysis.
5-10 units, given next year

IPS 210. The Politics of International Humanitarian Action—The relationship between humanitarianism and politics in international responses to recent civil conflicts and forced displacement. Focus is on policy dilemmas and choices, and the consequences of action or inaction. Humanitarian and political perspectives. Case studies include Cambodia, northern Iraq (Kurdistan), Bosnia, Rwanda and the Great Lakes region of Africa, and Kosovo.
5 units, Aut (Morris, E)

IPS 211. The Transition from War to Peace: Peacebuilding Strategies—How to find sustainable solutions to intractable conflicts that lead to a settlement. How institutions such as the UN, regional organizations, and NGOs can support a peace process that leads to disarmament, and reconstruction and reconciliation, or co-existence). Case studies.
5 units, Win (Morris, E)

IPS 212. Issues in Development—Current policy issues in development economics and how they relate to sub-Saharan Africa. Economic theories and econometric methods necessary for credible development program evaluation and to explain persistent African economic underdevelopment.
5 units, Spr (Miguel, E)

IPS 219. The Role of Intelligence in U.S. Foreign Policy—How intelligence supports U.S. national security and foreign policies. How it has been used by U.S. presidents to become what it is today; organizational strengths and weaknesses; how it is monitored and held accountable to the goals of a democratic society; and successes and failures. Current intelligence analyses and national intelligence estimates are produced in support of simulated policy deliberations.
5 units, Spr (Hansen, K)

IPS 230. Democracy, Development, and the Rule of Law—(Same as INTNLREL 114D, POLISCI 114D/314D.) Links among the establishment of democracy, economic growth, and the rule of law. How democratic, economically developed states arise. How the rule of law can be established where it has been historically absent. Variations in how such systems function and the consequences of institutional forms and choices. How democratic systems have arisen in different parts of the world. Available policy instruments used in international democracy, rule of law, and development promotion efforts.

5 units, Aut (Stoner-Weiss, K; McFaul, M)

IPS 240. Issues in International Security and Cooperation—Gateway seminar. Students attend POLISCI 114S lectures. Major threats and global responses to international and regional security. Political and technical issues involved in arms control, the military legacy of the Cold War, regional conflicts, proliferation of advanced weapons capabilities, civil and ethnic wars, and terrorism.

5 units, Win (Crenshaw, M)

IPS 250. International Conflict: Management and Resolution—(Same as LAW 656, POLISCI 210R.) Interdisciplinary. Theoretical insights and practical experience in resolving inter-group and international conflicts. Sources include social psychology, political science, game theory, and international law. Personal, strategic, and structural barriers to solutions. How to develop a vision of a mutually bearable shared future, trust in the enemy, and acceptance of loss that a negotiated settlement may produce. Spoilers who seek to sabotage agreements. Advantages and disadvantages of unilateral versus reciprocal measures. Themes from the Stanford Center of International Conflict and Negotiation (SCICN).

5 units, Win (Holloway, D; Weiner, A; Ross, L; Bland, B)

IPS 299. Directed Reading—IPS students only. May be repeated for credit.

1-5 units, Aut, Win, Spr, Sum (Staff)

IPS 314S. Decision Making in U.S. Foreign Policy—(Same as POLISCI 314S.) Priority to IPS students. Formal and informal processes involved in U.S. foreign policy decision making. The formation, conduct, and implementation of policy, emphasizing the role of the President and executive branch agencies. Theoretical and analytical perspectives; case studies.

5 units, Spr (Blacker, C)

COGNATE COURSES

See respective department listings for course descriptions. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ANTHSCI 167/267. Social Policy for Sustainable Resource Use—(Same as EARTHSYS 167/267.)

5 units, Spr (Irvine, D)

ANTHSCI 167C/267C. Managing the Commons: Evolving Theories for Sustainable Resource Use—(Same as EARTHSYS 167C/267C.)

5 units, Aut (Irvine, D)

ANTHSCI 170. Medical Anthropology—(Same as HUMBIO 178.)

3 units, not given this year

ANTHSCI 179/279. Environmental Change and Emerging Infectious Diseases—(Same as HUMBIO 114.)

3-5 units, Aut (Durham, W; Jones, J)

BIOSCI 147/247. Controlling Climate Change in the 21st Century—(Same as EARTHSYS 147/247, HUMBIO 116.)

3 units, alternate years, not given this year (Schneider, S)

CASA 152/252. Archaeology: World Cultural Heritage

5 units, alternate years, not given this year

CASA 336. Anthropology of Rights

5 units, alternate years, not given this year

CASA 364. The Anthropology of Development

5 units, not given this year

CEE 142A/242A. Creating Sustainable Development

3 units, Win (Christensen, S)

CEE 265A. Sustainable Water Resources Development

3 units, Aut (Ortolano, L)

CEE 265C. Water Resources Management

3 units, Aut (Findikakis, A)

CEE 265D. Water and Sanitation in Developing Countries

3 units, Win (Davis, J)

COMM 136/236. Democracy and the Communication of Consent—(Same as POLISCI 134.)

5 units, Aut (Fishkin, J)

COMM 236G/336G. Democracy, Justice, and Deliberation

1-5 units, not given this year (Fishikin, J)

COMM 238/338. Democratic Theory: Normative and Empirical Issues

1-5 units, not given this year (Fishikin, J)

COMM 244/344. Democracy, Press, and Public Opinion

1-4 units, not given this year (Fishikin, J)

EARTHSYS 175/275. The California Coast: Science, Policy, and Law—(Same as CEE 175A/275A, LAW 514.)

3-4 units, Win (Caldwell, M; Boehm, A; Sivas, D)

EARTHSYS 180/280. Fundamentals of Sustainable Agriculture—(Same as BIOSCI 180/280.)

3 units, alternate years, not given this year

ECON 106. World Food Economy

5 units, not given this year

ECON 214. Development Economics I

2-5 units, Aut (Jayachandran, S)

ECON 216. Development Economics II

2-5 units, Win (DeGiorgi, G)

ECON 217. Development Economics III

2-5 units, not given this year

ECON 243. Economics of Environment

2-5 units, not given this year

ECON 250A. Natural Resource and Energy Economics

2-5 units, not given this year

ECON 250B. Environmental Economics

2-5 units, not given this year

ECON 265. International Economics I

2-5 units, Aut (Fitzgerald, D)

ECON 266. International Economics II

2-5 units, Win (Staiger, R)

FRENLIT 278. Rethinking Identities in the Era of Globalization—(Same as COMPLIT 246.)

3-5 units, not given this year

GES 145/245. Energy Flow and Policy: The Pacific Rim—(Same as EARTHSYS 145/245.)

3 units, alternate years, not given this year (Howell, D)

GES 253. Petroleum Geology and Exploration

3 units, alternate years, not given this year (Graham, S)

HISTORY 102. The History of the International System

5 units, Win (Sheehan, J)

HISTORY 103E. History of Nuclear Weapons—(Same as POLISCI 116.)

5 units, Spr (Holloway, D)

HISTORY 202/306E. International History and International Relations Theory—(Same as POLISCI 316.)
5 units, not given this year (Holloway, D)

HISTORY 204G/304G. War, Culture, and Society in the Modern Age
5 units, Aut (Weiner, A)

HISTORY 224A/324A. Modern Russia, Iran, and Afghanistan
4-5 units, not given this year (Crews, R)

HISTORY 226E. The Creation and Destruction of Yugoslavia
5 units, Aut (Knezevic, J)

HISTORY 226G/326G. Civilians and War in Modern Europe
4-5 units, Spr (Knezevic, J)

HISTORY 227/327. East European Women and War in the 20th Century
5 units, not given this year (Jolluck, K)

HISTORY 257/347. The Politics and Ethics of Modern Science and Technology—(Same as STS 221.)
4-5 units, not given this year (Bernstein, B)

HISTORY 291E/391E. Maps, Borders, and Conflict in East Asia
4-5 units, not given this year (Wigen, K)

HRP 207. Issues and Methods of Health Services and Policy Research
2 units, Aut (Baker, L; McDonald, K; Haberland, C)

HRP 208. Issues and Methods of Health Services and Policy Research 2
2 units, offered occasionally

HRP 212. Crosscultural Medicine
3 units, Spr (Corso, I)

HRP 231. Epidemiology of Infectious Diseases
3 units, alternate years, not given this year

HUMBIO 122. International Health Policy: Comparative National Health Care Systems
4 units, Win (Heller, G)

HUMBIO 122S. Social Class, Race, Ethnicity, Health
4 units, given next year

HUMBIO 153. Parasites and Pestilence: Infectious Public Health Challenges
4 units, Spr (Smith, D)

INTNLREL 140C. The U.S., UN Peacekeeping, and Humanitarian War
5 units, Spr (Patenaude, B)

LAW 220. Regulated Industries
3 units, Win (Victor, D)

LAW 313. Health Law and Policy I—(Same as HRP 210.)
3 units, Aut (Greely, H)

LAW 330. International Human Rights Clinic
3 units, Win (Martinez, J)

LAW 336. International Jurisprudence
3 units, Aut (Stacy, H)

LAW 338. Land Use
3 units, Aut (Caldwell, M; Diamond, S)

LAW 605. International Environmental Law: Climate Change
3 units, Aut (Wara, M)

MED 242. Physicians and Human Rights
1 unit, Win (Laws, A)

MED 243. Biomedical and Social Science Responses to the HIV/AIDS Epidemic
3 units, Spr (Katzenstein, D)

MED 262. Economics of Health Improvement in Developing Countries—(Same as ECON 127, HUMBIO 121.)
5 units, Win (Miller, N)

MGTECON 332. Analysis of Costs, Risks, and Benefits of Health Care—(Same as BIOMEDIN 432, HRP 392.)
4 units, Aut (Garber, A; Owens, D)

MS&E 243. Energy and Environmental Policy Analysis—(Same as IPER 243.)
3 units, Spr (Sweeney, J)

MS&E 248. Economics of Natural Resources
3-4 units, Aut (Sweeney, J)

MS&E 294. Climate Policy Analysis
3 units, Win (Weyant, J), alternate years, not given next year

PHIL 176/276. Political Philosophy: The Social Contract Tradition
4 units, not given this year

PHIL 377. Topics in Democratic Theory—(Same as POLISCI 333.)
3-5 units, not given this year

POLISCI 110B. Strategy, War, and Politics
5 units, not given this year

POLISCI 110D/110Y. War and Peace in American Foreign Policy
5 units, Spr (Schultz, K)

POLISCI 113F. The United Nations and Global Governance
5 units, not given this year

POLISCI 215. Explaining Ethnic Violence
5 units, Aut (Fearon, J)

POLISCI 218. U.S. Relations in Iran
5 units, Aut (Milani, A)

POLISCI 221. Tolerance and Democracy
5 units, Spr (Sniderman, P)

POLISCI 223S. The Imperial Temptation: U.S. Foreign Policy in a Unipolar World
5 units, Aut (Joffe, J)

POLISCI 231S. Contemporary Theories of Justice
5 units, not given this year

POLISCI 232. Civil Society and the Nonprofit Sector—(Same as URBANST 121.)
2-4 units, not given this year

POLISCI 236. Theories of Civil Society, Philanthropy, and the Nonprofit Sector
5 units, Spr (Reich, R; Sievers, B)

POLISCI 244R. Political Economy of Disease: AIDS in Historical Perspective
5 units, not given this year

POLISCI 318S. State Building
5 units, Spr (Krasner, S)

POLISCI 340S. Political Economy of Post-Communism
5 units, Spr (McFaul, M)

POLISCI 341T. Comparative Democratization and Regime Change
5 units, not given this year

POLISCI 343R. African Civil Wars in Comparative Perspectives: A Research Seminar
5 units, not given this year

POLISCI 346S. The Logic of Authoritarian Government, Ancient and Modern—(Same as HISTORY 378A.)
5 units, Aut (Haber, S)

POLISCI 431. Collective Action in Democratic Athens—(Same as CLASSHIS 431.)
5 units, not given this year

POLISCI 432. Graduate Seminar: Global Justice—(Same as PHIL 372C.)
5 units, not given this year

POLISCI 434. Democracy and the Constitution—(Same as PHIL 374C.)
5 units, not given this year

POLISCI 440B. Political Economy of Development—(Same as HISTORY 378E.)
5 units, Aut (Haber, S)

POLISCI 441. Politics of Development
5 units, Win (Díaz-Cayeros, A)

POLISCI 443S. Political Economy of Reform in China
5 units, Aut (Oi, J)

PSYCH 215. Mind, Culture, and Society
3 units, Win (Markus, H; Steele, C)

PUBLPOL 231. Political Economy of Health Care in the United States—(Same as MGTECON 331, HRP 391.)
4 units, Spr (Kessler, D; Bundorf, M)

SOC 109/209. Sociology of Terrorism
5 units, Spr (Meyersson Milgrom, E)

SOC 110/210. Politics and Society
5 units, Aut (Beck, C)

SOC 118/218. Social Movements and Collective Action
5 units, not given this year

SOC 140/240. Introduction to Social Stratification
5 units, Win (Sandefur, R)

SOC 141/241. Controversies about Inequality
5 units, Spr (Grusky, D)

SOC 147A/247A. Comparative Ethnic Conflict
5 units, Win (Olzak, S)

SOC 314. Economic Sociology
3-5 units, Aut (Granovetter, M)

SOC 314A. Social Norms and Corruption in the Economy
3-5 units, offered occasionally

SOC 345. Seminar in Comparative Race and Ethnic Relations
3-5 units, not given this year

SOC 368. Workshop: China Social Science—(Same as POLISCI 348R.)
1-5 units, Aut, Win, Spr (Walder, A; Zhou, X; Oi, J)

STS 210. Ethics, Science, and Technology
4 units, Spr (McGinn, R), alternate years, not given next year

STS 279. Technology, Policy, and Management in Newly-Industrializing Countries
2-4 units, Spr (Forbes, N), offered occasionally

INTERNATIONAL RELATIONS

Director: Kenneth Schultz (Political Science)

Faculty Committee: Coit D. Blacker (Freeman Spogli Institute for International Studies), James Fearon (Political Science), Judith L. Goldstein (Political Science), Stephen H. Haber (Political Science), Timothy Josling (Freeman Spogli Institute for International Studies), Michael McFaul (Political Science), Ronald I. McKinnon (Economics), James Sheehan (History), Michael Tomz (Political Science)

Affiliated Faculty: David Abernethy (Political Science), Barton Bernstein (History), Gordon Chang (History), Larry J. Diamond (Hoover Institution), Peter Duus (History), Amir Eshel (German Studies), Zephyr Frank (History), Lawrence H. Goulder (Economics), David J. Holloway (History, Political Science), Terry L. Karl (Political Science), David M. Kennedy (History), Stephen D. Krasner (Political Science), Gail Lapidus (Freeman Spogli Institute for International Studies), Beatriz Magaloni (Political Science), Mark I. Mancall (History), Isabela Mares (Political Science), Robert McGinn (Management Science and Engineering), Norman Naimark (History), Rosamond Naylor (Freeman Spogli Institute for International Studies), Jean C. Oi (Political Science), Daniel I. Okimoto (Political Science), William J. Perry (Freeman Spogli Institute for International Studies, Management Science and Engineering), Richard Roberts (History), Scott Sagan (Political Science), Debra M. Satz (Philosophy), Andrew Walder (Sociology), Amir Weiner (History), Jeremy Weinstein (Political Science), Ann Wren (Political Science)

Other Affiliation: Jasmina Bojic (International Relations), Christophe Crombez (Freeman Spogli Institute for International Studies), Rafiq Dossani (Freeman Spogli Institute for International Studies), Gili S. Drori (International Relations), John Dunlop (Hoover Institution), Yifat Holzman-Gazit (School of Law), Katherine Jolluck (History), Myung-koo Kang (Freeman Spogli Institute for International Studies), Paul Kapur (Freeman Spogli Institute for International Studies), Martin W. Lewis (History), Pawel Lutomski (International Relations), Kenneth Mcelwain (International Relations), Alice Lyman Miller (Hoover Institution), Thomas O'Keefe (International Relations), Bertrand Patenaude (Hoover Institution), Hamid Shomali (Iranian Studies), Stephen Stedman (Political Science), Richard Steinberg (International Comparative and Area Studies), Kathryn Stoner-Weiss (Freeman Spogli Institute for International Studies)

Program Office: Encina Hall West, Room 216
Mail Code: 94305-6045
Phone: (650) 723-4547
Web Site: http://internationalrelations.stanford.edu

Courses in International Relations have the subject code INTNLREL. For a complete list of subject codes, see Appendix.

International Relations (IR) is an interdisciplinary undergraduate major focusing on the changing political, economic, and cultural relations within the international system in the modern era. The program explores how global, regional, and domestic factors influence relations among world actors. Students are equipped with the skills and knowledge necessary to analyze choices and challenges that arise in this arena. IR majors pursue a study in world politics that includes courses in political science, economics, history, and languages, focusing on issues such as international security, international political economy, political and economic development, and democratization. Students must spend at least one quarter overseas and show two-year proficiency in a foreign language. Many IR students pursue careers in government, nongovernmental organizations, and business, or go to graduate school in law, business, economics, or political science.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Requirements for the major (70 units) are as follows; IR core courses are lited in items 1-5:

1. POLISCI 1
2. POLISCI 110A or 110B or 110C or 110D or HISTORY 158
3. ECON (10 units), two of these five courses: ECON 1A, 1B, 50, 51, 52
4. Two additional upper-division Economics courses from the IR approved course offerings lists
5. At least one of the following skills classes: ECON 102A, POLISCI 150A, STATS 60
6. Complete either a functional specialization or an area specialization (see below for descriptions of specializations). Courses that are used in the core area (1-5 above) cannot also be counted for the specialization.
7. At least one course must be an upper-division seminar or colloquium.
8. At least one course designated as writing intensive (WIM) for International Relations.
9. No more than 20 units can be lower-division courses.
10. A minimum grade of 'C' is required for courses to count towards major requirements.
11. Completion of one quarter study overseas either through the Stanford Overseas Studies Program or an approved non-Stanford program; non-Stanford programs must be pre-approved by the IR program before the student enrolls in the program.
12. Proficiency in a foreign language through two years of course work (second-year, third-quarter) or a proficiency exam.

FUNCTIONAL SPECIALIZATION

The three functional specializations are:

1. Comparative Political and Historical Analysis (CPHA)
2. Comparative Culture and Society (CCAS)
3. Comparative and International Political Economy (CIPE)

Students must complete a total of seven courses (35 units) for their functional specialization. Four courses must be from the student's functional area (CPHA, CCAS, CIPE); two courses from a second track; and the final course from the third track (4-2-1). Consult the updated course offering lists available in the International Relations office or on the web site for IR approved courses in each track.

Functional specializations are not declared on Axess.

AREA SPECIALIZATION

The area specializations are: Africa, Europe, Latin America, and Russia/East Europe. Students must complete a total of seven courses (35 units) with five courses directly related to their area specialization. Three of these five courses must be in one of the three tracks (CPHA, CCAS, CIPE), one course in a second track, and the final course in the third track. The ten remaining units must be fulfilled by comparative or further area course work.

Students must also demonstrate proficiency in a language, other than English, commonly spoken in the area chosen, by completing two years of language study or by passing a second-year, third-quarter proficiency exam.

Check the IR office for updated information about the area specialization requirements.

Area specializations are not declared on Axess.

DECLARING THE MAJOR

The International Relations major must be declared no earlier than the beginning of sophomore year and no later than the end of the second quarter of the junior year. Students must submit an acceptable proposal to the director of the program and declare IR on Axess. Students completing a double major, or fulfilling International Relations as a secondary major, are also required to file a proposal by the end of the second quarter of the junior year.

MINORS

A minor in International Relations is intended to provide an interdisciplinary background allowing a deeper understanding of contemporary international issues. Declaration of the minor must take place no later than the end of the second quarter of the junior year. To declare, complete the application for a minor on Axess.

Students complete the minor by taking seven unduplicated courses (35 units) from the IR curriculum, including the following:

1. POLISCI 1
2. Two of these five courses: POLISCI 110A,B,C,D, or HISTORY 158
3. Four courses from one of the three tracks (CPHA, CCAS, CIPE), or four courses relating to the same geographic region (Africa, Europe, Latin America, and Russia/East Europe). Consult the updated course offering lists available in the International Relations office or on the web site.

HONORS PROGRAM

The International Relations honors program offers qualified students the opportunity to conduct a major independent research project under faculty guidance. Such a project requires a high degree of initiative and dedication, significant amounts of time and energy, and demonstrated skills in research and writing.

In their junior year, students should consult with prospective honors advisers, choose the courses that provide academic background in their areas of inquiry, and demonstrate an ability to conduct independent research. Students can select from the IR honors option or the CDDRL (Center on Democracy, Development, and the Rule of Law) option which focuses on issues of democracy, development, and the rule of law; for information on the CDDRL, see http://cddrl.stanford.edu/.

Students should submit their honors thesis proposal late in Winter Quarter of the junior year; check with IR office for the exact deadline.

Prerequisites for participation include a 3.5 grade point average (GPA), a strong overall academic record, good academic standing, successful experience in writing a research paper, and submission of an acceptable thesis proposal. Students are required to enroll in INTNLREL 200A, International Relations Honors Field Research, in Spring Quarter of their junior year and consider participating in Honors College. CDDRL option students should enroll in INTNLREL 199, Honors Research: Democracy, Development, and the Rule of Law in Developing Countries. In their senior year, honors students must enroll in INTNLREL 200B in Autumn Quarter and in research units each quarter with their faculty adviser. Honors students present a formal defense of their theses in mid-May. Students must receive at least a grade of 'B+' in order to graduate with honors in International Relations.

GRADUATE PROGRAM

MASTER OF ARTS

It is possible for students majoring in International Relations to work simultaneously for a coterminal master's degree in a number of related fields. Coterminal students should consult advisers in both departments or programs to ensure that they fulfill the degree requirements in both fields. For information on the M.A. program in International Policy Studies, see the "International Policy Studies" section in this bulletin.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement for International Relations.

CORE

ECONOMICS

ECON 1A. Introductory Economics A
5 units, Aut (Clerici-Arias, M), Win (Makler, C), Sum (Staff)

ECON 1B. Introductory Economics B
5 units, Win (Amador, M), Spr (Cojoc, D), Sum (Staff)

ECON 50. Economic Analysis I
5 units, Aut (Abramitzky, R), Spr (Tendall, M), Sum (Staff)

ECON 51. Economic Analysis II
5 units, Aut (Tendall, M), Win (Einav, L), Sum (Staff)

ECON 52. Economic Analysis III
5 units, Win (Jaimovich, N), Spr (Klenow, P), Sum (Staff)

ECON 102A. Introduction to Statistical Methods (Postcalculus) for Social Scientists
5 units, Aut, Win (Steiner, F)

HISTORY

HISTORY 158. The United States Since 1945
4-5 units, Win (Bernstein, B)

POLITICAL SCIENCE

POLISCI 1. Introduction to International Relations
5 units, Spr (Tomz, M)

POLISCI 110A. Sovereignty and Globalization
5 units, not given this year

POLISCI 110B. Strategy, War, and Politics
5 units, not given this year

POLISCI 110C/110X. America and the World Economy
5 units, Win (Goldstein, J)

POLISCI 110D/110Y. War and Peace in American Foreign Policy
5 units, Spr (Schultz, K)

POLISCI 150A/350A. Political Methodology I
5 units, Aut (Rivers, D)

STATISTICS

STATS 60. Introduction to Statistical Methods: Precalculus—(Graduate students register for 160; same as PSYCH 10.)
5 units, Aut (Thomas, E), Win (Walther, G), Spr (Boik, J), Sum (Staff)

ADDITIONAL OFFERINGS

The courses listed below fulfill the IR functional specialization track requirements in CPHA, CCAS, and CIPE, and can fulfill the area specialization option in Africa, Europe, Latin America, or Russia/East Europe. See http://internationalrelations.stanford.edu or the International Relations program office for specific course designations. For course descriptions and General Education Requirement (GER) information, see the respective department listings. Additional relevant courses may be offered; for updated information, visit the office or the web site.

COMPARATIVE POLITICAL AND HISTORICAL ANALYSIS (CPHA)

INTNLREL 112. International Security in South Asia—Topics include: partition of the Indian subcontinent; characteristics of the Indian and Pakistani militaries; India's war with China; Kashmir dispute; Indo-Pakistani wars and security competition; low intensity conflict in Nepal and Sri Lanka; and nuclear proliferation on the subcontinent.
5 units, Aut (Kapur, S)

INTNLREL 114D. Democracy, Development, and the Rule of Law—(Same as IPS 230, POLISCI 114D/314D.) Links among the establishment of democracy, economic growth, and the rule of law. How democratic, economically developed states arise. How the rule of law can be established where it has been historically absent. Variations in how such systems function and the consequences of institutional forms and choices. How democratic systems have arisen in different parts of the world. Available policy instruments used in international democracy, rule of law, and development promotion efforts. GER:DB-SocSci
5 units, Aut (Stoner-Weiss, K; McFaul, M)

INTNLREL 116. Politics of Divided Korea—Political and economic transformation. Colonialism and its impacts on modernization; war and social change; the rise and fall of authoritarianism; and economic development and crisis. The industrialization of S. Korea. The nature of modern, industrial S. Korean society consequent upon such rapid economic and social change. N. Korean development and recent threats.
5 units, Aut (Kang, M)

INTNLREL 120. The Organization and Behavior of Democracies—How the rules of the game affect political competition and policy output. How formal political institutions determine who gets into power and how much authority those actors have; how these institutions arise, what they do, and how they can be manipulated. Topics include the influence of electoral rules on partisan competition, why the difference between parliamentary and presidential systems matters, the costs and benefits of federalism, and principal-agent relationships between voters, elected representatives, and bureaucrats. Case studies of actual or simulated new democracy: what kinds of institutions best foster economic growth, minority representation, and political stability.
5 units, Aut (McElwain, K)

INTNLREL 125. Japanese Postwar Politics—How the postwar Japanese experience confirms or defies accepted wisdom in comparative and international politics, focusing on domestic party politics. The causes and consequences of the LDP's single-party dominance, given that the expectation of democratic competition is alternation in power. Electoral politics, conflicts between and within parties, and the distribution of winners and losers. Comparison of Japan with democracies in Asia and Europe. Readings from general theories in comparative politics.
5 units, Win (Mcelwain, K)

INTNLREL 131. Globalization and Organizations—How organizations act as the carriers of globalization processes by expanding worldwide, proliferating social procedures, establishing isomorphic structures, and diffusing cultural patterns. Political structures, international relations, commercial organizations, cultural institutions. Global organizational expansion, forms of organizational adaptation, notions of national sovereignty under global organizational expansion, and forms of national and international governance. Studies of global organizational fields including science, rights, environment, development, combining theoretical, comparative, and case study pieces.
5 units, not given this year (Drori, G)

INTNLREL 140A. International Law and International Relations—What is the character of international legal rules? Do they matter in international politics, and if so, to what degree? The foundational theories, principles, and sources of public international law. Prominent theories of international relations and how they address the role of law in international politics. Practical problems such as human rights, humanitarian intervention, and enforcement of criminal law. International law as a dynamic set of rules, at times influenced by power, at other times constraining it, but always essential to studying international relations. WIM
5 units, Aut (Lutomski, P)

INTNLREL 140B. Theories of International Law—Competing theories of international law, including approaches based on natural law, positivism, the Grotian tradition, realism, rational institutionalism, liberalism, social construction, and critical theory; evaluations based upon explanatory power, parsimony, and prescriptive implications. How international legal arguments are made through each theoretical perspective. Primary and secondary materials by international law theorists and political scientists. Term paper.
5 units, Win (Steinberg, R)

INTNLREL 163. History and Geography of Contemporary Global Issues—(Same as HISTORY 206.) The historical background and geographical context of contemporary global issues and events. Texts are a world atlas and regular reading of the *New York Times* and *The Economist*. Topics vary according to what is happening in the world. Student presentations. GER:DB-SocSci, WIM
5 units, Aut (Lewis, MW)

HISTORY

HISTORY 102. The History of the International System—WIM
5 units, Win (Sheehan, J)

HISTORY 120C. 20th-Century Russian and Soviet History
5 units, not given this year

HISTORY 123. Reform and Revolution in Modern Russia, 1856-2008
5 units, Spr (Patenaude, B)

HISTORY 125. 20th-Century Eastern Europe
5 units, Win (Jolluck, K)

HISTORY 137/337. The Holocaust
4-5 units, Spr (Felstiner, M)

HISTORY 145B. Africa in the 20th Century
5 units, Win (Hanretta, S)

HISTORY 150C. The United States in the Twentieth Century
5 units, Spr (Camarillo, A; Chang, G)

HISTORY 158. The United States Since 1945
4-5 units, Win (Bernstein, B)

HISTORY 181B. The Middle East in the 20th Century
5 units, not given this year

HISTORY 195. Modern Korean History
5 units, Aut (Moon, Y)

HISTORY 195C. Modern Japanese History
5 units, Spr (Uchida, J)

HISTORY 197. Southeast Asia: From Antiquity to the Modern Era
5 units, Win (Lewis, M)

HISTORY 198. The History of Modern China
5 units, Win (Mullaney, T)

HISTORY 202/306E. International History and International Relations Theory—(Same as POLISCI 316.)
5 units, not given this year (Holloway, D)

HISTORY 224/324. Violence, Islam, and the State in Central Asia
5 units, not given this year (Crews, R)

HISTORY 224A/324A. Modern Russia, Iran, and Afghanistan
4-5 units, not given this year (Crews, R)

HISTORY 228/328. Circles of Hell: Poland in World War II
5 units, not given this year (Jolluck, K)

HISTORY 252/355. Decision Making in International Crises: The A-Bomb, the Korean War, and the Cuban Missile Crisis
4-5 units, Aut (Bernstein, B)

HISTORY 256/356. U.S.-China Relations: From the Opium War to Tiananmen
4-5 units, Win (Chang, G)

INTERNATIONAL POLICY STUDIES

IPS 210. The Politics of International Humanitarian Action
5 units, Aut (Morris, E)

IPS 211. The Transition from War to Peace: Peacebuilding Strategies
5 units, Win (Morris, E)

IPS 219. The Role of Intelligence in U.S. Foreign Policy
5 units, Spr (Hansen, K)

MANAGEMENT SCIENCE AND ENGINEERING

MS&E 193/193W/293. Technology and National Security
3 units, Aut (Perry, W; Hecker, S)

POLITICAL SCIENCE

POLISCI 110B. Strategy, War, and Politics
5 units, not given this year

POLISCI 110D/110Y. War and Peace in American Foreign Policy—WIM
5 units, Spr (Schultz, K)

POLISCI 111D. British Politics
5 units, Spr (Dorfman, G)

POLISCI 113F. The United Nations and Global Governance
5 units, not given this year

POLISCI 114S. International Security in a Changing World
5 units, Win (Sagan, S; Blacker, C)

POLISCI 116. History of Nuclear Weapons—(Same as HISTORY 103E.)
5 units, Spr (Holloway, D)

POLISCI 140L. China in World Politics
5 units, not given this year

POLISCI 144T. Democracies and Dictatorships
5 units, Spr (Magaloni, B)

POLISCI 147. Comparative Democratic Development
5 units, Win (Diamond, L)

POLISCI 147S. Comparative Democratic Politics
5 units, Win (Jusko, K)

POLISCI 148/348. Chinese Politics: The Transformation and the Era of Reform
5 units, Spr (Oi, J)

POLISCI 149S. Islam and the West
5 units, Spr (Milani, A)

POLISCI 149T. Middle Eastern Politics
5 units, Win (Blaydes, L)

POLISCI 212. Managing Global Complexity—(Same as IPS 201.)
3 units, Spr (Krasner, S; Stedman, S)

POLISCI 217. International Organizations
5 units, Spr (Lipscy, P)

POLISCI 218. U.S. Relations in Iran
5 units, Aut (Milani, A)

POLISCI 245R. Politics in Modern Iran
5 units, Win (Milani, A)

POLISCI 248. Mexican Politics
5 units, Spr (Díaz-Cayeros, A)

POLISCI 248S. Latin American Politics
5 units, Win (Magaloni, B)

POLISCI 346S. The Logic of Authoritarian Government, Ancient and Modern—(Same as HISTORY 378A.)
5 units, Aut (Haber, S)

SOCIOLOGY

SOC 167A/267A. Asia-Pacific Transformation

5 units, Win (Shin, G)

COMPARATIVE CULTURE AND SOCIETY (CCAS)

INTNLREL 106. Present Pasts: History and Memory in Culture and Politics—(Same as GERLIT 290.) Theoretical, comparative, and interdisciplinary approach to historical representation and remembrance. Focus is on the uses and abuses of remembering and historiographic accounting for the recent past in culture and politics. Examples include post-WW II Germany and post-1948 Israel. How the memory of 9/11 is played out in contemporary American discourse, including political debates, literature, and popular culture.

5 units, not given this year (Eshel, A)

INTNLREL 114D. Democracy, Development, and the Rule of Law—(Same as IPS 230, POLISCI 114D/314D.) For description, see "Comparative Political and Historical Analysis" subsection above.

5 units, Aut (Stoner-Weiss, K; McFaul, M)

INTNLREL 136R. Introduction to Global Justice—(Same as POLISCI 136R.) Recent work in political theory on the ethics of international relations. Topics include human rights, global economic justice, and the problem of global poverty.

5 units, Spr (Pasternak, A; de Bres, H)

INTNLREL 140C. The U.S., UN Peacekeeping, and Humanitarian War—The involvement of U.S. and the UN in major wars and international interventions since the 1991 Gulf War. The UN Charter's provisions on the use of force, the origins and evolution of peacekeeping, the reasons for the breakthrough to peacemaking and peace enforcement in the 90s, and the ongoing debates over the legality and wisdom of humanitarian intervention. Case studies include Croatia and Bosnia, Somalia, Rwanda, Kosovo, East Timor, and Afghanistan. WIM

5 units, Spr (Patenaude, B)

INTNLREL 141A. Camera as Witness: International Human Rights Documentaries—Rarely screened documentary films, focusing on global problems, human rights issues, and aesthetic challenges in making documentaries on international topics. Meetings with filmmakers. GER:DB-Hum

5 units, Aut (Bojic, J)

INTNLREL 141B. Camera as Witness: A Forum for Global Dialogue—Challenges facing filmmakers documenting the struggle for human rights including communication of complex situations to an international audience, interpreting foreign cultures and politics, and filmmaker roles as artists, activists, and journalists. Meetings with filmmakers. GER:DB-Hum

5 units, not given this year (Bojic, J)

INTNLREL 150. The Arab-Palestinian Minority in Israeli Society—The ethnic and religious composition of Israel. Recent challenges to the primacy of the Jewish core of Israeli society; the status of the Arab-Palestinian minority in Israel. Issues include: the status of the Arabic language; the right to vote and run for office; allocation of state funds to minority projects and local governments; representation in decision making institutions; military service; and the Arab educational system. Political and legal dimensions of the minority status of Arab-Palestinians; impact of domestic Jewish/Palestinian politics on the Israeli/Arab international conflict.

5 units, Win (Holzman-Gazit, Y)

INTNLREL 161A. Global Human Geography: Asia and Africa—(Same as HISTORY 106A.) Global patterns of demography, economic and social development, geopolitics, and cultural differentiation, covering E. Asia, S. Asia, S.E. Asia, Central Asia, N. Africa, and sub-Saharan Africa. Use of maps to depict geographical patterns and processes.

5 units, Aut (Lewis, M.W.)

INTNLREL 161B. Global Human Geography: Europe and Americas—(Same as HISTORY 106B.) Patterns of demography, economic and social development, geopolitics, and cultural differentiation. Use of maps to depict geographical patterns and processes.

5 units, Win (Lewis, MW)

INTNLREL 166. Russia and Islam—Seminar. Focus is on 1985 to the present. The policies of Gorbachev toward the Muslim populace of the Soviet Union; how post-communist Russia under Yeltsin and Putin has dealt with its Muslim minorities; and the relationship of Russia to the newly independent states of Central Asia and the South Caucasus after the breakup of the USSR in 1991. The two major wars which Russia has fought with the secessionist Russian autonomous republic of Chechnya.

5 units, Win (Dunlop, J)

AFRICAN STUDIES

AFRICAST 111/211. Education for All? The Global and Local in Public Policy Making in Africa

5 units, Spr (Samoff, J)

ANTHROPOLOGY

CASA 77/277. Japanese Society and Culture

5 units, alternate years, not given this year

ECONOMICS

ECON 143. Ethics in Economics Policy

5 units, not given this year

EDUCATION

EDUC 136/306D. World, Societal, and Educational Change: Comparative Perspectives—(Same as SOC 231.)

4-5 units, Win (Drori, G)

HISTORY

HISTORY 185B. Jews in the Modern World

5 units, not given this year (Zipperstein, S)

HISTORY 221B. The Woman Question in Modern Russia

5 units, Aut (Jolluck, K)

HISTORY 227/327. East European Women and War in the 20th Century

5 units, not given this year (Jolluck, K)

HISTORY 245E/347E. Health and Society in Africa

4-5 units, not given this year (Roberts, R)

HISTORY 248S/448A. African Societies and Colonial States

4-5 units, not given this year (Roberts, R)

HISTORY 295J. Chinese Women's History

5 units, Spr (Sommer, M)

INTERNATIONAL POLICY STUDIES

IPS 210. The Politics of International Humanitarian Action

5 units, Aut (Morris, E)

JAPANESE GENERAL

JAPANGEN 51/251. Japanese Business Culture

3-5 units, Win (Dasher, R)

PHILOSOPHY

PHIL 171/271. Justice—(Same as ETHICSOC 171, IPS 208, POLISCI 136S, PUBLPOL 207.)

5 units, Aut (Cohen, J)

POLITICAL SCIENCE

POLISCI 141. The Global Politics of Human Rights

5 units, not given this year

POLISCI 149S. Islam and the West
5 units, Spr (Milani, A)

POLISCI 215. Explaining Ethnic Violence
5 units, Aut (Fearon, J)

SOCIOLOGY

SOC 110/210. Politics and Society
5 units, Aut (Beck, C)

SOC 111/211. State and Society in Korea
5 units, alternate years, not given this year

SOC 117A/217A. China Under Mao
5 units, Aut (Walder, A)

SCIENCE, TECHNOLOGY, AND SOCIETY

STS 110. Ethics and Public Policy—(Same as MS&E 197, PUBLPOL 103B.)
5 units, Win (McGinn, R)

COMPARATIVE INTERNATIONAL POLITICAL ECONOMY (CIPE)

INTNLREL 114D. Democracy, Development, and the Rule of Law—(Same as IPS 230, POLISCI 114D/314D.) For description, see "Comparative Political and Historical Analysis" subsection above.
5 units, Aut (Stoner-Weiss, K; McFaul, M)

INTNLREL 115. Development Issues in South Asia—Problems and solutions from theoretical and practical perspectives, including village economies and global networks, during the present period of growth.
5 units, Win (Dossani, R)

INTNLREL 117. Varieties of Capitalism in East Asia: Politics and Economic Reforms—Interaction between states and markets in Japan, S. Korea, and China, emphasizing similarities and differences in government reform attempts in response to globalization. Institutional arrangements to spur rapid economic growth. Differences in models of economic development and reforms, institutional settings, and cultural and sociopolitical contexts. How politics has determined the pace and sequence of economic reforms.
5 units, Win (Kang, M)

INTNLREL 118. The Political Economy of Modern Iran—Economic trends and changing priorities under the Pahlavi dynasty, constitutional monarchy, and the Islamic Republic. Development planning and the significance of oil. Fiscal, monetary, and exchange policies. Iran's economic standing in the world, distribution of income, poverty, educational programs, economic resources, and physical and human capital. Upcoming economic challenges.
5 units, Win (Shomali, H)

INTNLREL 122A. The Political Economy of the European Union—EU institutions, the legislative process, policies, relations with the U.S., and enlargement and the future of the EU. History and theories of EU integration. Democratic accountability of the institutions, and the emerging party system. Principal policies in agriculture, regional development, the internal market, single currency, and competition. Emphasis is on policies that affect the relations with the U.S. including trade and security. Results of the EU's constitutional convention.
5 units, Win (Crombez, C)

INTNLREL 130. Science, Technology, and Development—Global and sociological perspectives on science and technology expansion, comparing nations and regions. Social features such as gender equity; and social impact economic development strategies such as tech incubators, the triple helix model, and UN initiatives. Democratization, human rights, welfare of local populations, and national security. Policy issues, the digital divide, development debates, commodification of the public good, and notions of social change.
5 units, not given this year (Drori, G)

INTNLREL 133. Introduction to Comparative and International Political Economy—Economic growth and political redistribution in advanced industrialized democracies. Emphasis is on historical and institutional factors that undergird the distribution of economic power, and how tensions between socioeconomic actors play out in the political realm. Topics include: why and how governments tax their citizens; varieties of capitalism; endogenous growth theory; trajectories in the development of the welfare state; why some governments appear to waste more money than others; and how government policy may be constrained in a globalizing world.
5 units, Spr (Mcelwain, K)

INTNLREL 143. Nongovernmental Organizations and Development in Poor Countries—(Same as POLISCI 143.) Relations among nongovernmental organizations, governments, international organizations, and multinational corporations. How NGOs contribute to economic growth, equity, a sustainable environment, peace and order, and democracy in poor countries. Their record on natural disaster and war relief work. How NGOs based in rich countries interact with those based in poor ones. GER:DB-SocSci
5 units, Win (Abernethy, D)

INTNLREL 147. The Political Economy of the Southern Cone of South America—Argentina, Brazil, Paraguay, Uruguay, Bolivia, and Chile. Post-WW II political economy developments and political relations. Impacts of military rule from the 60s into the 80s. Regional and international political developments that led to MERCOSUR in 1991, and subsequent expansion.
5 units, Win (O'Keefe, T)

INTNLREL 148. Economic Integration of the Americas—Current attempts at economic integration throughout the Western Hemisphere, including the Andean Community, the Caribbean Common Market (CARICOM), the Latin American Integration Association (ALADI), MERCOSUR, the North American Free Trade Area (NAFTA), and the Central American Integration System (SICA). Emphasis is on practical applications of integration efforts and nuts-and-bolts issues of how integration efforts function.
5 units, Aut (O'Keefe, T)

INTNLREL 149. The Economics and Political Economy of the Multilateral Trade System—The historical development of the multilateral trade system, the current agenda of the World Trade Organization, and prospects for trade liberalization. Emphasis is on the economic rationale for multilateral trade rules, the political problems facing countries in supporting further liberalization, and the challenges to the legitimacy of WTO procedures and practices. Issues include the greater participation of developing countries, the impact of new members, and the relationship between the WTO and other multilateral bodies. Guest speakers; student research paper presentations.
5 units, Win (Josling, T)

BIOLOGICAL SCIENCES

BIOSCI 147/247. Controlling Climate Change in the 21st Century—(Same as EARTHSYS 147/247, HUMBIO 116.)
3 units, alternate years, not given this year (Schneider, S)

EAST ASIAN STUDIES

EASTASN 185C/285C. Economic Development of Greater China: Past, Present, and Future
3-5 units, Aut (Rozelle, S)

ECONOMICS

ECON 106. World Food Economy
5 units, not given this year

ECON 111. Money and Banking
5 units, Aut (Gould, A), Sum (Staff)

ECON 113. Technology and Economic Change
5 units, not given this year

ECON 115. European Economic History
5 units, Win (Chaudhary, L)

ECON 117. Economic History and Modernization of the Islamic Middle East
5 units, not given this year

ECON 118. Development Economics
5 units, Aut (Jayachandran, S)

ECON 120. Socialist Economies in Transition
5 units, not given this year

ECON 122. Economic Development of Latin America
5 units, Win (Schargrodsky)

ECON 124. Contemporary Japanese Economy
5 units, not given this year

ECON 126. Economics of Health and Medical Care—(Same as BIOMEDIN 156/256.)
5 units, Aut (Bhattacharya, J)

ECON 150. Economic Policy Analysis—(Same as PUBLPOL 104.)
5 units, Spr (Staff)

ECON 155. Environmental Economics and Policy—(Same as EARTHSYS 112.)
5 units, Win (Goulder, L)

ECON 162. Monetary Economics
5 units, not given this year

ECON 165. International Trade and Finance
5 units, Aut (Fitzgerald, D), Win (Staiger, R), Sum (Desmet, K)

ECON 166. International Trade
5 units, Spr (Staff)

ECON 167. European Monetary and Economic Integration
5 units, Win (Staff)

ECON 169/269. International Financial Markets and Monetary Institutions
5 units, Spr (Taylor, J)

HISTORY

HISTORY 279/379. Latin American Development: Economy and Society, 1800-2000
4-5 units, Spr (Frank, Z)

HUMAN BIOLOGY

HUMBIO 129. Critical Issues in International Women's Health
4 units, Win (Murray, A)

HUMBIO 129S. International Health
4 units, Win (Wise, P)

POLITICAL SCIENCE

POLISCI 110A. Sovereignty and Globalization
5 units, not given this year

POLISCI 110C/110X. America and the World Economy—110C fulfills WIM
5 units, Win (Goldstein, J)

POLISCI 140. Political Economy of Development
5 units, Win (Díaz-Cayeros, A)

POLISCI 211. Political Economy of East Asia
5 units, Spr (Lipscy, P)

POLISCI 216. Law, Economics, and Politics of International Trade—(Same as LAW 306.)
3-5 units, Win (Sykes, A; Goldstein, J)

POLISCI 242S. Politics of Welfare State Expansion and Reform
5 units, not given this year

POLISCI 247R. Politics and Economics in Democracies—WIM
5 units, Spr (Rodden, J)

1- AND 2-UNIT OPTIONS

INTNLREL 191. IR Journal
1 unit, Aut, Win, Spr (Schultz, K)

INDEPENDENT STUDY/HONORS

INTNLREL 197. Directed Reading in International Relations—Open only to declared International Relations majors.
3-5 units, Aut, Win, Spr, Sum (Staff)

INTNLREL 198. Senior Thesis—Open only to declared International Relations majors with approved senior thesis proposals.
2-5 units, Aut, Win, Spr, Sum (Staff)

INTNLREL 199. Honors Research: Democracy, Development, and the Rule of Law in Developing Countries—Restricted to students in the CDDRL option of the International Relations honors program. Goal is to prepare students to do research and/or fieldwork to complete their thesis research. Main currents in democracy and development literature concerning how economic growth and democratization are related; how the rule of law supports these processes in countries undergoing change. Student presentations of thesis questions; student groups develop research problems and designs. May be repeated for credit.
3-5 units, Spr (Stoner-Weiss, K)

INTNLREL 200A. International Relations Honors Field Research—For juniors planning to write an honors thesis during senior year. Initial steps to prepare for independent research. Professional tools for conceptualizing a research agenda and developing a research strategy. Preparation for field research through skills such as data management and statistics, references and library searches, and fellowship and grant writing. Creating a work schedule for the summer break and first steps in writing. Prerequisite: acceptance to IR honors program.
3 units, Spr (Drori, G)

INTNLREL 200B. International Relations Honors Seminar—Second of two-part sequence. For seniors working on their honors theses. Professional tools, analysis of research findings, and initial steps in writing of thesis. How to write a literature review, formulate a chapter structure, and set a timeline and work schedule for the senior year. Skills such as data analysis and presentation, and writing strategies. Prerequisites: acceptance to IR honors program, and 199 or 200A.
3 units, Aut (Drori, G)

OVERSEAS STUDIES

The following courses taught overseas are approved for the International Relations major; consult the updated course offering lists available in the International Relations office or on the IR website for track information. For course descriptions and additional information, see the "Overseas Studies" section of this bulletin, or http://osp.stanford.edu.

BEIJING

OSPBEIJ 13. China's Economy
5 units, Aut (Wang, D)

OSPBEIJ 19. Population and Society in East Asia
4 units, Spr (Zhou, Y)

OSPBEIJ 55. Chinese Economy in Transition
5 units, Spr (Zhou, L)

OSPBEIJ 66. Essentials of China's Criminal Justice System
5 units, Aut, Spr (Wang, S)

BERLIN

OSPBER 15. Shifting Alliances? The European Union and the U.S.
4-5 units, Win (Brückner, U)

OSPBER 83. World War II: Germany's Ever Present Past
4 units, Win (Tempel, S)

OSPBER 115X. The German Economy: Past and Present
4-5 units, Aut (Klein, I)

OSPBER 126X. A People's Union? Money, Markets, and Identity in the EU
4-5 units, Aut (Brückner, U)

OSPBER 161X. The German Economy in the Age of Globalization
4-5 units, Win (Klein, I)

OSPBER 174. Sports, Culture, and Gender in Comparative Perspective
5 units, Spr (Junghanns, W)

FLORENCE

OSPFLOR 36. Introduction to the International Economy: The State, the Firm and the Region
5 units, Spr (Di Minin, A)

OSPFLOR 49. The Cinema Goes to War: Fascism and World War II as Represented in Italian and European Cinema
5 units, Win (Campani, E)

OSPFLOR 77. Italian Politics Between Europe and the Mediterranean
5 units, Win (Morel, L)

OSPFLOR 78. An Extraordinary Experiment: Politics and Policies of the New European Union
5 units, Aut (Morlino, L)

OSPFLOR 79. Migrations and Migrants: The Sociology of a New Phenomenon
5 units, Aut (Allam, K)

OSPFLOR 97. Current Issues in Human Rights and International Justice
4 units, Spr (Vierucci, L)

OSPFLOR 106V. Italy: From Agrarian to Postindustrial Society
4 units, Aut (Mammarella, G)

KYOTO

OSPKYOTO 24. Japan in Contemporary International Affairs
5 units, Spr (MacDougall, T)

OSPKYOTO 215X. The Political Economy of Japan
4-5 units, Spr (Hayashi, T)

MOSCOW

OSPMOSC 20. The Soviet Union in World War II
5 units, Aut (Holloway, D)

OSPMOSC 22. Russia and the World
3 units, Aut (Holloway, D)

OSPMOSC 61. Problems and Prospects of Post-Soviet Eurasia
5 units, Aut (Trenin, D)

OSPMOSC 62. Economic Reform and Economic Policy in Modern Russia
5 units, Aut (Mau, V)

OXFORD

OSPOXFRD 24. British and American Constitutional Systems in Comparative Perspective
4-5 units, Aut (McMahon, R)

OSPOXFRD 35. Modern UK and European Government and Politics
4-5 units, Spr (Cappocia, G)

OSPOXFRD 45. British Postwar Economic Policy
4-5 units, Win (Forder, J)

OSPOXFRD 117W. Social Change in Modern Britain
4 units, Spr (Palmer, A)

OSPOXFRD 141V. European Imperialism and the Third World, 1870-1970
5 units, Spr (Jackson, A)

PARIS

OSPPARIS 33. The Economics of Climate Change: Policies in Theory and Practice in the EU and the U.S.
5 units, Spr (de Perthuis, C; Keppler, J; Leguet, B)

OSPPARIS 81. France During the Second World War: Between History and Memory
5 units, Win (Virgili, F)

OSPPARIS 91. Globalization and Its Effect on France and the European Union
5 units, Spr (Le Cacheux, J; Laurent, E)

OSPPARIS 124X. Building the European Economy: Economic Policies and Challenges Ahead
5 units, Aut (Le Cacheux, J; Laurent, E)

OSPPARIS 153X. Health Systems and Health Insurance: France and the U.S., a Comparison across Space and Time
4-5 units, Win (Fessler, J)

OSPPARIS 211X. Political Attitudes and Behavior in Contemporary France
4-5 units, Aut (Mayer, N; Muxel, A)

SANTIAGO

OSPSANTG 104X. Modernization and Culture in Latin America
5 units, Aut (Subercaseaux, B)

OSPSANTG 111. Social Heterogeneity in Latin America
5 units, Aut (Valdes, T)

OSPSANTG 116X. Modernization and its Discontents: Chilean Politics at the Turn of the Century
5 units, Spr (Correa, G)

OSPSANTG 119X. The Chilean Economy: History, International Relations, and Development Strategies
5 units, Spr (Muñoz, O)

OSPSANTG 129X. Latin America in the International System
4-5 units, Win (Fuentes, C)

OSPSANTG 130X. Latin American Economies in Transition
5 units, Aut (Staff)

OSPSANTG 141X. Politics and Culture in Chile
5 units, Spr (Subercaseaux, B)

OSPSANTG 160X. Latin America in the International Economy
5 units, Win (Staff)

OSPSANTG 221X. Political Transition and Democratic Consolidation: Chile in Comparative Perspective
5 units, Aut (Micco, S)

TAUBE CENTER FOR JEWISH STUDIES

Directors: Charlotte Fonrobert, Vered Shemtov

Academic Advisory Committee: Zachary Baker (Stanford University Libraries), Joel Beinin (History), Arnold Eisen (Religious Studies, emeritus), Amir Eshel (German Studies), John Felstiner (English), Charlotte Fonrobert (Religious Studies), Mark Mancall (History), Norman Naimark (History), Jack Rakove (History), Aron Rodrigue (History), David Rosenhan (Law, Psychology, emeritus), Gabriella Safran (Slavic Languages and Literatures), Vered Shemtov (African and Middle Eastern Languages and Literatures), Peter Stansky (History), Sam Wineburg (Education), Amir Weiner (History), Steven Zipperstein (History)

Offices: Building 360, Room 362G
Mail Code: 94305-2190
Phone: (650) 725-0577
Email: jewish.studies@stanford.edu
Web Site: http://jewishstudies.stanford.edu/

The Taube Center for Jewish Studies investigates all aspects of Jewish life in history, religion, literature, language, education and culture from biblical times to the present. Courses are offered on the undergraduate and graduate levels in a program complemented by a full range of guest lectures, conferences, and symposia. The Center annually sponsors the Donald and Robin Kennedy Undergraduate Award for the best undergraduate essay on any theme in Jewish Studies, the Dr. Bernard Kaufman Undergraduate Research Award in Jewish Studies to an undergraduate engaged in research on Jews in modernity, and it coordinates the annual Dorot Travel Grants for summer study in Israel.

Graduate students enroll in the program through the departments of English, History, Comparative Literature, or Religious Studies, or the School of Education, and must meet the requirements of those departments.

UNDERGRADUATE PROGRAMS

INDIVIDUALLY DESIGNED MAJOR

The Individually Designed Major in Jewish Studies permits interested students to focus their attention on the broad field of Jewish Studies and, at the same time, to expand their knowledge of one or another related fields.

Each major should complete at least 75 units, all in courses at or above the 100 level (or their equivalent). A maximum of 15 of these 75 units may be taken on a credit/no credit basis. A maximum of 5 of these 75 units may be taken in individual study or directed reading. Students must present evidence that demonstrates their ability to do independent work and have at least three full quarters of undergraduate work remaining at Stanford after the date on which the proposal is approved by the committee. Each major must obtain sponsorship from three faculty members, one of whom is the student's primary adviser, and from one of the Directors of the Taube Center for Jewish Studies. The application deadline for IDM proposals is the fifth week of Spring Quarter of the sophomore year. Applications are reviewed only once a year. Details about the written procedures and documents necessary for application for an individually designed major in Jewish Studies can be obtained at the Taube Center for Jewish Studies, Bldg. 360, Main Quad, (650) 725-2789.

REQUIREMENTS

The faculty members in Jewish Studies have designed the following structure for the major:

Category	*Units*
History and Society: Students must take one course in each of the three periods: biblical and ancient, medieval and modern, and contemporary	20
Religion: Biblical, rabbinic, medieval, modern	20
Literature: Hebrew, Holocaust, American Jewish, Yiddish, German Jewish, Russian Jewish	15
Hebrew Language (second year or beyond): Students who demonstrate by examination that they have completed the equivalent of at least two years of university-level modern Hebrew may apply the 12 units required in this category to more work in another category, with the approval of their primary adviser.	12
Ancillary Courses: Ancient history, medieval history, modern European history, history of philosophy, Islam, Christianity	8-10
Total number of units required	75-77

Students planning an Individually Designed Major in Jewish Studies are also urged to write an honors thesis. Students interested in declaring an Individually Designed Major in Jewish Studies should discuss this with their adviser(s) when discussing the major itself. Up to 10 honors thesis units may be included in the major.

No course proposed for the major may be counted as fulfilling more than one required category in the proposed major. Transfer credits from other universities must be approved by the appropriate Stanford authorities.

MINORS

The Jewish Studies minor is open to students in any department who wish to enrich their studies through acquiring knowledge in Jewish history, thought, religion, literature, and society. Students must complete their declaration of the minor no later than the last day of the quarter four quarters before degree conferral. For example, a student graduating in Spring Quarter must declare the minor no later than the last day of Spring quarter of the junior year.

Students must complete six courses for a maximum of 36 units toward the minor. Courses of study should be discussed and approved by a Jewish Studies faculty member in the departments of English, History, or Religious Studies, or the Division of Literatures, Cultures, and Languages and by the center directors. In addition to suggested introductory courses, students are also encouraged to take courses in Hebrew language as part of their Jewish studies minor, and are granted credit toward the minor for up to 5 units of language study. Any variations on the minor requirements must be approved in advance by one of the directors of the center.

Courses credited toward the minor must be distributed as follows:

1. Three introductory courses at the 100 level or below in the fields of history, religious studies, literature, or Hebrew language (for a maximum of 5 units) or one of the designated introductory courses offered through the Program in Comparative Studies in Race and Ethnicity.
2. Two courses at the 100 level or above from two of three areas of concentration (history, religious studies, or literature).
3. One seminar or undergraduate colloquium at the 200 level or above in one area of concentration (history, religious studies, or literature.) No course credited toward the Jewish Studies minor may be double counted toward major requirements.

COURSES

JEWISH LANGUAGES COURSES

Modern Hebrew, Biblical Hebrew and Yiddish language courses are offered by the Language Center. For descriptions, course numbers and additional information, see the African, Jewish, and Middle Eastern language offerings in the "Language Center" section of this bulletin.

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

AMELANG 126. Reflection on the Other: The Jew in Arabic Literature, the Arab in Hebrew Literature
4 units, Aut (Barhoum, K; Shemtov, V)

COMPLIT 218. Sholem Aleichem and Jewish Minority Discourse
5 units, Win (Staff)

COMPLIT 247. The Modern Jewish Literary Complex
5 units, Win (Staff)

DRAMA 155T/255T. Drama of the Holocaust
5 units, Spr (Staff)

ENGLISH 140A. Creative Resistance and the Holocaust
5 units, Win (Felstiner, J)

ENGLISH 201. The Bible and Literature
5 units, Spr (Parker, P)

GERGEN 104N. Resistance Writings in Nazi Germany
3 units, Aut (Bernhardt, E)

GERLIT 132. Insights and Outlooks: Confronting the Nazi Past through Literature
4 units, Aut (Tempel, S)

HISTORY 137/337. The Holocaust
4-5 units, Spr (Felstiner, M)

HISTORY 185G/385G. Coexistence and Conflict: Jews in Premodern Christian and Muslim Lands
4-5 units, Aut (Staff)

HISTORY 229/329. Poles and Jews
4-5 units, Win (Jolluck, K)

HISTORY 286/386. Jews among Muslims
4-5 units, Win (Rodrigue, A)

HISTORY 287A/387A. History of the Israeli-Arab Land Conflict
4-5 units, Spr (Staff)

HISTORY 486A. Graduate Research Seminar in Jewish History
4-5 units, Spr (Rodrigue, A)

HISTORY 486B. Graduate Research Seminar in Jewish History
4-5 units, Sum (Staff)

RELIGST 5N. Three Sacred Stories of Judaism, Christianity, and Islam
3-4 units, Aut (Gregg, R)

RELIGST 23. Introduction to Judaism
4 units, Aut (Radwin, A)

RELIGST 54. The Roots of Right and Wrong in Christianity, Judaism, and Islam
4 units, Win (Sadeghi, B)

RELIGST 57. Millennium, Messiahs, and Mayhem
4 units, Aut (Levinsky, D)

RELIGST 129. Modern Jewish Thought
4 units, Spr (Lerner, A)

RELIGST 237. Jewish and Christian Rome, 1st to 6th Centuries
3-5 units, Win (Gregg, R; Fonrobert, C)

RELIGST 321. The Talmud
4 units, Spr (Fonrobert, C)

RELIGST 226/326. Philosophy and Kabbalah in Jewish Society: Middle Ages and Early Modern Period
5 units, Win (Malkiel, D)

LANGUAGE CENTER

Director: Elizabeth Bernhardt
Associate Director: Joan Molitoris
Assistant Director: Patricia de Castries

African and Middle Eastern Languages
Senior Lecturers: Khalil Barhoum (Coordinator, and Minor Adviser: Arabic Language and Literature), Vered Shemtov (Jewish Language and Literature)
Lecturers: Salem Aweiss, Estee Greif, Yussuf Hamad (Fulbright Scholar), Jon Levitow, Sangai Mohochi, Gallia Porat, Ramzi Salti

Catalan Language
Lecturers: Joan Molitoris (Coordinator and Associate Director, Language Center), Maria Del Carmen San Juan Pastor

Chinese Language
Coordinator: Chao Fen Sun (Associate Professor, Asian Languages)
Lecturers: Marina Chung, Michelle DiBello, Sik Lee Dennig, Nina Lin, Yu-hwa Liao Rozelle, Huazhi Wang, Hong Zeng, Youping Zhang, Qi Zhu, Xiaoya Zhu

English for Foreign Students
Director and Senior Lecturer: Philip Hubbard (Linguistics)
Lecturers: Carole Mawson, Kenneth Romeo, Constance Rylance, Carol Shabrami, Seth Streichler

French Language
Lecturers: Olubunmi Ashaolu, Jane Dozer-Rabedeau, Heather Howard, Sylvie Palumbo-Liu, Tanya Shashko, Kenric Tsethlikai (Coordinator)

German Language
Coordinator: Elizabeth Bernhardt (Director, Language Center)
Senior Lecturers: William E. Petig (on leave Spring), Kathryn Strachota (on leave Winter)
Lecturers: Paul Nissler, Shafiq Shamel

Italian Language
Senior Lecturer: Maria Devine
Lecturers: Marta Baldocchi, Anna Cellinese, Sara Gelmetti (Coordinator), Alessandra McCarty, Giovanni Tempesta

Japanese Language
Coordinator: Yoshiko Matsumoto (Associate Professor, Asian Languages)
Senior Lecturer: Kazuko M. Busbin
Lecturers: Fumiko Arao, Hisayo O. Lipton, Momoyo K. Lowdermilk, Emiko Yasumoto Magnani, Kiyomi Nakamura, Yoshiko Tomiyama

Korean Language
Lecturers: Hee-Sun Kim (Coordinator), Jinim Park (Fulbright Scholar)

Portuguese Language
Senior Lecturer: Lyris Wiedemann (Coordinator; on leave Autumn)
Lecturers: Ana Isabel Delgado, Karen Sotelino

Slavic Language
Senior Lecturer: Rima Greenhill (on leave)
Lecturers: Eugenia Khassina (Coordinator), Marina Marcos

Spanish Language
Senior Lecturer: Irene Corso
Lecturers: Amy Alexander, Vivian Brates, Loreto Catoira, Citlalli del Carpio, Candy Guzmán, Caridad Kenna, Laura Méndez Barletta, Alice Miano (Coordinator), Joan Molitoris (Associate Director, Language Center), Paul Nissler, Carimer Ortiz Cuevas, Consuelo Perales, Veronika Reinhold, Kara Sanchez, Ana M. Sierra, María Cristina Urruela, Hae-Joon Won

Special Language Program
Lecturers: Mary Grace Alvarez (Fulbright Scholar), Cathy Haas, Tri Indrawati (Fulbright Scholar), Costantia Manoli (Fulbright Scholar), Mona Sharma (Fulbright Scholar), Eva Prionas (Coordinator, Modern Greek Language and Literature)

Tibetan Language Program
Lecturer and Coordinator: Robert W. Clark

Language Center Offices: Building 30
Mail Code: 94305-2015
Department Phone: (650) 725-9222
Email: patricia@stanford.edu
Web Site: http://language.stanford.edu

Courses given in the Language Center have one of the following subject codes: AMELANG, APPLLING, CATLANG, CHINLANG, EFSLANG, FRENLANG, GERLANG, ITALLANG, JAPANLNG, KORLANG, PORTLANG, SLAVLANG, SPANLANG, SPECLANG, and TIBETLNG. For a complete list of subject codes, see Appendix.

The Stanford Language Center was created to oversee all language instruction at Stanford. The center's charge is to guarantee that Stanford language programs are of the highest quality; to develop and administer achievement and proficiency tests needed to implement the language requirement; to provide technical assistance and support to the graduate students, lecturers, and faculty who deliver Stanford's language instruction; and to take leadership in research and development efforts in language learning. The Language Center is a unit within the Division of Literatures, Cultures, and Languages.

PROFICIENCY IN FOREIGN LANGUAGE NOTATION

A student who demonstrates levels of achievement equivalent to those expected at the end of the third quarter of the third year of study in a language may be awarded the notation "proficiency in" that language on the official transcript.

In order for a student to have the proficiency notation appear on the official transcript, the student must:

1. Inform the Language Center at least two quarters prior to graduation that he/she is requesting such a notation.
2. Schedule an Oral Proficiency Interview (OPI) through the Language Center. Since this is a formal oral proficiency interview, at least two quarters of lead time are essential for scheduling this interview. The interview will be conducted by a certified OPI rater.
3. Submit to the Language Center an academic paper written in the foreign language in question of at least five pages (two pages in the Asian languages and Russian).
4. Ask one Stanford University Academic Council faculty member to write a letter on the student's behalf, attesting to a high level of academic writing and composition skill in the foreign language.
5. Receive a rating of 'Advanced Low' on the Foreign Service Institute/American Council on the Teaching of Foreign Languages (FSI/ACTFL) oral proficiency scale, except in the non-cognate languages which require an 'Intermediate High' rating.

UNDERGRADUATE PROGRAM

MINOR IN MIDDLE EASTERN LANGUAGES, LITERATURES, AND CULTURES

The undergraduate minor in Middle Eastern Languages, Literatures, and Cultures has been designed to give students majoring in other departments an opportunity to gain a substantial introduction to Middle Eastern and African languages, and to the cultures and civilizations of the Middle East and Africa. Contact the minors adviser before declaring at khalil@stanford.edu.

Students declaring a minor must do so no later than the last day of the fourth quarter before degree conferral. For example, students graduating in June (Spring Quarter) must declare the minor no later than the last day of Spring Quarter of their junior year. If a student is not able to meet this deadline, he or she may petition the Language Center director and request a revised declaration date, which may be granted at the director's discretion.

The requirements for a minor in Middle Eastern Languages, Literatures, and Cultures are:

1. Completion of six courses in either Track A, Cultural Studies, or Track B, Language Studies.

2. Courses for the minor must be taken for a letter grade unless only offered for faculty-elected satisfactory/no credit.
3. All courses must be completed with a letter grade of ‘C’ or better.
4. Courses may not overlap with those taken for a major course of study.
5. Courses taken which also fulfill a GER count toward fulfilling both minor and GER requirements.
6. Students pursuing Track B, Cultural Studies, must complete the prerequisite of beginning level in the respective language, or demonstrate an equivalent competence.

CULTURAL STUDIES TRACK

Requirements are:

1. Completion of the language prerequisite, or a demonstrated equivalent competence.
2. In the case of Arabic completion of six non-language courses including three from the AME program.
3. In the case of Hebrew and African languages, completion of six non-language related courses. Consult minor adviser for course options.
4. Course work from GER courses may be used to fulfill the unit requirements for the minor.

LANGUAGE TRACK

Requirements are:

1. Completion of prerequisite language study at the beginning level, or a demonstrated equivalent competence.
2. Completion of one year of language study at the intermediate level.
3. Completion of three non-language related courses, including one of the AMELANG 161-165 series in the case of Arabic. Consult the minor adviser for course options.

MINOR IN LITERATURE

An undergraduate minor in Literature is offered through the Division of Literatures, Cultures, and Languages and includes courses offered through the Language Center. Students should consult the “Division of Literatures, Cultures, and Languages” section of this bulletin for further details about the minor and its requirements.

MINOR IN MODERN LANGUAGES

An undergraduate minor in Modern Languages is offered through the Division of Literatures, Cultures, and Languages and includes courses offered through the Language Center. Students should consult the “Division of Literatures, Cultures, and Languages” section of this bulletin for further details about the minor and its requirements.

GRADUATE PROGRAM

Ph.D. MINOR IN APPLIED LINGUISTICS

The Ph.D. minor in Applied Linguistics has been designed to give students the opportunity to examine and explore language as it pertains to teaching, learning, translation, education, and language policies.

The Ph.D. minor requires the completion of no less than 30 units of unduplicated course work. Course work must include LINGUIST 201 (Foundations of Linguistic Analysis, 4 units). At least one additional Linguistics course must also be taken. Courses taken for the minor must be incremental units beyond those used to satisfy the major (with the exception of Linguistics 201 for Linguistics students). At least 20 of the 30 units must be at the 200 level or above. Students may also supplement their Applied Linguistics training with an array of courses from the departments of Anthropology, Linguistics, and Spanish and Portuguese.

Overlapping applied linguistics concentrations are available in Learning, Teaching, and Translation of Second Languages; and in Educational and Policy Applications of Linguistics.

Some suggested courses relevant to each track are listed below the track description; a more complete listing of courses which are appropriate for the minor can be found on the Language Center’s web site at http://language.stanford.edu/.

Students in either track should develop a program of study in consultation with an academic adviser and submit the proposed program of study for approval by the Applied Linguistics Steering Committee.

THE LEARNING, TEACHING, AND TRANSLATION OF SECOND LANGUAGES TRACK

This overall program concentration requires general reading in second language acquisition (SLA) and/or translation while offering students course work in the following areas:

1. Second language acquisition in instructed contexts
2. Elements of curricular design for university and college settings
3. The acquisition of second language literacy
4. The use of technology to enhance student performance
5. Linguistics and the teaching of foreign languages
6. Theoretical foundations in the translation of various languages

Subject and Catalog Number	*Units*
APPLLING 201. The Learning and Teaching of Second Languages	3
APPLLING 202. Workshop in Technology	3
APPLLING 203/SPANLIT 300. Issues and Methods in the Teaching of Heritage Languages	3-5
LINGUIST 191/291. Linguistics and the Teaching of English as a Foreign Language	4-5
LINGUIST 140/240. Language Acquisition I	4

EDUCATIONAL AND POLICY APPLICATIONS OF LINGUISTICS TRACK

This concentration is oriented toward a combination of conceptual and research foci regarding language minority populations and their educational welfare. The education of women, low-income, and language minority populations receive primary attention within this concentration.

Subject and Catalog Number	*Units*
EDUC 249. Theory and Issues in the Study of Bilingualism	3-4
EDUC 277. Education of Immigrant Students: Psychological Perspectives	4
EDUC 335X. Language Policy and Planning	3
EDUC 435X. Research Seminar in Applied Linguistics	2-4
LINGUIST 73/273. African American Vernacular English	4
LINGUIST 150. Language in Society	4-5
LINGUIST 159. Language in the U.S.	3-5
LINGUIST 250. Sociolinguistic Theory and Analysis	4-6

COURSES

Offerings in this section are ordered as follows:

Applied Linguistics (APPLLING)
African and Middle Eastern Languages (AMELANG)
Catalan (CATLANG)
Chinese (CHINLANG)
English for Foreign Students (EFSLANG)
French (FRENLANG)
German (GERLANG)
Italian (ITALLANG)
Japanese (JAPANLNG)
Korean (KORLANG)
Portuguese (PORTLANG)
Russian (SLAVLANG)
Spanish (SPANLANG)
Special Languages (SPECLANG)
Tibetan (TIBETLNG)

Students interested in general courses concerning languages, cultures, and literatures, or in advanced study of language and literature should consult the following departments and subject codes:

Asian Languages (CHINGEN, CHINLIT, JAPANGEN, JAPANLIT, KORGEN)
French and Italian (FRENGEN, FRENLIT, ITALGEN, ITALLIT)
German Studies (GERGEN, GERLIT)
Slavic Languages and Literatures (SLAVGEN, SLAVLIT)
Spanish and Portuguese (SPANLIT, PORTLIT)

APPLIED LINGUISTICS (APPLLING)

APPLLING 201. The Learning and Teaching of Second Languages—Learning perspective rather than traditional teaching methods. Focus is on instructional decision making within the context of student intellectual and linguistic development in university settings to different populations. Readings in second-language acquisition.

3 units, Spr (Bernhardt, E)

APPLLING 203. Issues and Methods in the Teaching of Heritage Languages—(Same as EDUC 300, SPANLIT 300.) Teaching Spanish to students raised in Spanish-speaking homes. Language variation in the Spanish-speaking world, English/Spanish bilingualism in the U.S., and second dialect acquisition. Techniques for developing the academic Spanish language skills of heritage students.

3-5 units, not given this year

APPLLING 204. Second Language and Second Dialect Acquisition—(Same as EDUC 216, SPANLIT 204.) In Spanish.

3-5 units, not given this year

APPLLING 206. Language Use in the Chicano Community—(Same as EDUC 242, SPANLIT 206.) The significance and consequences of language diversity in the culture and society of the U.S. Experiences of non-English background individuals through focus on Spanish-English bilingual communities.

3-5 units, Spr (Valdés, G)

APPLLING 207. Perspectives on the Education of Linguistic Minorities—(Same as EDUC 146X.) Social, political, linguistic, and pedagogical issues associated with educating students who do not speak the language or language variety of the majority society. Focus is on the U.S.; attention to minorities elsewhere. American attitudes toward linguistic and racial minorities. Educational problems of linguistically different children and non-English- or limited-English-speaking children. Approaches to solving problems.

3-5 units, Spr (Valdés, G)

APPLLING 297. Directed Reading—Search for instructor on Axess. May be repeated for credit. Prerequisite: consent of instructor.

1-4 units, Aut, Win, Spr (Staff)

AFRICAN AND MIDDLE EASTERN LANGUAGES AND LITERATURES (AMELANG)

The African and Middle Eastern Languages and Literatures Program offers classes in Arabic, Hebrew, Swahili, and African languages not regularly taught at Stanford. Based on current funding and student requests, the courses planned for 2007-08 are listed below. Additional languages may still be offered upon request, provided funding is available. Requests for the 2008-09 academic year should be made by Spring Quarter of this year at the AME program office, email: khalil@stanford.edu.

All beginning-level, three-unit courses are offered on a S/NC basis only. Intermediate-level and four-unit courses are offered with a grading option. Beginning and intermediate each refer to an academic year's sequence of language study. Most three-unit language courses are offered for a two-year, three quarter sequence:

All 'A' suffix courses are taught Autumn.
All 'B' suffix courses are taught Winter.
All 'C' suffix courses are taught Spring.

All beginning, intermediate, and advanced courses are 3 units except Arabic, Hebrew, and Swahili. In some circumstances, a beginning or intermediate course may be offered in alternate years.

Fulfilling the language requirement—Students can fulfill the language requirement by taking an African or Middle Eastern language. At least 12 units are needed to complete the requirement. Normally, the requirement is completed after the first quarter of intermediate-level language. In the case of African or Middle Eastern languages taught only at the beginning level, students may petition the Language Center to fulfill the requirement by taking a directed reading course in the fourth quarter. Contact patricia@stanford.edu for more information.

Those who have taken courses in the relevant language at another institution, or have previous knowledge of the language, can request to be tested. Tests are comprised of two parts, written and oral. Students must display first-year proficiency in the requested language to fulfill the requirement. Testing is guaranteed only for languages currently offered. Students planning to take a test must contact the AME program no later than the Spring Quarter of their sophomore year. To submit a request for language testing or to request that a language be taught, and for further information on the program, see http://www.stanford.edu/dept/lc/MEL/. Language courses may not be repeated for credit and must be taken in sequence.

AFRICAN LANGUAGES COURSES

AMELANG 100A,B,C. Beginning Amharic
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Tesfamariam, I)*

AMELANG 106A,B,C. Beginning Swahili
4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Mohochi, E)*

AMELANG 107A,B,C. Intermediate Swahili
2-4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Mohochi, E)*

AMELANG 108A,B,C. Advanced Swahili
2-4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Mohochi, E)*

AMELANG 134A,B,C. Beginning Igbo
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ajaelo, G)*

AMELANG 135A,B,C. Intermediate Igbo
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ajaelo, G)*

AMELANG 136A,B,C. Beginning Xhosa
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

AMELANG 138A,B,C. Advanced Xhosa
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Sibanda, G)*

AMELANG 153A,B,C. Beginning Twi
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Nyam, K)*

AMELANG 157A,B,C. Intermediate Zulu
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Sibanda, G)*

AMELANG 158A,B,C. Advanced Zulu
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

AMELANG 186A,B,C. Beginning Yoruba
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ashaolu, O)*

AMELANG 187A,B,C. Intermediate Yoruba
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ashaolu, O)*

MIDDLE EASTERN LANGUAGE AND LITERATURE COURSES

AMELANG 126. Reflection on the Other: The Jew in Arabic Literature, the Arab in Hebrew Literature—How literary works outside the realm of western culture struggle with questions such as identity, minority, and the issue of the other. How the Arab is viewed in Hebrew literature and how the Jew is viewed in Arabic literature. Historical, political, and sociological forces that have contributed to the shaping of the writer's views. Arab and Jewish (Israeli) culture. GER:DB-Hum, EC-GlobalCom

4 units, Aut (Barhoum, K; Shemtov, V)

AMELANG 144A,B,C. Beginning Persian
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Mohammadi, S)*

AMELANG 184A,B,C. Beginning Turkish
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ozisik, N)*

AMELANG 185A,B,C. Intermediate Turkish
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ozisik, N)*

ARABIC LANGUAGE AND LITERATURE COURSES

AMELANG 20A,B. Intensive Beginning Arabic—Stanford graduate students restricted to 9 units register for 220A,B,C.
4 units, **A:** *Sum,* **B:** *Sum (Aweiss, S)*

AMELANG 120A,B,C. Intensive Beginning Arabic—One-year sequence. Emphasis is on reading and writing standard Arabic (*fusha*).
5 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Barhoum, K)*

AMELANG 121A,B,C. Intermediate Arabic—Speaking, listening, reading, and writing, emphasizing Arabic grammar and functional applications..
2-3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Aweiss, S; Salti, R)*

AMELANG 122A,B,C. Advanced Arabic—Language proficiency through use of complex and compound sentences. Media Arabic, literary works, the Arabic Internet, films, and cultural productions.
2-3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Salti, R)*

AMELANG 162. Arab Women Writers and Issues—Fiction and nonfiction work. The major cultural factors shaping their feminist attitudes. Readings: Fatima Mernissi, Nawal El-Saadawi, Etel Adnan, Fadia Faqir, Alifa Rifaat, and Sahar Khalifeh. No knowledge of Arabic required; extra unit for readings in Arabic. Limited enrollment. GER:DB-Hum, EC-Gender
4 units, Win (Barhoum, K)

AMELANG 165. The West through Arab Eyes—Events and thinking influencing Arab relations with the West; the impact of common historical events on the Arab side. Texts include: Amin Maalouf's *The Crusades through Arab Eyes;* Edward Said's *Orientalism* and *Covering Islam;* Jack Shaheen's *Reel Bad Arabs;* and Francesco Gabriel's *Arab Historians of the Crusades*. Limited enrollment. GER:EC-GlobalCom
4 units, Spr (Barhoum, K)

AMELANG 196A,B,C. Reading Arabic—For seniors and graduate students who need to acquire reading ability in Arabic for the Ph.D. or for advanced research in their own field.
2-3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

AMELANG 213A,B,C. Beginning Arabic: From Basic Script to Islamic Text—Introduction to Islam through Arabic. Islam as faith, practice, philosophy, and institution; personalities and dynasties.
4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Aweiss, S)*

JEWISH LANGUAGES AND LITERATURE COURSES

AMELANG 50A,B. Reading Hebrew—Introduction to Hebrew literature through short stories and poetry by notable Israeli writers. In Hebrew. Prerequisite: one year of Hebrew or equivalent.
2-4 units, **A:** *Win,* **B:** *Spr (Shemtov, V)*

AMELANG 128A,B,C. Beginning Hebrew
5 units, **A:** *Aut,* **B:** *Win (Shemtov, V; Greif, E),* **C:** *Spr (Porat, G)*

AMELANG 129A,B,C. Intermediate Hebrew
2-4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Porat, G)*

AMELANG 130A,B,C. Advanced Hebrew
1-4 units, **A:** *Aut (Porat, G),* **B:** *Win (Shemtov, V),* **C:** *Spr (Porat, G)*

AMELANG 170A,B. Biblical Hebrew—The basic lexicon and grammar of Hebrew of the *Tanakh* or Old Testament.
2-4 units, **A:** *Win,* **B:** *Spr (Porat, G)*

AMELANG 297. Directed Reading in African and Middle Eastern Languages—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

AMELANG 395. Graduate Studies in African and Middle Eastern Languages—Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

CATALAN LANGUAGE COURSES

Because the Catalan Language Program does not have a formal placement test, students registering for the first time must see the coordinator for proper placement if they have had any prior training in Catalan. Completion of CATLANG 2A fulfills the University Foreign Language Requirement. Consult the Language Center or http://language.stanford.edu/ for further information. Language courses may not be repeated for credit and must be taken in sequence.

CATLANG 1A,2A. Accelerated First-Year Catalan—For students with knowledge of another Romance language, preferably Spanish. Emphasis is on developing socially and culturally appropriate proficiency in interpersonal, interpretive, and presentational spheres. Completion of 2A fulfills the University language requirement. Prerequisite: consent of instructor.
5 units, **1A:** *Aut,* **2A:** *Win (San Juan Pastor, M)*

CATLANG 11A, 12A. Accelerated Second-Year Catalan—Sequence integrating culture and language of the Catalan-speaking world. Socially and culturally appropriate forms in narrations, descriptions, and expression of ideas and opinions. Emphasis is on oral and written proficiency in formal, informal, academic, and professional contexts. Prerequisite: consent of instructor.
3-5 units, **11A:** *Spr (San Juan Pastor, M),* **12A:** *not given this year*

CATLANG 199. Individual Work—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Staff)

CATLANG 395. Graduate Studies in Catalan—May be repeated for credit. Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

CHINESE LANGUAGE COURSES

Students registering for the first time in a first- or second-year course must take a placement test if they have had any training in Chinese before entering Stanford. All entering students must take Part I (written) of the placement test online during the summer, followed by Part II (oral), to be administered on campus September 19, 2007. Consult the Language Center or http://language.stanford.edu/ for further information. Language courses may not be repeated for credit and must be taken in sequence.

FIRST- AND SECOND-YEAR LANGUAGE

CHINLANG 1,2,3. First-Year Modern Chinese—Conversation, grammar, reading, elementary composition. Daily sections may be set at the beginning of the quarter to suit schedule requirements.
5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Dibello, M; Lin, J; Lin, N; Zhang, X; Zeng, H; Staff)*

CHINLANG 1B,2B,3B. First-Year Modern Chinese for Bilingual Students—For students with elementary comprehension and speaking skills who need work on conversation, grammar, reading, and composition.
3 units, **1B:** *Aut,* **2B:** *Win,* **3B:** *Spr (Lin, N; Rozelle, Y)*

CHINLANG 5. Intensive First-Year Modern Chinese—Equivalent to 1,2,3 combined. Five weeks at Stanford and four weeks at Peking University.
7-8 units, Sum (Zeng, H)

CHINLANG 6,7,8. Beginning Conversational Chinese—Three quarter sequence. Basic language skills in Mandarin to function abroad.
2 units, **6:** *Aut,* **7:** *Win,* **8:** *Spr (Rozelle, Y)*

CHINLANG 10,11,12. Beginning Southern Min (Taiwanese) Conversation—Three quarter sequence. Basic language skills for everyday life situations.
2 units, **10:** *Aut,* **11:** *Win,* **12:** *Spr (Lin, N)*

CHINLANG 13A,B,C. Intermediate Southern Min (Taiwanese) Conversation—Vocabulary including business-related terms, grammatical structures, and spontaneous conversations. Prerequisite: 12 or consent of instructor.
2 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Lin, N)*

CHINLANG 14A,B,C. First-Year Comprehensive Cantonese
5 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Dennig, S)*

CHINLANG 15,16,17. Beginning Cantonese Conversation—Three quarter sequence. Language skills for everyday life.
2 units, **15:** *Aut,* **16:** *Win,* **17:** *Spr (Dennig, S)*

CHINLANG 18, 19,20. Intermediate Cantonese Conversation
2 units, **18:** *Aut,* **19:** *Win,* **20:** *Spr (Dennig, S)*

CHINLANG 20A,B,C. Advanced Cantonese Conversation—Improving Cantonese through Hong Kong movies.
2 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Dennig, S)*

CHINLANG 21,22,23. Second-Year Modern Chinese—Grammar, reading, conversation, composition. Daily sections may be set at the beginning of the quarter to suit schedule requirements. Prerequisite: 3 or equivalent.
5 units, **21:** *Aut,* **22:** *Win,* **23:** *Spr (Chung, M; Zou, Y)*

CHINLANG 21B,22B,23B. Second-Year Modern Chinese for Bilingual Students—For students with advanced comprehension and speaking skills, but lacking equivalent knowledge of grammar, reading, and writing Chinese characters. Equivalent to 21,22,23.
3 units, **21B:** *Aut,* **22B:** *Win,* **23B:** *Spr (Zhu, Q)*

CHINLANG 25. Intensive Second-Year Modern Chinese—Equivalent to 21,22,23 combined. Five weeks at Stanford and four weeks at Peking University. Prerequisite: 3 or equivalent.
7-8 units, Sum (Chung, M)

CHINLANG 27,28,29. Intermediate Chinese Conversation—Prerequisite: 3 or consent of instructor.
2 units, **27:** *Aut,* **28:** *Win,* **29:** *Spr (Zhang, Y)*

ADVANCED CHINESE

CHINLANG 101,102,103. Third-Year Modern Chinese—Written and spoken styles of modern Chinese. Reading and discussion of authentic writings on cultural topics; newspaper reports, radio, and TV broadcasts and films; online Chinese software and email network to facilitate study. Prerequisite: 23 or equivalent.
5 units, **101:** *Aut,* **102:** *Win,* **103:** *Spr (Wang, H)*

CHINLANG 101B,102B,103B. Third-Year Modern Chinese for Bilingual Students—For students with advanced listening and speaking abilities, but lacking equivalent knowledge in reading and writing. Equivalent to 101,102,103.
3 units, **101B:** *Aut,* **102B:** *Win,* **103B:** *Spr (Wang, H)*

CHINLANG 105. Intensive Third-Year Modern Chinese—Equivalent to 101,102,103 combined. Five weeks at Stanford and four weeks at Peking University. Prerequisite: 23 or equivalent.
7-8 units, Sum (Wang, H)

CHINLANG 121,122,123. Advanced Chinese Conversation—Prerequisite: 23 or equivalent.
2 units, **121:** *Aut,* **122:** *Win,* **123:** *Spr (Chung, M)*

CHINLANG 131,132,133. Business Chinese—Commercial, economic, and business-related vocabulary. Materials include formal business conversations, newspaper and journal articles, and TV news on trade and economics. Technical language and business etiquette. Student oral and written reports on their own research regarding recent economic developments, using sources in China. Prerequisite: 23 or equivalent.
3-4 units, **131:** *Aut,* **132:** *Win,* **133:** *Spr (Wang, H)*

CHINLANG 211,212,213. Fourth-Year Modern Chinese—Year-long sequence. Goal is to become functional speakers, readers, and writers of modern Chinese through articles and essays from newspapers, magazines, scholarly journals, and the Internet. Cultural and social science themes: students may take both themes for 5 units or one theme for reduced units. Prerequisite: three years of Chinese.
2-5 units, **211:** *Aut,* **212:** *Win,* **213:** *Spr (Zhu, Q; Staff)*

CHINLANG 231,232,233. Fifth-Year Modern Chinese: Cultural China—Year-long sequence. Rhetorical devices through essays about China's cultural journey in relationship to geographical regions.
2-5 units, **231:** *Aut,* **232:** *Win,* **233:** *Spr (Zhu, Q)*

CHINLANG 394. Graduate Studies in Chinese Conversation—Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Staff)

CHINLANG 395. Graduate Studies in Chinese—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

ENGLISH FOR FOREIGN STUDENTS

These courses, numbered from 690-698, represent offerings for nonnative English-speaking graduate students in Autumn, Winter, and Spring quarters. Enrollment in one or more courses may be required of, or recommended to, current graduate students from other countries after they have taken the English placement examination. To enroll, students must go to http://efs.stanford.edu for directions on or before the first day of each quarter. Some courses are open to undergraduates by consent of the program; email efs@stanford.edu for information.

During the Summer Session, courses in spoken and written English are offered. Two six-week intensive courses are also offered during the summer. Summer visitors must apply directly to the EFS program.

EFSLANG 687X. American Language and Culture, First Session—Closed enrollment. Intensive English language and U.S. culture program. Enrollment limited to 14.
3 units, Sum (Staff)

EFSLANG 687Y. American Language and Culture, Second Session—Closed enrollment. Intensive English language and U.S. culture program. Enrollment limited to 14.
3 units, Sum (Staff)

EFSLANG 690A. Interacting in English—Strategies for communicating effectively in social and academic settings. Informal and formal language used in campus settings, including starting and maintaining conversations, asking questions, making complaints, and contributing ideas and opinions. Simulations and discussions, with feedback on pronunciation, grammar, and usage. Enrollment limited to 14.
1-3 units, Aut, Win, Spr (Staff)

EFSLANG 690B. Academic Discussion—Skills for effective participation in classroom settings, seminars, and research group meetings. Pronunciation, grammar, and appropriateness for specific tasks. Feedback on language and communication style. Enrollment limited to 14. May be repeated once for credit. Prerequisite: 690A or consent of instructor.
1-3 units, Aut (Staff), Win (Rylance, C), Spr (Staff)

EFSLANG 690C. Advanced Interacting in English—Communication skills for extended discourse such as storytelling and presenting supported arguments. Development of interactive listening facility and overall intelligibility and accuracy. Goal is advanced fluency in classroom, professional and social settings. Identification of and attention to individual patterned errors. Prerequisite: 690A or B or consent of instructor. Enrollment limited to 14.
1-3 units, Aut, Win, Spr (Romeo, K)

EFSLANG 691. Oral Presentation—For advanced graduate students. Practice in academic presentation skills; strategy, design, organization, and use of visual aids. Focus is on improving fluency and delivery style, with videotaping for feedback on language accuracy and usage. Enrollment limited to 14. May be repeated once for credit.
1-3 units, Aut, Win, Spr, Sum (Staff)

EFSLANG 692. Speaking and Teaching in English—For non-native speakers who must teach in English. Focus is on developing clarity, intelligibility, and effectiveness through weekly presentations simulating actual teaching assistant responsibilities. Enrollment limited to 14. May be repeated once for credit.
1-3 units, Aut (Mawson, C), Win (Rylance, C), Spr (Staff),
Sum (Shabrami, C)

EFSLANG 693A. Listening Comprehension—Strategies for effective listening in an academic setting, focusing on identifying key ideas in lectures. Practice in understanding words and phrases commonly encountered in classroom settings. Computer-based exercises for comprehension of rapid, natural speech. Enrollment limited to 14.
1-3 units, Aut (Rylance, C; Staff)

EFSLANG 693B. Listening and Communication—Listening strategies and vocabulary for understanding English in academic and non-academic contexts. Discussion and interpretation of communicative intent. Computer-based and video exercises; individual project. May be repeated once for credit. Prerequisite: 693A or consent of instructor.
1-3 units, Aut (Hubbard, P; Staff), Win (Shabrami, C; Staff), Spr (Romeo, K; Staff), Sum (Staff)

EFSLANG 694. Communication Strategies in Professional Life—For advanced graduate students. Task-based practice of language appropriate for professional settings in industry and related teamwork. Simulation of the roles of manager, applicant, subordinate, and coworker. Prerequisite: 693A, or consent of instructor. Enrollment limited to 14.
1-3 units, Aut, Spr (Shabrami, C)

EFSLANG 695A. Pronunciation and Intonation—Recognition and practice of American English sounds, stress, and intonation patterns for greater comprehension and intelligibility. Analysis of problem areas. Biweekly tape assignments and tutorials. May be repeated once for credit. Enrollment limted to 14.
1-3 units, Aut, Win (Staff), Spr (Mawson, C), Sum (Staff)

EFSLANG 695B. Advanced Pronunciation and Intonation—Continuation of 695A, focusing on American English sounds, stress, rhythm, and intonation patterns. Emphasis is on self-monitoring, integrated with short presentations. Biweekly recorded assignments and tutorials. Enrollment limited to 14. May be repeated for credit three times. Prerequisite: 695A.
1-3 units, Aut, Win (Staff), Spr (Mawson, C)

EFSLANG 696. Understanding American Humor—Recognizing rhetorical devices, jokes, and character types common to spoken humor in film and television programs. Crosscultural discussion. Prerequisites: 690B, 693B or consent of the instructor. Enrollment limited to 14.
1-3 units, Win (Rylance, C)

EFSLANG 697. Writing Fundamentals—Focus is on improving grammatical accuracy and vocabulary, building fluency, and learning the structure and conventions of English correspondence, reports, and short academic papers. Enrollment limited to 14.
1-3 units, Aut, Win (Staff), Spr (Shabrami, C)

EFSLANG 698A. Writing Academic English—Strategies and conventions. Emphasis is on fluency, organization, documentation, and appropriateness for writing tasks required in course work. Enrollment limited to 14. May be repeated once for credit.
1-3 units, Aut (Rylance, C), Win, Sum (Staff)

EFSLANG 698B. Advanced Graduate Writing—For graduate students experienced in English writing and currently required to write for courses and research. Class meetings and individual conferences. Prerequisite: 698A. Enrollment limited to 14. May be repeated once for credit.
1-3 units, Aut (Hubbard, P), Win (Staff), Spr (Hubbard, P), Sum (Staff)

EFSLANG 698C. Writing and Presenting Research—For advanced graduate students completing major research projects. Revising and editing strategies for preparing papers, conference abstracts, and poster presentations. Adapting content and style to different audiences. Students present their research with participant feedback. Enrollment limited to 14. May be repeated once for credit. Prerequisite: 698B and 691 or consent of instructor.
1-3 units, Aut, Spr (Shabrami, C)

FRENCH LANGUAGE COURSES

FIRST- AND SECOND-YEAR FRENCH

Students who have never studied French before should enroll in FRENLANG 1. Students with previous training in French must take a placement test. All entering students must take Part I (written) of the online placement test during the summer, followed by Part II (oral) to be administered on campus September 19, 2007, in order to be placed in an appropriate course for Autumn Quarter. Consult the Language Center or http://language.stanford.edu/ for further information.

FRENLANG 2A, 3, and 41B, prepare students for intermediate-level proficiency in listening comprehension, speaking, reading, and writing in satisfaction of the University foreign language requirement. Students may continue with second-year French language courses (22 or 23) or higher-level courses upon completion of the first-year sequence and recommendation of the coordinator.

A grade of 'C' or better is required to enter the next course in a language sequence. Language courses may not be repeated for credit and must be taken in sequence.

FRENLANG 1,2,3. First-Year French—Proficiency-based. Development of discourse appropriate in French and Francophone contexts.
5 units, Aut, Win, Spr (Ashaolu, O; Dozer-Rabedeau, J; Howard, H, Shashko, T; Samokhina, D; Tamas, J; Staff)

FRENLANG 1A,2A. Intensive First-Year French—Completes first-year language sequence in two rather than three quarters. Recommended for students with previous knowledge of French who place into 5A on the placement test. 2A fulfills the University foreign language requirement. Prerequisite: French placement test and consent of instructor.
1A: *5 units, Aut (Ashaolu, O), Win (Shashko, T)*
2A: *5 units, Win (Ashaolu, O), Spr (Howard, H; Shashko, T)*

FRENLANG 5A,B. Intensive First-Year French—Accelerated. Written exercises, compositions, conversational practice, and daily work.
5 units, **A:** *Sum,* **B:** *Sum (Staff)*

FRENLANG 10. Beginning French Oral Communication—For students who have completed 2 or equivalent. Emphasis is on speaking skills, vocabulary, and pronunciation. May be repeated once for credit.
2 units, Aut (Howard, H), Win (Dozer-Rabedeau, J), Spr (Tamas, J)

FRENLANG 15. Intermediate French Oral Communication—For students who have completed the first-year language requirement. May be repeated once for credit.
2 units, Aut (Howard, H), Win (Dozer-Rabedeau, J), Spr (Staff)

FRENLANG 15S. Intermediate Conversation: French in Everyday Life—Same content as 15. May be repeated once for credit. Prerequisite: one year of college French or equivalent.
2 units, Sum (Staff)

FRENLANG 20A. France and Francophonie—Second-year French conversation based on themes from the regions of France and the Francophone world. Topics include travel, food, and crosscultural comparisons. Students returning from study abroad programs are encouraged to enroll. May be repeated once for credit. Prerequisite: 22 or equivalent.
2 units, Aut (Staff)

FRENLANG 20B. French Cinema—Second-year French conversation based on films. Intermediate-level speaking skills and advanced-level functions. Themes include: French filmmakers, stars, and trends. Film viewing in and outside the class in French. May be repeated once for credit. Prerequisite: 22 or equivalent.
2 units, Aut, Win (Staff)

FRENLANG 20C. Contemporary French Language—Second-year French conversation. Intermediate-level speaking skills and advanced-level functions for formal and informal situations. Useful for students planning to travel or study abroad. May be repeated once for credit. Prerequisite: 22 or equivalent.
2 units, Spr (Staff)

FRENLANG 22,23. Second-Year French—Proficiency-based. Advanced-level skills including past, present, and future narration, description, and defending points of view on social and cultural issues. Topics from cultural comparisons with French and Francophone contexts. Prerequisite: 3 or consent of coordinator.

22: *4-5 units, Aut (Howard, H; Shashko, T), Win (Shashko, T; Streicher, S), Spr (Howard, H; Shashko, T)*
23: *4-5 units, Aut (Dozer-Rabedeau, J), Win (Howard, H), Spr (Dozer-Rabedeau, J; Howard, H)*

FRENLANG 24C. Second-Year French: Literary Texts—Proficiency oriented. Discussion, writing, reading, and listening comprehension based on literary texts. Prerequisite: 23.
3-4 units, Spr (Tsethlikai, K)

FRENLANG 24R. Second-Year French: International Relations, Political Science, and Economics Emphasis—Proficiency-based. Discussion, writing, reading, and listening comprehension based on political, economic, and social topics. Prerequisite: 23.
3-4 units, Win (Howard, H)

FRENLANG 50. Reading French—For seniors or graduate students seeking to meet the University reading requirement for advanced degrees. Reading strategies for comprehension of secondary literature for academic research. Fulfills the University foreign language requirement for advanced degrees if student earns a grade of 'B.' Prerequisite: one year or reading proficiency in another Romance language.
4 units, Aut (Howard, H)

FRENLANG 50S. Reading French—Same content as 50.
2-4 units, Sum (Staff)

ADVANCED FRENCH

FRENLANG 120. Advanced French Oral Communication—Speaking skills and functions including narration, description, supporting opinions, and hypothesizing about current events and issues in France. May be repeated once for credit. Prerequisites: 23 or equivalent, and consent of instructor.
3 units, Aut, Win, Spr (Staff)

FRENLANG 122. Introduction to French Culture and Civilization—Discussion of French art, geography, history, political change, and social institutions. Prerequisite: 23 or equivalent.
3-4 units, Aut (Palumbo-Liu, S)

FRENLANG 123. French Creative Writing—Advanced. Model texts introduce students to genres and styles; review of grammar and vocabulary. Discussion of original writing by students. Prerequisite: 23 or equivalent.
3-4 units, Win (Palumbo-Liu, S)

FRENLANG 124. Advanced French Grammar—Required for students majoring or minoring in French; recommended for students planning to take literature courses. Review of difficulties in French. Grammatical and logical analysis. Prerequisite: 23 or equivalent.
3-4 units, Aut, Win (Tsethlikai, K)

FRENLANG 126. French Stylistics and Textual Analysis—For majors and minors. Writing intensive. Control of grammar and syntax in research and argumentative papers. Prerequisite: 124 or placement.
3-4 units, Spr (Calefas-Strebelle, A)

FRENLANG 199. Language Specials—Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

FRENLANG 394. Graduate Studies in French Conversation—Prerequisite: consent of the instructor.
1-3 units, Aut, Win, Spr (Staff)

FRENLANG 395. Graduate Studies in French—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

MAISON FRANÇAISE

Other in-house courses may be announced.

FRENLANG 60A. Beginning French Conversation—(AU)
1 unit, Aut, Win, Spr (de Castries, P)

FRENLANG 60B. Intermediate French Conversation—(AU)
1 unit, Aut, Win, Spr (de Castries, P)

FRENLANG 60C. Advanced French Conversation—(AU)
1 unit, Aut, Win (Staff), Spr (de Castries, P)

FRENLANG 60D. French Viticulture—See http://www.stanford.edu/class/frenlang60d/. Prerequisite: 21 or older. (AU)
1 unit, Aut, Win, Spr (de Castries, P)

FRENLANG 60E. French Cooking—(AU)
1 unit, Aut (Staff), Win, Spr (de Castries, P)

FRENLANG 60F. Filmmaking—(AU)
1 unit, Win (de Castries, P)

FRENLANG 60K. Thought for the 21st Century—(AU)
1 unit, Spr (de Castries, P)

FRENLANG 60N. French Drama—(AU)
1 unit, Spr (de Castries, P)

FRENLANG 60P. French House Projects—Prerequisite: consent of instructor. (AU)
1 unit, Aut, Win, Spr (de Castries, P)

FRENLANG 60T. Teaching French Conversation—(AU)
1 unit, Aut, Win, Spr (de Castries, P)

GERMAN LANGUAGE COURSES

Students registering for the first time in a first- or second-year course must take a placement test if they had any training in German before entering Stanford. All entering students must take Part I (written) of the placement test online during the summer, followed by Part II (oral), to be administered on campus September 19, 2007. Consult the Language Center or http://language.stanford.edu/ for further information. Language courses may not be repeated for credit and must be taken in sequence.

FIRST-YEAR GERMAN

GERLANG 1,2,3. First-Year German—Speaking, reading, writing, and listening. Authentic materials. Interactive approach with emphasis on developing communicative expression. The cultural context in which German is spoken.

1: *5 units, Aut (Petig, W; Strachota, K; Tsui, C), Win (Lee, S), Spr (Strachota, K)*
2: *5 units, Aut (Nissler, P), Win (Nissler, P; Petig, W), Spr (Lee, S)*
3: *5 units, Aut (Lee, S), Win (Nissler, P), Spr (Tsui, C)*

GERLANG 5A,B. Intensive First-Year German—Equivalent of 1,2,3 combined. Stanford graduate students restricted to 9 units register for 205A,B.
5 units, **A:** *Sum,* **B:** *Sum (Staff)*

GERLANG 10. Elementary German for Seniors and Graduate Students—Intensive. For students who need to acquire reading ability in German for the Ph.D. or for advanced research in their own field. 52 fulfills Ph.D. reading exam.
4 units, Win, Sum (Petig, W)

GERLANG 11P. Individually Programmed Beginning German—For those who wish to complete more or fewer than 5 units a quarter, have scheduling conflicts, or prefer to work independently. Self-paced work with text and tapes; instructor available for consultation on a regular basis. 3-unit minimum for beginners. Conversational practice available for additional unit.
1-12 units, Aut (Strachota, K), Win (Shamel, M), Spr (Strachota, K)

INTERMEDIATE GERMAN

At this level, students have several options depending on their interests. After completing 3 or equivalent, students may enroll in 120-level courses which consider topics in German culture while encouraging additional language learning. Alternatively, 21,22 emphasize a systematic review of the language, 21W,22W study the language of business and international relations, and 100-level courses develop advanced language skills along with cultural awareness.

GERLANG 21,22. Intermediate German—Reading short stories, and review of German structure. Discussions in German, short compositions, videos. 22: emphasis on reading and writing skills, and literary texts of major 20th-century writers in historical context.
4 units, **21:** *Aut,* **22:** *Win (Petig, W)*

GERLANG 21S. Intermediate German—Reading short stories, and review of German structure. Discussions in German, short compositions, videos. Prerequisite: one year of college German; or two years high school German; or equivalent of GERLANG 4; or AP German.
4 units, Sum (Petig, W)

GERLANG 21W. Intermediate German I: German for Business and International Relations—Equivalent to 21, but focus is on business and the political and economic geography of Germany. CDs and videos. For students planning to do a business internship in a German-speaking country. Prerequisite: 3.
4 units, Aut (Petig, W)

GERLANG 52. Readings in Humanities—For undergraduates and graduate students with a knowledge of German who want to acquire reading proficiency. Readings from scholarly works and professional journals. Recommended for students who need to pass the Ph.D. reading exam. Prerequisite: one year of German, or 10, or equivalent.
4 units, Spr (Urlaub, P)

ADVANCED GERMAN

GERLANG 100. *Hundert Deutsche Jahre:* One Hundred German Years—Language skills by introducing 20th-century history and culture of Germany as experienced by ordinary people. Themes include democracy, money, Hitler, books, the Wall, and food. Video series, parallel readings. Extra listening, reading, or speaking for fourth unit.
3-4 units, Spr (Strachota, K)

GERLANG 101,102. Advanced Language Study—Short fictional and expository readings, discussions, compositions. Review of grammatical structures. Vocabulary building with emphasis on common idiomatic expressions and troublesome lexical distinctions.
3-4 units, **101:** *Aut (Urlaub, P),* **102:** *Spr (Engel, A)*

GERLANG 110. German Newspapers—For intermediate and advanced students. Articles from current newspapers and magazines, reading comprehension strategies with online news updates, and vocabulary. Writing practice if desired. May be repeated once for credit.
3-4 units, Aut (Strachota, K)

GERLANG 111. Television News from Germany—For intermediate and advanced students. Current news reports and features for listening comprehension and vocabulary. Extra listening, speaking, or writing practice for fourth unit.
3-4 units, Win (Urlaub, P)

GERLANG 199. Individual Reading—Prerequisite: consent of instructor.
1-12 units, Aut, Win, Spr, Sum (Staff)

GERLANG 395. Graduate Studies in German—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

GERLANG 399. Independent Study—Prerequisite: consent of instructor.
1-6 units, Aut, Win, Spr, Sum (Staff)

HAUS MITTELEUROPA

Other in-house courses may be announced.

GERLANG 20A. Beginning German Conversation—(AU)
1 unit, Aut, Win, Spr (McQueen, K)

GERLANG 20B. Intermediate German Conversation—(AU)
1 unit, Aut, Win, Spr (McQueen, K)

GERLANG 20C. Advanced German Conversation—(AU)
1 unit, Aut, Win, Spr (McQueen, K)

GERLANG 20E. Fun Facts about Europe—(AU)
1 unit, Win (McQueen, K)

GERLANG 20K. *Küche Mitt* (German Cooking Class)—(AU)
1 unit, Aut, Win, Spr (McQueen, K)

GERLANG 20M. *Mitt* Movie Series—(AU)
1 unit, Aut, Win, Spr (McQueen, K)

GERLANG 20P. Theme Projects—(AU)
1 unit, Aut, Win, Spr (McQueen, K)

GERLANG 20T. Teaching German Conversation—(AU)
1 unit, Aut, Win, Spr (McQueen, K)

ITALIAN LANGUAGE COURSES

Students who have never studied Italian before should enroll in ITALLANG 1.Students who have had some training in Italian before entering Stanford must take a placement test. Part I (written) of the placement test must be taken online during the summer, followed by Part II (oral), to be administered on campus September 19, 2007. Consult the Language Center or http://language.stanford.edu/ for further information.

Completion of ITALLANG 2A, 3, or 41C fulfills the University foreign language requirement. Students may continue with second-year Italian (20, 21, or 21A) or other higher level courses upon recommendation of the coordinator.

A grade of 'C' or better is required to enter the next course in a language sequence. Language courses may not be repeated for credit and must be taken in sequence.

FIRST- AND SECOND-YEAR ITALIAN

ITALLANG 1,2,3. First-Year Italian—All-in-Italian communicative and interactive approach. Emphasis is on the development of authentic discourse in appropriate cultural contexts. Reading and listening to authentic materials, written and oral presentations, and conversational practice. Language lab, multimedia, and online activities. 3 fulfills the University language requirement.
5 units, Aut, Win, Spr (Baldocchi, M; Cellinese, A; Coggeshall, B; Devine, M; McCarty, A; Tempesta G, Staff)

ITALLANG 1A,2A. Accelerated First-Year Italian—Completes first-year sequence in two rather than three quarters. For students with previous knowledge of Italian or with a strong background in another Romance language. 2A fulfills the University language requirement. Prerequisite: placement tests or consent of instructor.
5 units, **1A:** *Aut (Baldocchi, M), Win (McCarty, A),*
2A: *Win, Spr (Baldocchi, M)*

ITALLANG 5A,B,C. Intensive First-Year Italian—Accelerated. Covers 1-3 quarters of Italian. Emphasis is on the development of authentic discourse. Online activities, conversational practice, and interpretation and production of oral and written materials.
5 units, Sum (Staff)

ITALLANG 20. Intermediate Oral Communication: Italy Today—Second-year conversation based on movie clips, slide shows, and other authentic materials. Guest lectures on Italian culture including opera, pop music, wine, and food culture. Preview of the Florentine experience with Florence returnees sharing their experiences in Italy. Prerequisite: first-year Italian or consent of coordinator.
3 units, Aut, Win, Spr (Tempesta, G)

ITALLANG 21,22,23. Second Year Italian—Content-based, integrating culture and language in the development of authentic discourse. Sources include news and film clips, music and audio files, and literary texts. Reading, writing, listening, and speaking competence based on crosscultural understanding. Prerequisite for 21: 2A, 3, 41C, or consent of coordinator.

3-4 units, **21:** *Aut (Baldocchi, M; Devine, M),* **22:** *Win (Cellinese, A; Devine, M),* **23:** *Spr (Cellinese, A)*

ITALLANG 21A,22A. Accelerated Second-Year Italian—Completes second-year sequence in two rather than three quarters. Prerequisite: 2A, 3, or consent of coordinator.

4-5 units, **21A:** *Win (Gelmetti, S), Spr (Wampole, C),* **22A:** *Aut, Spr (Gelmetti, S)*

ITALLANG 50. Reading Italian—Accelerated. For graduate students seeking to meet the University reading requirement for advanced degrees; seniors require consent of instructor. Fulfills the University foreign language requirement for advanced degrees if student earns a grade of 'B.' Prerequisite: one year of Italian or reading proficiency in another Romance language.

3 units, Spr (Devine, M)

THIRD-YEAR ITALIAN

ITALLANG 101. Advanced Oral Communication: Italian Language Through Opera—For Florence returnees or those who have completed second-year Italian. Use of opera excerpts by Leoncavallo, Puccini, Rossini, and Verdi to improve communication skills and review language functions. Emphasis is on listening, speaking, conversation, and debate. Prerequisites: second-year Italian and OSPFLOR 66, or consent of coordinator.

3 units, Aut (Cellinese, A)

ITALLANG 102. Advanced Oral Communication: Italian Language Through Cinema—For Florence returnees or those who have completed second-year Italian. Use of movie sequences by Italian film directors such as Benigni, Moretti, Salvatores, Soldini, and Tornatore to improve communication skills and review language functions. Emphasis is on speaking, conversation, and debate. Prerequisites: second-year Italian and OSPFLOR 66, or consent of coordinator.

3 units, Win (Gelmetti, S)

ITALLANG 103. Advanced Oral Communication: Italian Language Through Contemporary Music—For Florence returnees or those who have completed second-year Italian. Use of song lyrics and music videos of prominent Italian singers and songwriters to improve communication skills and review language functions. Emphasis is on listening, speaking, conversation, and debate. Prerequisites: second-year Italian and OSPFLOR 66, or consent of coordinator.

3 units, Spr (Gelmetti, S)

ITALLANG 113. Italian Cultural Studies—Literature, news reports, comic books, film reviews, music lyrics, and sociological surveys used to examine Italy's language, culture, and society today. Advanced grammatical analysis and reading comprehension. Prerequisite: second-year Italian or consent of coordinator.

3-4 units, Aut (Gelmetti, S)

ITALLANG 114. Advanced Stylistics and Composition—Goal is proficiency in written and spoken Italian. Literary and non-literary texts with textual and grammatical analysis, oral reports, translations, and weekly writing assignments. Prerequisite: second-year Italian or consent of coordinator.

3-4 units, Win (Baldocchi, M)

ITALLANG 115. Academic and Creative Writing—Continuation of 114. Academic prose: formal structures and academic terminology. Creative prose: short stories, expressive language, and when and how to break the rules for effect. Prerequisite: second-year Italian or consent of coordinator.

3-4 units, Spr (Baldocchi, M)

ITALLANG 99. Language Specials—Prerequisite: consent of instructor.

1-5 units, Aut, Win, Spr, Sum (Staff)

ITALLANG 394. Graduate Studies in Italian Conversation—Prerequisite: consent of instructor.

1-3 units, Aut, Win, Spr (Staff)

ITALLANG 395. Graduate Studies in Italian—Prerequisite: consent of instructor.

2-5 units, Aut, Win, Spr (Staff)

CASA ITALIANA

ITALLANG 126. Italy and Italians Today—May be repeated once for credit.

2 units, Aut, Win, Spr (Lummus, D)

JAPANESE LANGUAGE COURSES

Students registering for the first time in a course must take a placement test if they have had any training in Japanese before entering Stanford. All entering students must take Part I (written and listening) of the placement test online during the summer, followed by Part II (oral and written), to be administered on campus September 19, 2007. Consult the Language Center or http://language.stanford.edu/ for further information. Language courses may not be repeated for credit and must be taken in sequence.

FIRST- AND SECOND-YEAR JAPANESE

JAPANLNG 1,2,3. First-Year Modern Japanese—Foundation in grammar, reading, and composition. 150 Kanji characters introduced.

5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Busbin, K)*

JAPANLNG 5. Intensive First-Year Japanese Language—Equivalent to 7B, 8B, and 9B combined. See http://www.stanford.edu/group/japanese/summer.

7-8 units, Sum (Staff)

JAPANLNG 7A,8A,9A. First-Year Japanese Language, Culture, and Communication A—For students who want to build communication skills in limited time. Online listening exercises, audiovisual materials, kanji tutorials. See http://www.stanford.edu/group/japanese/jlcca.htm.

3 units, **7A:** *Aut,* **8A:** *Win,* **9A:** *Spr (*Magnani, E*)*

JAPANLNG 7B,8B,9B. First-Year Japanese Language, Culture, and Communication B—First-year sequence enables students to converse, write, and read essays on topics such as personal history, experiences, familiar people. 300 kanji characters. See http://www.stanford.edu/group/japanese/1stB.htm.

5 units, **7A:** *Aut,* **8A:** *Win,* **9A:***Spr (Lipton, H)*

JAPANLNG 17A,18A,19A. Second-Year Japanese Language, Culture, and Communication A—Continuation of 9A. For students who want to build communication skills in limited time. Prerequisite: 9A or equivalent. See http://www.stanford.edu/group/ll/jlcc/jlcca.htm.

3 units, **17A:** *Aut (Nakamura, K),* **18A:** *Win,* **19A:** *Spr (Arao, F)*

JAPANLNG 17B,18B,19B. Second-Year Japanese Language, Culture, and Communication B—Goal is to express in spoken and written Japanese advanced concepts such as comparisons and contrasts of the two cultures, descriptions of incidents, and social issues. 800 kanji, 1,400 new words, and higher-level grammatical constructions. Readings include authentic materials such as newspaper articles, and essays. Prerequisite: 9B. See http://www.stanford.edu/group/japanese/2ndB2.htm.

5 units, **17B:** *Aut,* **18B:** *Win,* **19B:** *Spr (Lowdermilk, M)*

JAPANLNG 20. Intensive Second-Year Japanese—(Same as JAPANLNG 20G.) Equivalent to 17B,18B,19B combined. Prerequisite 9B or equivalent. See http://www.stanford.edu/group/japanese/summer.

7-8 units, Sum (Nakamura, K)

JAPANLNG 21,22,23. Second-Year Modern Japanese—Continuation of 3. Expression of ideas, advanced grammatical patterns, 600 kanji characters, simple compositions, and enhanced understanding of Japanese culture. Goal is to read original source material. Prerequisite: 3 or equivalent.

5 units, **21:** *Aut,* **22:** *Win,* **23:** *Spr (Arao, F)*

JAPANLNG 27,28,29. Intermediate Japanese Conversation—Develops oral proficiency through simple sentence patterns, audio tapes, and oral presentations. For the practical use of Japanese. Prerequisite: 3, 9B, or consent of instructor.
2 units, **27:** *Aut,* **28:** *Win,* **29:** *Spr (Busbin, K)*

JAPANLNG 51,52,53. Intermediate to Advanced Japanese Conversation—Oral proficiency through role play, oral presentations, and discussion. Recommended for those who have participated in Kyoto SCTI program May be able to take concurrently with 17B, 18B, and 19B. Prerequisite: 9K, 19B, or consent of instructor.
2 units, **51:** *Aut,* **52:** *Win,* **53:** *Spr (Lowdermilk, M)*

THIRD-YEAR ADVANCED JAPANESE

JAPANLNG 121,122,123. Advanced Japanese Conversation—Focus is on fine tuning grammatical points, explaining things in Japanese, and fluency. Audiovisual material and oral presentations. Prerequisite: 23, 29, 19B, or consent of instructor.
2 units, **121:** *Aut,* **122:** *Win,* **123:** *Spr (Lipton, H)*

JAPANLNG 127B,128B,129B. Third-Year Japanese Language, Culture, and Communication B—Emphasis is on spontaneous conversations and expressing abstract thoughts. Materials include Japanese media, literature, and TV. Cultural and social topics related to Japan and its people. Prerequisite: 19B. See http://www.stanford.edu/group/japanese/3rdB.htm.
5 units, **127B:** *Aut,* **128B:** *Win,* **129B:** *Spr (Tomiyama, Y)*

JAPANLNG 130. Intensive Third-Year Japanese—Equivalent to 127B,128B,129B combined. Prerequisite: 19B or equivalent. See http://www.stanford.edu/group/japanese/summer.
7-8 units, Sum (Staff)

JAPANLNG 211,212,213. Advanced Japanese—Structure of Japanese, writings in different genres and styles, using such knowledge in writing, and expressing opinions on a variety of topics. Original writings, including fiction, essays, newspaper, and journal articles. Recommended taken in sequence. Prerequisite: 103, 129B, or equivalent.
3-5 units, **211:** *Aut,* **212:** *Win,* **213:** *Spr (Nakamura, K)*

JAPANLNG 200. Directed Reading—Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Staff)

JAPANLNG 394. Graduate Studies in Japanese Conversation—Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Staff)

JAPANLNG 395. Graduate Studies in Japanese—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

KOREAN LANGUAGE COURSES

Students registering for the first time in a first- or second-year course must take a placement test if they had any training in Korean before entering Stanford. All entering students must take Part I (written) of the placement test online during the summer, followed by Part II (oral and written), to be administered on campus September 19, 2007. Consult the Language Center or http://language.stanford.edu/ for further information. Language courses may not be repeated for credit and must be taken in sequence.

FIRST- AND SECOND-YEAR KOREAN

KORLANG 1,2,3. First-Year Korean—Communication skills, vocabulary, and grammar patterns. Culturally appropriate conduct relevant to contexts such as greetings, gestures, and body language.
5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Kim, H)*

KORLANG 1A,2B. Accelerated First-Year Korean—Completes first-year sequence in two quarters. For students with previous knowledge of Korean or a strong background in listening and speaking skills. Completion of 2B fulfills the University language requirement. Prerequisite: placement tests or consent of instructor.
5 units, **1A:** *Win,* **2B:** *Spr (Kim, H)*

KORLANG 21,22,23. Second-Year Korean—More complex sentences and grammatical patterns. Conversation in daily situations such as making a polite request or suggestion, reading simple texts, and Korean culture. Prerequisite: 3 or consent of instructor.
3-5 units, **21:** *Aut,* **22:** *Win,* **23:** *Spr (Kim, H)*

ADVANCED

KORLANG 110. Korean Pronunciation and Intonation—Goal is intelligibility and fluency. Lab assignments. Prerequisite: 3 or consent of instructor.
2-4 units, Aut (Kim, H)

KORLANG 120B. Korean Culture—Examination of Korean culture and society to develop fluency and vocabulary through newspapers and short essays and stories. May be repeated for credit. Prerequisites: 103 and consent of instructor.
1-3 units, Win (Kim, H)

KORLANG 130. Reading Korean—Contemporary literature and academic texts. Prerequisite: 103 or consent of instructor.
1-3 units, Aut (Staff)

KORLANG 141. Business Korean—Business-related vocabulary and cultural etiquette. Business letters, mock interviews, and resumes. May be repeated for credit. Prerequisite: 103 or consent of instructor.
2-3 units, Spr (Kim, H)

KORLANG 200. Directed Reading in Korean—Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

KORLANG 395. Graduate Studies in Korean—Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Staff)

PORTUGUESE LANGUAGE COURSES

Because the Portuguese Language Program is in the process of instituting a formal placement test, students registering for the first time in a first- or second-year course must see the coordinator for proper placement if they have had any prior training in Portuguese. Certain Portuguese classes count towards a major in Spanish, and all count for a minor in Portuguese. Consult the Department of Spanish and Portuguese or http://span-port.stanford.edu for further information. Language courses may not be repeated for credit and must be taken in sequence.

FIRST- AND SECOND-YEAR PORTUGUESE

PORTLANG 1,2,3. First-Year Portuguese—Emphasis is on oral comprehension and proficiency in speaking. Students learn the language as they contrast Brazilian culture with their own. Lab. Completion of 3 fulfills the University Foreign Language Requirement.
5 units, **1:** *Aut (Sotelino, K),* **2:** *Win (Delgado, A),* **3:** *Spr (Staff)*

PORTLANG 1A,2A. Accelerated First-Year Portuguese—For students with two years of college-level study of a Romance language, preferably Spanish. Goal is to use socially and culturally appropriate forms in conversations, providing and obtaining information, and expressing feelings, emotions, and opinions. Students learn the language as they contrast Brazilian culture with their own. Lab. Completion of 2A fulfills the University's foreign language requirement.
3-5 units, **1A:** *Aut (Delgado, A), Win (Wiedemann, L), Spr (Delgado, A),* **2A:** *Aut, Win (Delgado, A), Spr (Wiedemann, L)*

PORTLANG 11A,12A. Accelerated Second-Year Portuguese—Goal is to use socially and culturally appropriate forms in narrations, descriptions, and expression of ideas and opinions Prerequisite: first-year sequence, equivalent, or consent of instructor.
3-5 units, Aut, Win, Spr (Delgado, A)

PORTLANG 50. Reading in Portuguese—For students with superior reading proficiency in Spanish or another Romance Language. Reading competence for research and courses in Luso-Brazilian studies. Literary, journalistic, and academic readings. Fulfills University reading requirement for advanced degrees.
3-4 units, Spr (Wiedemann, L)

ADVANCED PORTUGUESE

PORTLANG 101. Reading Brazil—For intermediate or advanced students. Short expository readings, guest lectures, discussions, compositions on Brazilian issues. Review of grammatical structures. Vocabulary building with emphasis on common idiomatic expressions and troublesome lexical distinctions. Prerequisite: 12A or equivalent, or consent of instructor.
3-4 units, Aut (Delgado, A)

PORTLANG 102. Brazil in Text: Advanced Grammar and Composition—For intermediate and advanced students. Further development of academic writing. Short fictional and expository readings, guest lectures, discussions, compositions on Brazilian issues. Emphasis is on building paragraphs, organizing arguments, and justifying positions. May be used as workshop to write papers in Portuguese for another course. May be repeated once for credit. Prerequisite: 12A or equivalent, or consent of instructor.
3-4 units, Win (Wiedemann, L)

PORTLANG 103. Advanced Conversation: Brazil Today—For intermediate and advanced students. Reading and discussions on issues from current newspapers and magazines, reading comprehension strategies with online news updates, and vocabulary building with emphasis on formal expository writing. Writing practice if desired. Students prepare short presentations and lead subsequent discussions. May be repeated once for credit. Prerequisite: 12A or consent of instructor.
3 units, Spr (Wiedemann, L)

PORTLANG 297. Directed Reading—Prerequisite: consent of instructor.
1-4 units, Aut, Win, Spr (Staff)

PORTLANG 394. Graduate Studies in Portuguese Conversation—Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Staff)

PORTLANG 395. Graduate Studies in Portuguese—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

SLAVIC LANGUAGE COURSES

Students registering for the first time in a first- or second-year course must take a placement test if they had any training in Russian before entering Stanford. All entering students must take Part I (written) of the placement test online during the summer, followed by Part II (oral), to be administered on campus September 19, 2007. Consult the Language Center or http://language.stanford.edu/ for further information. Language courses may not be repeated for credit and must be taken in sequence.

FIRST- AND SECOND-YEAR RUSSIAN

SLAVLANG 1,2,3. First-Year Russian—Functionally-based communicative approach, including essential Russian grammar. Discussions of Russian culture and the Russian view of reality.
5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Leidy, B; Marcos, M,)*

SLAVLANG 5,6,7. Russian for Native Speakers—Self-paced. Reading and writing skills and communicating in formal and informal settings. Does not fulfill the University foreign language requirement.
2 units, **5:** *Aut,* **6:** *Win,* **7:** *Spr (Marcos, M)*

SLAVLANG 51,52,53. Second-Year Russian—More difficult grammar such as numbers, verb conjugation, and aspect. Vocabulary, speaking skills.
5 units, **51:** *Aut,* **52:** *Win,* **53:** *Spr (Khassina, E)*

SLAVLANG 55. Intermediate Russian Conversation—May be repeated for credit. Prerequisite: first-year Russian or equivalent placement.
2 units, Aut (Schupbach, R), Win, Spr (Staff)

SLAVLANG 99. Language Specials—Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Staff)

THIRD-YEAR AND ADVANCED RUSSIAN

SLAVLANG 111,112,113. Third-Year Russian, First Quarter—A snapshot of Russian life. Reading comprehension, conversational competence, grammatical accuracy, and cultural sophistication.
4 units, **111:** *Aut,* **112:** *Win,* **113:** *Spr (Erman, I)*

SLAVLANG 177,178,179. Fourth-Year Russian—Culture, history, and current events. Films, classical and contemporary writers, newspaper articles, documentaries, radio and TV programs, and music. Review and fine-tuning of grammar and idiomatic usage. Prerequisite: 113 or equivalent.
3 units, **177:** *Aut,* **178:** *Win,* **179:** *Spr (*Marcos, M*)*

SLAVLANG 181,182,183. Fifth-Year Russian—Language proficiency maintenance; appropriate for majors and non-majors with significant language experience overseas. Discussions, oral presentations, and writing essays on contemporary Russia.
3 units, **181:** *Aut,* **182:** *Win,* **183:** *Spr (Khassina, E)*

SLAVLANG 199. Individual Work—Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

SLAVLANG 299. Independent Study
1-5 units, Aut, Win, Spr, Sum (Staff)

SLAVLANG 395. Graduate Studies in Russian—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

SLAVIANSKII DOM

Other in-house courses may be announced.

SLAVLANG 60A. Beginning Russian Conversation—(AU)
1 unit, Aut (Schupbach, R)

SLAVLANG 60B. Intermediate Russian Conversation—(AU)
1 unit, Win (Schupbach, R)

SLAVLANG 60C. Advanced Russian Conversation—(AU)
1 unit, Spr (Schupbach, R)

SLAVLANG 60D. East European Breweries and Brewing—(AU)
1 unit, Win, Spr (Schupbach, R)

SLAVLANG 60F. Slavic Films Series—(AU)
1 unit, Win (Schupbach, R)

SLAVLANG 60P. Slav Dom Theme Projects—(AU)
1 unit, Aut, Win, Spr (Schupbach, R)

SLAVLANG 60T. Teaching Slavic Conversation—(AU)
1 unit, Aut, Win (Schupbach, R), Spr (Staff)

SPANISH LANGUAGE COURSES

Students who have never studied Spanish before should enroll in SPANLANG 1. Students registering for the first time in a first- or second-year course must take a placement test if they had any training in Spanish before entering Stanford. All entering students who have not taken the Spanish Language Advanced Placement (AP) Exam and received a score of 4 or 5, or who have not taken the SAT II with a score of 630 or above, must take Part I (written) of the placement test online during the summer at http://language.stanford.edu/SPANISH, followed by Part II (oral), to be administered on campus September 19, 2007. Students who have passed the language AP exam with a 4 or 5 or the SAT II with a 630 or above are exempted from the written test, but must take the oral on September 19, 2007 in order to determine their correct placement. Students who have taken the Spanish Language Advanced Placement (AP) and received a score of 5 are eligible for 10 units of credit in Spanish. Consult the Language Center or http://language.stanford.edu/ for further information.

Completion of SPANLANG 2A, 3, or 41C fulfills the University language requirement.

Students who grew up in homes where Spanish is spoken should take the placement assessment for the special series of courses (21B,22B,23B) designed for these speakers. The bilingual series fulfills the language requirement at Stanford. Potential home-background speakers should complete the questionnaire found at http://language.stanford.edu/HOMEBACKGROUND, and attend the assessment for potential home-background speakers administered on September 19, 2007.

A grade of 'C' or better is required to enter the next course in a language sequence. Language courses may not be repeated for credit and must be taken in sequence. Second-year students may alternate between the cultural emphasis (11C,12C,13C) and international relations (11R,12R,13R) series if done so in sequence (11,12,13); however, a student may only take one of each level in these series.

FIRST- AND SECOND-YEAR SPANISH

SPANLANG 1,2,3. First-Year Spanish—Emphasis is on developing socially and culturally appropriate proficiency in interpersonal, interpretive, and presentational spheres. Influences shaping the production of oral and written texts in the Spanish- and English-speaking world.
5 units, Aut, Win, Spr (Alexander, A; Catoira, L; Del Carpio, C; Flores, F; Junguito, M; Méndez Barletta, L; Miano, A; Ortiz Cuevas, C; Sánchez, K; Reinhold, V; Urruela, M)

SPANLANG 1A,2A. Accelerated First-Year Spanish—Completes first-year sequence in two rather than three quarters. For students with previous knowledge of Spanish, or those with a strong background in another Romance language. 2A fulfills the University language requirement. Prerequisite: written and oral placement tests.
5 units, **1A:** *Aut (Brates, V; Del Carpio, C; Nissler, P; Won, H), Win (Del Carpio, C; Won, H),* **2A:** *Win, Spr (Brates, V; Del Carpio, C; Guzmán, C; Won, H)*

SPANLANG 5A,B,C. Intensive First-Year Spanish—Goal is to engage in interactions with Spanish speakers in socially and culturally appropriate forms. Social and cultural influences shaping the production of oral and written texts in the Spanish- and English-speaking world. Stanford graduate students restricted to 9 units register for 205A,B,C.
5 units, Sum (Staff)

SPANLANG 10. Beginning Oral Communication—Additional pronunciation, vocabulary, and speaking skills. May be repeated once for credit. Prerequisite: one quarter of Spanish, demonstrated oral proficiency above the novice level; may be taken concurrently with 2, 2A, or 3.
2 units, Aut (Alexander, A; Corso, I), Win, Spr (Corso, I; Miano, A)

SPANLANG 11C,12C,13C. Second-Year Spanish: Cultural Emphasis—Sequence integrating culture and language. Emphasis is on advanced proficiency in oral and written discourse including presentational language and socioculturally appropriate discourse in formal and informal, academic, and professional contexts. Prerequisite: one year of college Spanish or equivalent.
4-5 units, Aut, Win, Spr (Burgos Jara, C; Catoira, L; Guzmán, C; Kenna, C; Méndez Barletta, L; Molitoris, J; Ortiz Cuevas, C; Perales, O; Schmidt, S; Urruela, M)

SPANLANG 11R,12R,13R. Second-Year Spanish: Emphasis on International Relations—Sequence integrating geopolitics and language. Emphasis is on advanced proficiency in oral and written discourse including presentational language, international relations, and socioeconomics of the Spanish-speaking world. Prerequisite: one year of college Spanish or equivalent.
4-5 units, **11R:** *Aut,* **12R:** *Win,* **13R:** *Spr (Brates, V; Sierra, A)*

SPANLANG 15. Intermediate Oral Communication—Emphasis is on interaction in Spanish locally and globally. Regional vocabularies and cultures at home and abroad. Interaction with local native Spanish speakers and communities globally via the Internet. May be repeated once for credit. Prerequisite: first-year Spanish and demonstrated oral proficiency above the low intermediate level.
3 units, Aut (Alexander, A; Won, H), Win (Perales, O), Spr (Guzman, C; Nissler, P), Sum (Staff)

SPANLANG 21B,22B,23B. Second-Year Spanish for Heritage Language Students—Emphasis is on ability to communicate orally and in writing. Spelling and the written accent. Goal is to understand, interpret, and analyze texts, movies, radio, and television. Written language skills include rules for editing written language. Third quarter focus is on the development of written and oral styles and registers used in more formal settings.
3-5 units, **21B:** *Aut (Casas, C),* **22B:** *Win (Casas, C),* **23B:** *Spr (Méndez Barletta, L)*

SPANLANG 25A,B,C. Intensive Second-Year Spanish—Sequence integrating culture and language. Emphasis is on advanced proficiency in oral and written discourse including presentational language and socioculturally appropriate discourse in formal and informal, academic, and professional contexts. Prerequisite: one year of college Spanish or equivalent. Stanford graduate students restricted to 9 units register for 225A,B,C and take all three courses for a total of 9 units, or two of the courses for a total of 9 units.
4 units, **A:** *Sum,* **B:** *Sum,* **C:** *Sum (Staff)*

SPANLANG 50. Reading Spanish—For students who have already taken Spanish for at least one year or have superior reading proficiency in another Romance language. Emphasis is on academic texts. Fulfills University reading requirements for advanced degrees if students earn a grade of 'B.'
3 units, Win (Sierra,A)

ADVANCED COURSES

SPANLANG 100. Advanced Oral Communication—For students who have completed second-year Spanish or who have oral skills above the intermediate level. Interactive activities require students to persuade, analyze, support opinions, and gather and interpret others' points of view. Focus is on vocabulary enrichment and idiomatic expressions. Cultural, literary, political, and journalistic readings. May be repeated once for credit. Prerequisite: 13 or equivalent.
3 units, Aut, Win, Spr (Perales, O)

SPANLANG 101. The Structure of Spanish—Criteria and skills to analyze Spanish grammatical structure. Identification of word functions in sentences and texts, types of sentences, and terminology. Structure of nouns, adjectives, and verbs, and their relationship with meaning. The differences between Spanish grammar as a formal system and in everyday life. Prerequisite: 13C, 13R, 23B, or equivalent.
3-5 units, Aut (Valdés, G)

SPANLANG 102. Composition and Writing Workshop—Individual development of the ability to write in Spanish. Emphasis is on style and diction, and on preparing and writing essays on literary topics. Non-Spanish majors or minors may choose topics more closely related to their studies for projects. Prerequisite: two years of college Spanish or equivalent. WIM
3-5 units, Aut (Méndez Barletta, L), Spr (Kenna, C)

SPANLANG 102B. Composition and Writing Workshop for Heritage Language Students—For students with a good understanding of written accents, spelling, and syntax. Focus is on the craft of writing with emphasis on brainstorming, planning, outlining, drafting, revising, style, diction, and editing. Writing essays on literary topics. Non-Spanish majors or minors may choose topics related to their studies. Prerequisite: 23B or equivalent. WIM
3-5 units, Win (Miano, A)

SPANLANG 121M,122M,123M. Spanish for Medical Students—(Same as HRP 280,281,282.) Goal is a practical and rapid command of spoken Spanish. Topics: the human body, hospital procedures, diagnostics, food, and essential phrases for on-the-spot reference when dealing with Spanish-speaking patients. Series can be taken independently, depending on the level of prior knowledge.
3 units, **121M:** *Aut,* **122M:** *Win,* **123M:** *Spr (Corso, I)*

SPANLANG 131M. Spanish for Heritage and Foreign Language Pre-Med and Public Health Students—For pre-med or public health students who grew up in homes where Spanish is spoken or for students who possess a considerable command of Spanish. Focus is on developing the ability to provide information on health-related topics to Spanish speakers in the U.S. Students participate in the organization and delivery of information on preventive health care in a workshop setting to a Spanish-speaking community.
3-4 units, Aut, Spr (Sierra, A)

SPANLANG 199. Individual Reading—May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr, Sum (Staff)

SPANLANG 394. Graduate Studies in Spanish Conversation—Prerequisite: consent of instructor.
1-3 units, Aut, Win, Spr (Staff)

SPANLANG 395. Graduate Studies in Spanish—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

YOST HOUSE

Other in-house courses may be announced.

SPANLANG 60A,B,C. Beginning Spanish Conversation—(AU)
1 unit, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Urruela, M)*

SPANLANG 60K. Cooking Class—(AU)
1 unit, Win (Urruela, M)

SPANLANG 60M. Movie Series—(AU)
1 unit, Win (Urruela, M)

SPANLANG 60P. Yost Lecture Series—(AU)
1 unit, Aut (Urruela, M), Win (Staff), Spr (Urruela, M)

SPANLANG 60T. Teaching Spanish Conversation—(AU)
1 unit, Aut, Win, Spr (Urruela, M)

SPECIAL LANGUAGE PROGRAM

The Special Language Program (SLP) offers foreign languages not otherwise taught at Stanford. Based on current funding and student requests, the courses planned for 2007-08 are listed below; however, not every course listed is taught. Additional languages may still be offered upon request, provided funding is available. Requests for the 2008-09 academic year should be made by Spring Quarter of this year at the Special Language Program office.

All beginning-level 3-unit courses are offered on a satisfactory/no credit basis only. Intermediate-level and 4-unit courses are offered with a grading option. Beginning and intermediate each refer to an academic year's sequence of language study. Most 3-unit language courses are offered for a two-year, three quarter sequence:

'A' suffix courses are typically taught Autumn.
'B' suffix courses are typically taught Winter.
'C' suffix courses are typically taught Spring.

Beginning, intermediate, and advanced courses are 3 units except modern Greek and ASL. In some circumstances, a beginning or intermediate course may be offered in alternate years.

For more information, see http://www.stanford.edu/dept/SLP/. Language courses may not be repeated for credit, and must be taken in sequence.

FULFILLING THE LANGUAGE REQUIREMENT

Students who have already taken courses in the relevant language at another institution, or who have previous knowledge of the language, can request to be tested. Tests are comprised of written and oral parts. A student must display first-year level proficiency in the requested language in order to fulfill the requirement. Testing is guaranteed only for these languages currently offered. Students planning to take a test must contact the Special Language Program no later than the Spring Quarter of sophomore year. To submit a request for language testing, or to request a language, apply via the web at http://www.stanford.edu/dept/SLP.

BEGINNING-LEVEL, FIRST-YEAR COURSES

Beginning-level, first-year language courses require no previous knowledge of the language. The beginning-level sequence emphasizes development of the full range of language skills, reading, listening comprehension, the use of grammatical structures, and oral and written communication, through a variety of learning themes. Individual, small group, interactive work and multimedia-based activities reinforce language skills and provide the platform for adapting the curriculum to specific student learning goals. Cultural awareness is a strong component of the curriculum.

INTERMEDIATE-LEVEL, SECOND-YEAR COURSES

Intermediate-level, second-year language courses require completion of the beginning sequence, or consent of instructor. The intermediate-level sequence focuses on continuous mastery and development of learning skills that help students to converse accurately and more fluently, incorporate more advanced grammatical structures in their oral and written work, use idiomatic expressions in the right context, and write simple compositions. Curricular objectives and enhanced understanding of the culture are built into the courses through a multimodal approach.

ADVANCED-LEVEL, THIRD-YEAR COURSES

Advanced-level, third-year language courses require completion of the intermediate-year sequence and consent of the program coordinator. The advanced-level sequence focuses on accurate understanding and use of structures through authentic texts and multimedia materials, and readings from various genres. Individual learning goals and student proficiency are taken into account to provide a learning environment that helps students become more autonomous learners.

AMERICAN SIGN LANGUAGE COURSES

SPECLANG 178A,B,C. Beginning Sign Language—Comprehension and production skills; cultural awareness. Limited enrollment.
4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Haas, C)*

SPECLANG 179A,B,C. Intermediate Sign Language—Additional functional structures, lexical items, and history. Limited enrollment.
4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Haas, C)*

CENTRAL ASIAN LANGUAGE COURSES

SPECLANG 192A,B,C. Beginning Kazakh—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Kazakh culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Kunanbaeva, A)*

SPECLANG 193A,B,C. Intermediate Kazakh
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

SPECLANG 238A,B,C. Beginning Uzbek
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

SOUTH ASIAN LANGUAGE COURSES

SPECLANG 152A,B,C. Beginning Hindi—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Hindi culture.
3 units, **A:** *Aut (Mody, S),* **B:** *Win,* **C:** *Spr (Malhotra, P)*

SPECLANG 153A,B,C. Intermediate Hindi
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Mody, S)*

SPECLANG 183A,B,C. Beginning Sanskrit
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Porta, F)*

SOUTHEAST ASIAN LANGUAGE COURSES

SPECLANG 144A,B,C. Beginning Tagalog—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Tagalog culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Alvarez, G)*

SPECLANG 145A,B,C. Intermediate Tagalog
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Alvarez, G)*

SPECLANG 150A,B,C. Beginning Vietnamese—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Vietnamese culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

SPECLANG 151A,B,C. Intermediate Vietnamese
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ha, P)*

SPECLANG 156A,B,C. Beginning Indonesian—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Indonesian culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Indrawati, T)*

SPECLANG 157A,B,C. Intermediate Indonesian
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Indrawati, T)*

CREOLE LANGUAGE COURSES

SPECLANG 134A. Beginning Haitian Creole—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Haitian culture.
3 units, Spr (Staff)

EUROPEAN LANGUAGE COURSES

SPECLANG 75. Greek Culture, Ideals, and Themes—Introduction to Greek culture and its global influence in a social historical context, through images from its past and institutions in contemporary Greek society. Limited enrollment. GER:DB-Hum, EC-GlobalCom
3 units, Spr (Prionas, E)

SPECLANG 129A,B,C. Beginning Ukrainian
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Jarboe, L)*

SPECLANG 167A,B,C. Intermediate Czech
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Dusatko, J)*

SPECLANG 167A,B,C. Beginning Polish—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Polish culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Bartoszewski, L)*

SPECLANG 168A,B,C. Intermediate Polish
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Bartoszewski, L)*

SPECLANG 170A,B,C. Beginning Modern Greek—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Greek culture.
4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Prionas, E)*

SPECLANG 171A,B, C. Intermediate Modern Greek
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Prionas, E)*

SPECLANG172A,B,C. Modern Greek Language through Literature and Film—Accelerated. Vocabulary enrichment through multimedia, online materials.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Prionas, E)*

SPECLANG 173A,B,C. Beginning Hungarian—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Hungarian culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Mihalik, A)*

SPECLANG 186A,B,C. Beginning Serbo-Croatian—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Serb and Croat culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Medic, S)*

SPECLANG 188A,B,C. Advanced Serbo-Croatian
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Medic, S)*

SPECLANG 198Q. Modern Greece in Film and Literature—Stanford Introductory Seminar. Preference to sophomores. Cultural and literary highlights. Filmmakers include Kakoyannis, Dassen, Boulmetis, Angelopoulos, and Scorsese; readings from Eugenides, Gage, Kavafis, Kazantzakis, Samarakis, Seferis, and Elytis.
3-5 units, Aut (Prionas, E)

SPECLANG 221A,B,C. Beginning Norwegian—Grammatical structures, vocabulary, and sentence patterns through speaking, reading, writing, and listening. Norwegian culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Nergaard, A)*

SPECLANG 241A,B,C. Ukrainian for Speakers of a Slavic Language
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Fleishman, E)*

NATIVE AMERICAN LANGUAGE COURSES

SPECLANG 174A,B,C. Beginning Quechua—Speaking, reading, writing, and listening. Quechua culture.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Fajardo, J)*

SPECLANG 247A,B,C. Beginning Lakota
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Staff)*

DIRECTED READING AND GRADUATE STUDIES

SPECLANG 297. Directed Reading—Prerequisite: consent of instructor.
1-4 units, Aut, Win, Spr, Sum (Staff)

SPECLANG 395. Graduate Studies in Special Language—Prerequisite: consent of instructor.
1-4 units, Aut, Win, Spr (Staff)

TIBETAN LANGUAGE PROGRAM

Because the Tibetan Language Program does not have a formal placement test, students registering for the first time must see the coordinator for proper placement if they have had any prior training in Tibetan. Completion of TIBETLNG 3 fulfills the University Foreign Language Requirement. Consult the Language Center or http://language.stanford.edu/ for further information. Language courses may not be repeated for credit and must be taken in sequence.

TIBETLNG 1,2,3. First-Year Tibetan—Grammar, reading, and composition. Tibetan culture and the Tibetan view of reality.
5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Clark, R)*

TIBETLNG 199. Individual Reading—May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

TIBETLNG 395. Graduate Studies in Tibetan—Prerequisite: consent of instructor.
2-5 units, Aut, Win, Spr (Staff)

CENTER FOR LATIN AMERICAN STUDIES

Director of the Center: Herbert S. Klein
Associate Director: Megan Gorman
Visiting Professors: Ana María González de Tobia, Milton Hatoum, Cristián Sánchez, Ernesto Schargrodsky, Guillermo Solorzano

Affiliated Faculty and Staff:
Anthropology: Clifford R. Barnett (emeritus), George Collier (emeritus), William H. Durham, James A. Fox, Dominique Irvine, John W. Rick, Ian Robertson
Art and Art History: Barbaro Martinez-Ruiz
Biological Sciences: Gretchen Daily, Rodolfo Dirzo, Harold Mooney, Peter Vitousek, Virginia Walbot
Business, School of: Gerard Padró i Miquel
Comparative Literature: Roland Greene, Hans U. Gumbrecht
Dance: Susan Cashion
Earth Sciences, School of: Pamela Matson
Economics: Roger Noll (emeritus), Clark Reynolds (emeritus)
Education, School of: Martin Carnoy, Amado Padilla
Engineering, School of: Adrian Lew, Leonard Ortolano
English: Ramón Saldívar (also Comparative Literature)
Freeman Spogli Institute for International Studies: Rosamond Naylor, David Victor
History: Zephyr Frank, Tamar Herzog, Herbert S. Klein
Hoover Institute: William Ratliff
Human Biology: Anne Firth Murray
Language Center, Special Languages Program: José Carlos Fajardo
Law, School of: Thomas C. Heller
Linguistics: John Rickford
Medicine, School of: Victor F. Froelicher, Evaleen K. Jones, Samuel LeBaron, Grant Miller, Julie Parsonnet, Paul Wise
Political Science: Alberto Díaz-Cayeros, Terry Karl, Beatriz Magaloni, Robert Packenham (emeritus), Michael Tomz
Religious Studies: Thomas Sheehan
Sociology: Alex Inkeles (emeritus), Michael Rosenfeld
Spanish and Portuguese: Caridad Kenna, Alice Miano, Otilia Perales, Michael P. Predmore, Joan Ramon Resina, Jorge Ruffinelli, Ana Sierra, Lisa Surwillo, Guadalupe Valdés (also School of Education), Lyris Wiedemann, Yvonne Yarbro-Bejarano
Stanford University Libraries: Adán Griego, Robert Trujillo

Center Offices: Bolívar House, 582 Alvarado Row
Mail Code: 94305-8545
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Web Site: http://las.stanford.edu/

The Center for Latin American Studies (CLAS) supports research and teaching on Latin America by the faculty and students of Stanford in all fields of study. Field research, language training, and interdisciplinary approaches are stressed in the Latin American Studies program, which draws on the strength and diversity of its nationally recognized faculty affiliates and substantial library holdings on Latin America. These resources are enhanced by the Tinker Visiting Professorship in Latin American Studies and the Nabuco Visiting Chair in Brazilian Studies, which bring distinguished Latin American scholars to teach at Stanford each year.

The center's resources include funds used in support of student and faculty activities and classes in and about Latin America, visiting professors and scholars, and various forms of public outreach. CLAS also devotes resources to Iberian and Caribbean studies. The center offers an undergraduate minor, an undergraduate honors program, and a master's degree in Latin American Studies.

UNDERGRADUATE PROGRAMS

Although the University does not offer a B.A. in Latin American Studies, it does offer a minor and an honors program. Stanford also has departmental and interdisciplinary degree programs in which a student may concentrate on Latin America. These include Anthropology, History, Political Science, Spanish and Portuguese, and International Relations. Contact the respective departments for further information.

MINOR

The minor in Latin American Studies is offered to students in any major who wish to develop a complementary concentration on the region. To pursue the minor, students must submit for approval an online proposal of course work no later than the second quarter of their junior year. The minor must be completed by the second quarter of the senior year. Requirements for the minor include:

1. Completion of 25 units as follows: a 5-unit course surveying Latin America such as HISTORY 70 or an approved substitute; 20 additional units at the 100 level or higher which together comprise a coherent focus on a theoretical problem or issue of the region such as culture and identity, political economy, or sustainable development. At least 10 of the 25 units must be completed at Stanford.
2. Demonstration of proficiency in either Spanish or Portuguese, equivalent to the requirement for the honors program.
3. Field experience in Latin America such as study abroad, summer research, or internship is recommended.

Units for a student's major cannot be double-counted towards the minor.

Upon satisfactory completion of all requirements, the center's subcommittee on undergraduate programs authorizes the designation of the Minor in Latin American Studies on the student's transcript.

HONORS PROGRAM

The Honors Program in Latin American Studies is open to majors in any field. The aim of the honors program is to prepare students to pursue individualized research on Latin America, culminating in the preparation of an honors thesis written under the supervision of a faculty adviser. The honors program is particularly suited to the student who wishes to go on to graduate school or pursue employment in an institution emphasizing research and independent work. Although not required, students are encouraged to undertake independent field research in Latin America for their thesis. It is strongly recommended that students enroll in HISTORY 299X, Design and Methodology for International Field Research (1 unit), in the sophomore or junior year for an overview of research design and methods for international field research.

Admission to the honors program is by application by the end of the junior year. Applications are reviewed and approved by the CLAS director and associate director. Applicants must have a cumulative grade point average (GPA) of 3.3 (B+) or higher, and maintain this average in courses taken to satisfy the requirements. Courses must be taken for a letter grade where that option is available. Courses credited toward LAS honors may be double-counted toward the student's major requirements.

To graduate with interdisciplinary honors in Latin American Studies a student must:

1. Complete a total of 35 units in courses certified for honors by the Center for Latin American Studies, distributed as follows:
   a) *A survey course:* HISTORY 70, Culture, Politics, and Society in Latin America. This is normally taken in the sophomore year.
   b) *For breadth:* two 4-5-unit courses at the 100 level or higher with a focus on the region. These courses are normally taken during the sophomore and junior years.
   c) *For depth:* one 4-5-unit course at the 100 level or higher with a focus on the region that explores an issue in depth of particular interest to the student, approved by the honors adviser.
   d) LATINAM 198, Honors Thesis (1-10 units), under the supervision of the student's faculty honors adviser. Normally these units are spread over two or three quarters of the senior year and are devoted to the completion of the honors thesis.

   e) LATINAM 201 (same as HISTORY 275F), Social Change in Latin America Since 1900 (5 units). This Autumn Quarter honors seminar must be taken in the senior year.
   f) Additional courses at the 100 level or higher focusing on Latin America to bring the total to 35 units; up to 5 units may come from study of Spanish or Portuguese beyond the seventh quarter.
   g) Of the courses applied to 'b' and 'c' above, 10 units may be completed in Overseas Studies and 5 units may be taken as directed individual study.
2. Fulfill the Foreign Language Requirement (see below).
3. Submit an honors thesis which meets standards of scholarly excellence and is approved by the thesis adviser. If graduating in June, participate in the LAS honors symposium at the end of May.

More information about the honors program is available at http://las.stanford.edu/programs/honors_detailed.html.

FOREIGN LANGUAGE REQUIREMENT

The minimum requirement for completion of either the minor or honors program is advanced proficiency in Spanish or Portuguese by any one of the following means:

1. Completion of seven quarters of college-level study of Spanish or Portuguese.
2. Completion of a course on Spanish or Portuguese language or literature, or on some other subject but taught in Spanish or Portuguese, at the 100-level or higher, with a letter grade of 'B' (3.0).
3. Achievement of the advanced proficiency level on the ACTFL scale in a test administered by the Department of Spanish and Portuguese.

HONORS COLLEGE

The LAS honors college, sponsored with many other departmental and interdisciplinary honors colleges by the Vice Provost for Undergraduate Education, is an intensive three-week residential program offered directly preceding Autumn Quarter. It affords returning LAS honors students who have completed field work a debriefing and a focused series of presentations by a member of the CLAS-affiliated faculty and other Stanford instructors on adviser interaction, bibliographic resources, writing strategies, statistical analysis, organizational techniques for completing the thesis process, and opportunities to socialize with other honors students in the college, all without cost to the students. Ample time is provided for library research, individual faculty consultations, and data analysis. Applications for honors colleges are available in Spring Quarter prior to the senior year.

SUMMER INTERNSHIP GRANT

Each summer, the center awards grants to a small number of undergraduates to undertake internships in Latin America. Applications include a proposal, academic transcript, and recommendations from a faculty member and one other person knowledgeable about the applicant's abilities. Students from all departments are eligible to apply. See http://las.stanford.edu/funding/undergrad_summer_intgrants.html.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

Undergraduates at Stanford may apply for admission to the coterminal master's program in Latin American Studies when they have earned a minimum of 120 units toward graduation, including advanced placement and transfer credit, and no later than the quarter prior to the expected completion of their undergraduate degree. The annual deadline for coterminal applications is January 8.

Coterminal applicants must submit: a 500-word statement of purpose; resume; 10-15 page double-spaced academic writing sample; three letters of recommendation; a Stanford transcript; and scores from the General Test of the Graduate Record Exam. Coterminal applicants must have a minimum GPA of 3.5 and a working knowledge of Spanish or Portuguese at the third-year level.

For University coterminal degree program rules and application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

Requirements for the master's degree are summarized below.

GRADUATE PROGRAMS

MASTER OF ARTS

The Master of Arts in Latin American Studies is an interdisciplinary program. The curriculum consists of a core set of courses surveying the history, politics, society, and culture of the region, advanced language training, and in-depth course work. In consultation with a faculty adviser, students select a course of study suited to their individual interests. Students may obtain a dual professional degree concurrently with the M.A.

ADMISSION

The one-year master's program in Latin American Studies is designed for students who have experience working, living, or studying in Latin America or Iberia and little prior course work on the region.

The application deadline is January 8. Applicants submit an online application, including a 500-word statement of purpose, resume, 10-15 page double-spaced academic writing sample, and three letters of recommendation; official transcripts; and Graduate Record Examination scores. TOEFL scores are required of applicants for whom English is not their first language or who did not attend an undergraduate institution where English is the language of instruction. To apply online or for information on graduate admissions, go to http://gradadmissions.stanford.edu.

To be eligible for a dual degree program with the Graduate School of Business (M.B.A.), School of Law (J.D.), or School of Medicine (M.D.), candidates must apply and be accepted independently to both programs.

Applicants must meet the University admission requirements, have a working knowledge of Spanish or Portuguese at the third-year level, and have experience working, living, or studying in Latin America or Iberia prior to admission.

CLAS takes a broad approach to evaluating applications for admission. As important as GRE scores and grades are the applicant's essay, letters of recommendation, academic writing sample, and the experiences and goals conveyed through the personal statement and resume.

DEGREE REQUIREMENTS

University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin.

A description of the M.A. program is also available online at http://www.stanford.edu/group/las/programs/ma.html.

The program requires completion of a minimum of 45 graduate units. Upon entering, each student is assigned a faculty adviser who works with the student to develop a customized program of study.

To receive the M.A. degree in Latin American Studies, students must complete the items below.

1. *Core courses* (15 units): one core five-unit course in each of three fields of specialization:
   a) Culture and Society (CulSoc)—LATINAM 301, Social Change in Latin America Since 1900
   b) Environment and Ecology (Eco)—BIOSCI 175, Tropical Ecology and Conservation
   c) Political Economy (PolEcon)—POLISCI 248S, Latin American Politics.

   These fields (CulSoc, Eco, and PolEcon) are not declared on Axess; they do not appear on the transcript or the diploma.
2. *Cognate courses* (15 units): three courses, one from each of the three fields of specialization listed in '1' above. See http://www.stanford.edu/group/las/programs/macognatecurriculum.html for more information. Cognate courses which fulfill this requirement are indicated in the cognate courses list below with the abbreviations CulSoc, Eco, and PolEcon.
3. *Elective courses* (10-15 units): three elective courses in one of the three fields of specialization (see '1' above) from across the University's offerings.
4. *Language requirement:* at least 3 units of course work on a second Latin American language. Students must take either an advanced third-year language course if they have both Spanish and Portuguese, or take a basic course in the language in which they do not possess competence.

5. *Seminar requirement:* enroll each quarter in LATINAM 200, a 1-unit seminar on Contemporary Issues in Latin American Studies, where invited scholars present lectures on major Latin American themes and topics, followed by questions and discussion.
6. *Thesis option:* students may elect to write a master's thesis; they may register for up to 10 units of thesis research under the guidance of an Academic Council faculty member. Thesis units may be counted toward the elective field unit requirements.
7. *Grade requirements:* all courses to be counted toward the degree, except for LATINAM 200, must be taken for a letter grade and receive a grade of 'B' or higher.

FINANCIAL AID

The Center for Latin American Studies has several graduate fellowships as well as limited research and course assistantship positions with the Tinker Visiting Professors each quarter.

DOCTORAL PROGRAMS

Although the University does not offer a Ph.D. in Latin American Studies, Stanford has several departmental programs through which a student may concentrate on Latin America. These include Anthropology, History, Political Science, and Spanish and Portuguese. Contact the respective departments for admission information.

COURSES

LATINAM 197. Directed Individual Research—For students engaged in interdisciplinary work that cannot be arranged by department. May be repeated for credit. Prerequisite: consent of instructor.
1-10 units, Aut, Win, Spr (Staff)

LATINAM 198. Honors Thesis—Restricted to those writing an honors thesis in Latin American Studies.
1-10 units, Aut, Win, Spr (Staff)

LATINAM 200. Seminar on Contemporary Issues in Latin American Studies—Required of Latin American Studies master's students each quarter. Guest scholars present analyses of major Latin American themes and topics. May be repeated for credit.
1 unit, Aut, Win, Spr (Klein, H)

LATINAM 201/301. Social Change in Latin America Since 1900—(Same as HISTORY 275F/375F.) Changes in the social and demographic characteristics of Latin American populations since 1900 and the response of national governments in terms of the evolution of social welfare, health, and educational systems. Fulfills requirement for Latin American Studies honors seminar. Required core course for Latin American Studies master's students. GER:DB-SocSci
5 units, Aut (Klein, H)

LATINAM 398. Master's Thesis—Restricted to students writing a master's thesis in Latin American Studies. May be repeated for credit.
1-10 units, Aut, Win, Spr (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a minor or honors program. See "Degree Requirements" above for an explanation of the field codes CulSoc, Eco, and PolEcon.

ANTHSCI 103/262C. Cultural Diversity, Ethnicity, and Governance in Indigenous Latin America—CulSoc
3-5 units, Spr (Karp-Toledo, E)

ANTHSCI 106B. Maya Mythology and the *Popol Vuh*—CulSoc
5 units, Win (Fox, J)

ANTHSCI 112. Human Diversity: A Linguistic Perspective—(Same as HUMBIO 187.) CulSoc
3 units, Spr (Ruhlen, M)

ANTHSCI 142/242A. Incas and their Ancestors: Peruvian Archaeology—(Same as ARCHLGY 102B.) CulSoc
3-5 units, Spr (Contreras, D)

ANTHSCI 144/244. Ancient Cities in the New World—CulSoc
3-5 units, Spr (Robertson, I)

ANTHSCI 146A. The Aztecs and Their Ancestors: Introduction to Mesoamerican Archaeology—CulSoc
3-5 units, Win (Robertson, I)

ANTHSCI 162B/262B. Ethnography and Ethnohistory in the Andean World—CulSoc
3-5 units, Win (Karp-Toledo, E)

ANTHSCI 167C/267C. Managing the Commons: Evolving Theories for Sustainable Resource Use—(Same as EARTHSYS 167C/267C.) Eco
5 units, Aut (Irvine, D)

ANTHSCI 179/279. Environmental Change and Emerging Infectious Diseases—(Same as HUMBIO 114.) CulSoc, Eco
3-5 units, Aut (Durham, W; Jones, J)

BIOSCI 101. Ecology—Eco
3 units, Aut (Vitousek, P; Dirzo, R)

BIOSCI 117. Biology and Global Change—(Same as EARTHSYS 111, GEOPHYS 117.) Eco
4 units, Win (Vitousek, P; Arrigo, K)

BIOSCI 145/245. Behavioral Ecology—Eco
4 units, Spr (Gordon, D)

BIOSCI 175. Tropical Ecology and Conservation—Eco
5 units, Spr (Dirzo, R)

CEE 142A. Creating Sustainable Development—(Same as CEE 242A.) Eco
3 units, Win (Christensen, S)

CEE 171. Environmental Planning Methods—Eco
3 units, Win (Ortolano, L)

CHICANST 181S. U.S.-Mexico Borderlands in Comparative Perspective—(Same as CSRE 181S.) CulSoc, PolEcon
5 units, Spr (Palafox, J)

COMM 136/236. Democracy and the Communication of Consent—(Same as POLISCI 134.) PolEcon
4-5 units, Aut (Fishkin, J)

COMPLIT 142. The Literature of the Americas—(Same as ENGLISH 172E) CulSoc
5 units, Aut (Greene, R; Saldívar, R)

ECON 101. Economic Policy Analysis—PolEcon
5 units, Aut (Cojoc, D), Win (Steiner, F), Spr (Rothwell, G)

ECON 118. Development Economics—PolEcon
5 units, Aut (Jayachandran, S)

ECON 122. Economic Development of Latin America—PolEcon
5 units, Win (Schargrodsky, E)

ECON 126. Economics of Health and Medical Care—(Same as BIOMEDIN 156/256, HRP 256.) Eco, PolEcon
5 units, Aut (Bhattacharya, J)

ECON 155. Environmental Economics and Policy—(Same as EARTHSYS 112.) Eco
5 units, Win (Goulder, L)

ECON 165. International Trade and Finance—PolEcon
5 units, Aut (Fitzgerald, D), Win (Staiger, R), Sum (Staff)

ECON 214. Development Economics I—PolEcon
2-5 units, Aut (Jayachandran, S)

ECON 216. Development Economics II—PolEcon
2-5 units, Win (DeGiorgi, G)

ECON 220. Political Economy I—PolEcon
2-5 units, Win (Jackson, M)

ECON 221. Political Economy II—PolEcon
2-5 units, Spr (Staff)

ECON 224. Science, Technology, and Economic Growth—Eco
2-5 units, Win (David, P)

ECON 228. Institutions and Organizations in Historical Perspective—PolEcon
2-5 units, Aut (Greif, A)

ECON 265. International Economics I—PolEcon
2-5 units, Aut (Fitzgerald, D)

ECON 266. International Economics II—PolEcon
2-5 units, Win (Staiger, R)

ECON 267. Topics in International Trade—PolEcon
2-5 units, Spr (Staff)

EDUC 122X. From Local to Global: Collaborations for International Environmental Education—(Same as EARTHSYS 123.) Eco
2 units, Aut (Goldman, S; Hoagland, S)

EDUC 149/249. Theory and Issues in the Study of Bilingualism—(Same as SPANLIT 207.) CulSoc
3-5 units, Aut (Valdés, G)

EDUC 222. Resource Allocation in Education—PolEcon
4-5 units, Spr (Carnoy, M)

EDUC 306A. Education and Economic Development—PolEcon
5 units, Aut (Carnoy, M)

ENERGY 101. Energy and the Environment—(Same as EARTHSYS 101.) Eco
3 units, Win (Kovscek, A; Durlofsky, L; Gerritsen, M)

ENERGY 102. Renewable Energy Sources and Greener Energy Processes—(Same as EARTHSYS 102.) Eco
3 units, Spr (Kovscek, A; Gerritsen, M)

ENGLISH 357E. The Avant Garde and the Americas—CulSoc
5 units, Win (Heise, U)

FRENLIT 133. Literature and Society in Africa and the Caribbean—(Same as COMPLIT 141.) CulSoc
4 units, Spr (Boyi, E)

GES 333. Water Policy Colloquium—(Same as CEE 333, IPER 333.) Eco
1 unit, Spr (Freyberg, D)

HISTORY 70. Culture, Politics, and Society in Latin America—CulSoc
5 units, Win (Frank, Z)

HISTORY 170/370. Colonial Latin America—CulSoc
4-5 units, Aut (Herzog, T)

HISTORY 201/301. Public Service through Public History—CulSoc
5 units, Aut (Camarillo, A; McKibben, C)

HISTORY 203A/303A. Theories of the State from the Ancient World to the Present—CulSoc
4-5 units, Win (Baker, K; Sheehan, J)

HISTORY 205B/305B. Quantitative Methods in Historical Research—CulSoc
4-5 units, Aut (Klein, H)

HISTORY 217B/317B. Land of Three Religions: Medieval Spain—CulSoc
4-5 units, Win (Miller, K)

HISTORY 276. Modern Brazil—(Same as HISTORY 376) CulSoc
4-5 units, Spr (Frank, Z)

HISTORY 279/379. Latin American Development: Economy and Society, 1800-2000—CulSoc
4-5 units, Spr (Frank, Z)

HISTORY 299X/399A. Design and Methodology for International Field Research—CulSoc
1 unit, Spr (Kollmann, N; Roberts, R)

HISTORY 470A. Research Seminar in Latin American Social History—CulSoc
4-5 units, Aut (Frank, Z)

HISTORY 470B. Research Seminar in Latin American Social History II—CulSoc
4-5 units, Win (Frank, Z)

HUMBIO 112. Conservation Biology—(Same as BIOSCI 144.) Eco
3-4 units, Win (Boggs, C; Launer, A)

HUMBIO 129. Critical Issues in International Women's Health—Eco
4 units, Win (Murray, A)

HUMBIO 129S. International Health—Eco
4 units, Win (Wise, P)

HUMBIO 153. Parasites and Pestilence: Infectious Public Health Challenges—Eco
4 units, Spr (Smith, D)

HUMBIO 171. The Death Penalty: Human Biology, Law, and Policy—PolEcon, CulSoc
3 units, Spr (Abrams, W)

INTNLREL 114D. Democracy, Development, and the Rule of Law—(Same as IPS 230, POLISCI 114D/314D.) PolEcon
5 units, Aut (Stoner-Weiss, K; McFaul, M)

INTNLREL 148. Economic Integration of the Americas—PolEcon
5 units, Aut (O'Keefe, T)

INTNLREL 161B. Global Human Geography: Europe and Americas—(Same as HISTORY 106B.) CulSoc
5 units, Win (Lewis, M)

INTNLREL 163. History and Geography of Contemporary Global Issues—(Same as HISTORY 206.) CulSoc
5 units, Aut (Lewis, M)

LAW 330. International Human Rights Clinic—PolEcon
3 units, Win (Martinez, J)

LAW 611. International Conflict Resolution Colloquium—(Same as POLISCI 403, PSYCH 283.) PolEcon
2-5 units, Win (Weiner, A)

MED 230. Rethinking International Health—Eco
2-3 units, Win, Spr (Parsonnet, J; Wise, P)

MED 262. Economics of Health Improvement in Developing Countries—(Same as ECON 127, HUMBIO 121.) Eco, PolEcon
5 units, Win (Miller, N)

MS&E 243. Energy and Environmental Policy Analysis—(Same as IPER 243.) Eco, PolEcon
3 units, Spr (Sweeney, J)

POLISCI 114S. International Security in a Changing World—PolEcon
5 units, Win (Sagan, S; Blacker, C)

POLISCI 140. Political Economy of Development—PolEcon
5 units, Win (Díaz-Cayeros, A)

POLISCI 143. Nongovernmental Organizations and Development in Poor Countries—(Same as INTNLREL 143.) PolEcon
5 units, Win (Abernethy, D)

POLISCI 243R. Research Seminar in Democratization and Human Rights—PolEcon
5 units, Aut (Karl, T)

POLISCI 248. Mexican Politics—PolEcon
5 units, Spr (Díaz-Cayeros, A)

POLISCI 248S. Latin American Politics—PolEcon
5 units, Win (Magaloni, B)

POLISCI 346S. The Logic of Authoritarian Government, Ancient and Modern—(Same as HISTORY 378A.) PolEcon
5 units, Aut (Haber, S)

POLISCI 440B. Political Economy of Development—(Same as HISTORY 378E.) PolEcon
5 units, Aut (Haber, S)

PORTLIT 193Q. Spaces and Voices of Brazil through Films—CulSoc
3-4 units, Aut (Wiedemann, L)

PSYCH 155. Introduction to Comparative Studies in Race and Ethnicity—(Same as CSRE 196C, ENGLISH 172D.) CulSoc
5 units, Win (Moya, P; Markus, H)

PUBLPOL 104. Economic Policy Analysis—(Same as ECON 150) PolEcon
5 units, Spr (Staff)

SOC 231. World, Societal, and Educational Change: Comparative Perspectives—(Same as EDUC 136/306D.) CulSoc
4-5 units, Win (Drori, G)

SPANLIT 104N. Race and Slavery in Literature of the Nineteenth-Century Spanish Empire—CulSoc
3-4 units, Aut (Surwillo, L)

SPANLIT 108Q. Latin American Cinema: Politics and Aesthetics—CulSoc
3-4 units, Win (Ruffinelli, J)

SPANLIT 114N. Lyric Poetry—CulSoc
3-5 units, Spr (Predmore, M)

SPANLIT 119N. Buenos Aires, Havana, Mexico City: Modernism and the Latin American City—CulSoc
3-4 units, Win (Staff)

SPANLIT 125. The Forms of Wonder—CulSoc
3-5 units, Win (Arellano, J)

SPANLIT 131. Cultural Perspectives in the Luso-Hispanic Americas—CulSoc
3-5 units, Win (Gallo, R)

SPANLIT 136. Survey of Modern Iberian Literature—CulSoc
3-5 units, Win (Resina, J)

SPANLIT 140. Introduction to Methods of Literary and Cultural Analysis—CulSoc
3-5 units, Spr (Surwillo, L)

SPANLIT 157. Introduction to Medieval and Early Modern Iberian Literatures—(Same as PORTLIT 157.) CulSoc
3-5 units, Aut (Barletta, V)

SPANLIT 161. Survey of Latin American Literature—CulSoc
3-5 units, Spr (Ruffinelli, J)

SPANLIT 193. The Cinema of Pedro Almodóvar—CulSoc
3-5 units, Spr (Resina, J)

SPANLIT 215/315. Nineteenth-Century Spanish Serials—CulSoc
3-5 units, Win (Surwillo, L)

SPANLIT 240. Brazilian and Spanish American Novellas—(Same as PORTLIT 240.) CulSoc
3-5 units, Spr (Hatoum, M)

SPANLIT 242. The Rise of the Latin American Novel and Its Reception in Spain—CulSoc
3-5 units, Spr (Ruffinelli, J)

SPANLIT 244. The Formation of a Nation—(Same as PORTLIT 244.) CulSoc
3-5 units, Win (Costa Lima, L)

SPANLIT 249. Reading Cinema Today—CulSoc
3-5 units, Win (Sánchez, C)

SPANLIT 286/386. The Films of Lourdes Portillo—CulSoc
3-5 units, Aut (Yarbro-Bejarano, Y)

SPANLIT 314. Poetic Form and Performance: The Medieval Iberian Lyric—CulSoc
3-5 units, Win (Barletta, V)

SPANLIT 324. Modern Catalan Literature—CulSoc
3-5 units, Aut (Resina, J)

SPANLIT 336. Early 20th-Century Peninsular Spanish Poetry—CulSoc
3-5 units, Spr (Predmore, M)

SPANLIT 357. The Novel and Latin American Sociopolitical History—(Same as PORTLIT 357.) CulSoc
3-5 units, Win (Lima, L)

OVERSEAS STUDIES

Courses taught overseas can be found in the "Overseas Studies" section of this bulletin, in the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu/.

SANTIAGO

OSPSANTG 58. Living Chile: A Land of Extremes—CulSoc, Eco
5 units, Aut, Spr (Staff)

OSPSANTG 104X. Modernization and Culture in Latin America—CulSoc
5 units, Aut (Subercaseaux, B)

OSPSANTG 111. Social Heterogeneity in Latin America—CulSoc
5 units, Aut (Valdés, T)

OSPSANTG 116X. Modernization and its Discontents: Chilean Politics at the Turn of the Century—PolEcon
5 units, Spr (Correa, G)

OSPSANTG 118X. Artistic Expression in Latin America—CulSoc
5 units, Win (Albornoz, C)

OSPSANTG 129X. Latin America in the International System—PolEcon
4-5 units, Win (Fuentes, C)

OSPSANTG 141X. Politics and Culture in Chile—PolEcon, CulSoc
5 units, Spr (Subercaseaux, B)

OSPSANTG 160X. Latin America in the International Economy—PolEcon
5 units, Win (Di Filippo, A)

OSPSANTG 221X. Political Transition and Democratic Consolidation: Chile in Comparative Perspective—PolEcon
5 units, Aut (Micco, S)

LINGUISTICS

Emeriti: *(Professors)* Clara N. Bush, Shirley Brice Heath, William R. Leben, Elizabeth C. Traugott
Chair: Thomas A. Wasow
Professors: Joan Bresnan (Spring), Eve V. Clark, Penelope Eckert, Martin Kay (Autumn, Spring), Paul Kiparsky (on leave), Beth Levin, Stanley Peters, John R. Rickford, Ivan A. Sag, Thomas A. Wasow
Associate Professors: Daniel Jurafsky, Christopher Manning
Assistant Professors: Arto Anttila, Meghan Sumner
Senior Lecturers: Philip L. Hubbard, Beverley J. McChesney
Lecturer: Vivienne Fong (Winter)
Visiting Professor: Arnold Zwicky
Acting Assistant Professor: Asya Pereltsvaig
Consulting Professors: Ronald Kaplan, Lauri Karttunen, Annie Zaenen
Consulting Associate Professors: Jared Bernstein, Cleo Condoravdi
Affiliated Faculty: Herbert H. Clark, James A. Fox, Kenji Hakuta, Miyako Inoue, Yoshiko Matsumoto, Orrin W. Robinson III, Richard D. Schupbach, Chao Fen Sun

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Web site: http://www-linguistics.stanford.edu

Courses given in Linguistics have the subject code LINGUIST. For a complete list of subject codes, see Appendix.

Linguistics concerns itself with the fundamental questions of what language is and how it is related to the other human faculties. In answering these questions, linguists consider language as a cultural, social, and psychological phenomenon and seek to determine what is unique in languages, what is universal, how language is acquired, and how it changes. Linguistics is, therefore, one of the cognitive sciences; it provides a link between the humanities and the social sciences, as well as education, and hearing and speech sciences.

The department offers courses at the undergraduate and graduate levels in the areas central to linguistic theory and analysis. Many of them deal with the analysis of structural patterns in the different components that make up language, including sounds (phonetics and phonology), meanings (semantics), words (morphology), sentences (syntax), and the way they vary and change over time. Other courses integrate the analysis of linguistic structure with phenomena that directly concern other disciplines. These include courses in computational linguistics, language acquisition, the philosophy of language, and sociolinguistics.

A variety of open forums provide for the discussion of linguistic issues, including colloquia and regularly scheduled workshops in child language, computational linguistics, phonology, semantics, sociolinguistics, and syntax. Faculty and visiting scholars in the department and the Center for the Study of Language and Information (CSLI), whose members are computer scientists, linguists, philosophers, and psychologists, participate extensively in the activities of the department.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The undergraduate major stresses the study of language both as a fundamental human faculty and as a changing social institution. At the core of the program is a set of departmental courses on the nature of human language; the major also draws on courses offered by other departments and programs.

The Linguistics major cuts across the humanities and the social and physical sciences. It provides a solid general education as a background for advanced studies in such disciplines as Anthropology, Communication, Computer Science, Education (Language, Literacy, and Culture), hearing and speech sciences, languages, Law, Linguistics, Philosophy, and Psychology.

REQUIREMENTS

Requirements for the B.A. include at least 50 units of course work in Linguistics and approved courses in related fields. Of the 50 units required for the major, no more than 12 may be below the 100 level. No more than two courses, neither of which can be a core course, may be taken on a credit/no credit basis.

Core Courses—The core courses are:

LINGUIST 1. Introduction to Linguistics
LINGUIST 110. Introduction to Phonetics and Phonology
LINGUIST 120. Introduction to Syntax
LINGUIST 130A. Introduction to Linguistic Meaning, *or* 130B. Introduction to Lexical Semantics
LINGUIST 150. Language in Society, which fulfills the Writing in the Major requirement (WIM)
LINGUIST 160. Introduction to Language Change, *or*, in advance consultation with the Linguistics undergraduate studies adviser, a course in historical linguistics or the history of a language

All majors must complete at least five core courses, including LINGUIST 150, Language and Society, which fulfills the Writing in the Major requirement (WIM).

Other Courses—Other courses counting toward the unit requirement should form a coherent program with emphases from among the areas of concentration listed below. Students should consult with the Linguistics undergraduate studies adviser when declaring the major, and maintain regular contact during the remainder of their Stanford career. Each student's major program must be approved by the Linguistics undergraduate studies adviser, or approved department adviser.

Students in the major must also take:

1. At least two 200-level Linguistics courses, typically in their area of concentration.
2. LINGUIST 197, Undergraduate Research Seminar, in the junior year. (Special arrangements can be made for transfer students and others who start the major late.)

Other Requirements—

1. *Foreign language:* majors must have competence in at least one language other than English as part of their understanding of the field of linguistics and its study. This is usually demonstrated by the completion of six quarters of language study at Stanford or equivalent; level of proficiency is determined by the Language Center or the relevant language department.

   Students may petition to be exempted from the Language Requirement if they have grown up speaking a language other than English and can use it for everyday purposes and for linguistic analysis.
2. *Junior research paper:* this requirement is typically fulfilled by providing an additional stage of revision on a research paper previously submitted in a Linguistics course. It must be approved by both the instructor of the course and the Linguistics undergraduate studies adviser by the end of the junior year.

AREAS OF CONCENTRATION

Students select one of the following areas of concentration or develop one themselves in advance consultation with the Linguistics undergraduate studies chair. These areas of concentration are not declared on Axess, and they do not appear on the transcript or diploma.

General Linguistics—This concentration provides a broad education in Linguistics and is advisable for students interested in advanced degrees in Linguistics. All six core courses are required.

Language and Society—This concentration focuses on the social dimensions of language.

Language Structures—This concentration focuses on the cognitive aspects of language.

Language Specialization—This concentration focuses on linguistics as it pertains to a particular language. To date, Chinese, Japanese, and Spanish language specializations have been pre-approved. Other language specializations can be arranged on an ad hoc basis if appropriate courses are available in the relevant departments.

MINOR

Requirements for the minor include at least 28 units of course work (typically seven courses) in Linguistics and related fields, approved in advance by the Linguistics undergraduate studies adviser. No more than two courses, neither of which can be a core course, may be taken on a credit/no credit basis. The courses counting towards the minor must be incremental units beyond those needed to satisfy the student's major course of study. The minor consists of:

1. LINGUIST 1. Introduction to Linguistics
2. Two out of the following five Linguistics core courses:
   LINGUIST 110. Introduction to Phonetics and Phonology
   LINGUIST 120. Introduction to Syntax
   LINGUIST 130A. Introduction to Linguistic Meaning,
   or LINGUIST 130B. Introduction to Lexical Semantics
   LINGUIST 160. Introduction to Language Change,
   or, in advance consultation with the Linguistics undergraduate studies adviser, a course in historical linguistics or the history of a language.
3. At least four other courses determined in advance consultation with the Linguistics undergraduate studies adviser. Students are encouraged to take at least one 200-level Linguistics course. Students may also choose to do independent work with a faculty member of their choice.

HONORS PROGRAM

Students who wish to undertake a more intensive program of study, including independent research, should pursue departmental honors. Students should apply for honors by the end of Winter Quarter of their junior year. As part of the application, the student must write a research proposal describing the honors project which must be approved by the faculty adviser. Approval is given only to students who have maintained a grade point average (GPA) of 3.3 (B+) or better in the courses required for the major.

Honors students complete a total of 60 units including the 50 units for the major, plus 10 additional units of independent study and Honors Research. In addition, they must complete an honors thesis based on research conducted with a principal adviser who must be a member of the Linguistics faculty, and a secondary faculty adviser who may, with the approval of the Undergraduate Studies Committee, be a member of another department. In the Autumn Quarter of the senior year, honors students enroll in LINGUIST 199, Independent Study, to work closely with one of their advisers on the research project. In Winter and Spring quarters, honors students enroll in LINGUIST 198, Honors Research, with the student's principal adviser for close supervision of the honors thesis. The thesis must be submitted in final, acceptable, form by May 15. The thesis topic is presented orally at a department Honors Colloquium late in Spring Quarter.

COTERMINAL PROGRAM

The Department of Linguistics admits a limited number of undergraduates to the coterminal degree program. Students are required to submit to the department a complete application, which includes a statement of purpose identifying a thesis topic, a Stanford transcript, three letters of recommendation (at least one of which must be from a faculty member in Linguistics), and a proposed course of study (worked out in advance with a Linguistics adviser). Applicants for the coterminal degree may apply as early as their eighth quarter and no later than early in the eleventh quarter of undergraduate study. Decisions on admission to the coterminal degree program rest with the Graduate Admissions Committee of the Department of Linguistics. For further application information, see the department's web pages.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

MASTER OF ARTS

The University's basic requirements for the master's degree are discussed in the "Graduate Degrees" section of this bulletin. The following are additional departmental requirements. Candidates should review the department's *Guidelines for the M.A. Degree in Linguistics* for further particulars concerning these requirements.

1. *Courses:* candidates must complete 45 units of graduate work in Linguistics, including at least four courses in the student's area of specialization. No more than two courses should be at the 100 level.

   Individual programs should be worked out in advance with an adviser who should ascertain that the necessary courses in the area of specialization are offered over the course of the year of anticipated enrollment. The overall grade point average (GPA) must be at least 3.0 (B) for all degree program coursework.
2. *Language:* reading knowledge of a non-native language in which a substantial linguistic literature is written, with sufficient facility to understand and interpret linguistic research published in that language, or in-depth research on the structure of a non-native language.
3. *Thesis or Thesis Project:* a research paper supervised by a committee of three faculty (normally fulfilled by up to 6 units of LINGUIST 398, Directed Research).

DOCTOR OF PHILOSOPHY

The following requirements are in addition to the basic University requirements for the degree sought; see the "Graduate Degrees" section of this bulletin. Candidates should review the department's *Guidelines for the Degree of Ph.D. in Linguistics*, downloadable at http://www-linguistics.stanford.edu/graduate/phd-guidelines.pdf, for further particulars concerning these requirements.

1. *Language:* candidates must demonstrate the ability to read at least one foreign language in which a substantial linguistic literature is written, with sufficient facility to understand and to interpret linguistic research published in that language. (Particular areas of specialization may require additional research languages.)

   In addition, each candidate must demonstrate an explicit in-depth knowledge of the structure of at least one language (normally neither the candidate's native language nor the language used for the reading exam). This requirement is fulfilled by writing an original research paper on a language.
2. *Courses:* a minimum of 135 units of graduate work beyond the bachelor's degree or, 90 units beyond the master's degree. The course requirements detailed in the *Guidelines for the Degree of Ph.D. in Linguistics* guarantee that each student covers a sufficient set of subareas within the field.

   Candidates must maintain a satisfactory record in the number and distribution of units completed. The overall course work GPA must be at least 3.0 (B) and all of the basic courses should be completed with at least a 'B.'
3. *Research:* the prospective Ph.D. candidate is expected to complete two substantial qualifying papers. The deadline for completion of the first qualifying paper is the end of the Autumn Quarter of the second year; the deadline for completion of the second qualifying paper is the end of Spring Quarter of the second year. The subject matter of the two papers, although it may be related (for example, same language), must be clearly distinct. The requirement is fulfilled by LINGUIST 395A, B, Research Workshop (1-2 units each), and by oral discussion with a committee of at least three faculty members selected by the student and the faculty.
4. *Candidacy:* students must complete a prescribed portion of the basic course requirement (see item 2 above), one foreign language requirement (see item 1 above), and one qualifying paper (see item 3 above) by the end of their second year.
5. *Teaching:* at least three quarters serving as teaching assistant in Linguistics courses.

6. *Colloquia:* two oral presentations exclusive of the oral presentation of the dissertation proposal (see item 7b below). This requirement is satisfied by class presentations, conference papers, or colloquium talks. Normally, both should be given during the first four years of study.
7. *Dissertation:*
   - a) a written dissertation proposal is required by the end of the third year.
   - b) oral presentation of the dissertation proposal, preferably as a colloquium.
   - c) approval of the dissertation topic and appointment of a dissertation committee.
   - d) passing a University oral examination on the dissertation and related areas.
   - e) dissertation (up to 15 units of LINGUIST 399).

PH.D. MINOR

1. *Courses:* the candidate must complete 30 units of course work in linguistics at the 100 level or above, including LINGUIST 110, 120, and either 130A or 130B (100-level courses are waived if 200-level courses in the same area are taken), and at least three courses related to the area of specialization. Courses submitted for the minor must be incremental units beyond those used to satisfy the major. Individual programs should be worked out in advance with the student's Ph.D. minor adviser in linguistics.
2. *Research Project* (optional): the candidate may elect to present a paper which integrates the subject matter of linguistics into the field of specialization of the candidate.
3. The linguistics minor adviser or designee serves on the candidate's University oral examination committee and may request that up to one-third of the examination be devoted to the minor subject.

Ph.D. Minor in Applied Linguistics—The Department of Linguistics participates in the Applied Linguistics Minor. See the "Language Center" section of this bulletin for full details.

COGNITIVE SCIENCE

Linguistics is participating with the departments of Computer Science, Philosophy, and Psychology in an interdisciplinary program in Cognitive Science for doctoral students. The program is intended to provide an interdisciplinary education as well as a deeper concentration in linguistics. Students who complete the Linguistics and Cognitive Science requirements receive a special designation in Cognitive Science along with the Ph.D. in Linguistics. To receive this field designation, students must complete 30 units of approved courses, to be determined in consultation with the graduate studies adviser.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement.

Courses numbered under 100 are designed primarily for pre-majors. Courses with 100-level numbers are designed for majors, minors, and M.A. and Ph.D. minor candidates in Linguistics. Those with numbers 200 and above are primarily for graduate students, but with consent of instructor some of them may be taken for credit by qualified undergraduates. At all levels, the course numberings indicate a special area, as follows:

01-04	General
05-09	Phonetics
10-14	Phonology
15-19	Morphology
20-29	Syntax
30-39	Semantics, Pragmatics, Discourse
40-49	Language Acquisition, Psycholinguistics
50-61	Sociolinguistics, Language Variation, Change
62-73	Language and Culture, Structure of a Language
74-79	Methods, Mathematical Linguistics, Statistics
80-89	Computational Linguistics
90-93	Applied Linguistics
94-99	Directed Work, Theses, Dissertations

LINGUIST 1. Introduction to Linguistics—The cognitive organization of linguistic structure and the social nature of language use. Why language learning is difficult. Why computers have trouble understanding human languages. How languages differ from one another. How and why speakers of the same language speak differently. How language is used strategically. GER:DB-SocSci

4 units, Aut (Eckert, P; Sag, I), Spr (Pereltsvaig, A)

LINGUIST 37Q. Forensic Linguistics—Stanford Introductory Seminar. Preference to sophomores. The use of linguistic techniques to investigate crimes in which language data forms part of the evidence to authenticate police statements, confessions, threats to harm or kill, and suicide notes. Language data including choice of words, sentence structure, punctuation, spelling, handwriting, and voice identification. Differences between what is said, what is meant, and what is understood. Variations in language use and practice between authors and within the same author. Case studies.

2 units, Spr (Traugott, E)

LINGUIST 44N. Living with Two Languages—Stanford Introductory Seminar. Preference to freshmen. The nature of bi- and multilingualism with emphasis on the social and educational effects in the U.S. and worldwide, in individual versus society, and in child and adult. The social, cognitive, psycholinguistic, and neurological consequences of bilingualism. Participation in planning and carrying out a research project in language use and bilingualism. GER:DB-SocSci

3 units, Spr (Clark, E)

LINGUIST 46Q. Slips of the Tongue—Stanford Introductory Seminar. Preference to sophomores. Linguistic mistakes, using collections of real-life errors as windows on how languages are structured and used.

3 units, Spr (Zwicky, A)

LINGUIST 62N. The Language of Food—Stanford Introductory Seminar. Preference to freshmen. The relationship between food and language around the globe. The vocabulary of food and prepared dishes, and crosslinguistic similarities and differences, historical origins, forms and meanings, and relationship to cultural and social variables. The structure of cuisines viewed as meta-languages with their own vocabularies and grammatical structure. The language of menus; their historical development and crosslinguistic differences.

3 units, Win (Jurafsky, D)

LINGUIST 63N. Translation—Stanford Introductory Seminar. Preference to freshmen. What is a translation? The increased need for translations in the modern world due to factors such as tourism and terrorism, localization and globalization, diplomacy and treaties, law and religion, and literature and science. How to meet this need; different kinds of translation for different purposes; what makes one translation better than another; why some texts are more difficult to translate than others. Can some of this work be done by machines? Are there things that cannot be said in some languages? GER:DB-SocSci

3 units, Aut (Kay, M)

LINGUIST 65/265. African American Vernacular English—The English vernacular spoken by African Americans in big city settings, and its relation to Creole English dialects spoken on the S. Carolina Sea Islands (Gullah), in the Caribbean, and in W. Africa. The history of expressive uses of African American English (in soundin' and rappin'), and its educational implications. GER:DB-SocSci, EC-AmerCul

3-5 units, Spr (Rickford, J)

LINGUIST 90. Teaching Spoken English—Practical approach to teaching English to non-native speakers. Teaching principles and the features of English which present difficulties. Preparation of lessons, practice teaching in class, and tutoring of non-native speaker.

3-4 units, Spr (Rylance, C)

LINGUIST 104/204. Seminar on Grammar and Usage—(Graduate students register for 204.) Linguistic behaviors as evidence for grammatical models. Inferring categorical grammars from graded data. History of competence/performance debates within generative grammar.

1-4 units, Spr (Wasow, T)

LINGUIST 105/205A. Phonetics—(Graduate students register for 205A.) The study of speech sounds: how to produce them, how to perceive them, and their acoustic properties. The influence of production and perception systems on sound change and phonological patterns. Acoustic analysis and experimental techniques. Lab exercises. Prerequisite: 110 or equivalent, or consent of instructor. GER:DB-SocSci

4 units, Spr (Sumner, M)

LINGUIST 110. Introduction to Phonetics and Phonology—Differences in the sounds of the world's languages and how these sounds are made by the human vocal tract. Theories that account for cross-linguistic similarities in the face of differences. GER:DB-SocSci

4 units, Spr (Anttila, A)

LINGUIST 112/212A. Seminar in Phonology: The Phonology of Syntax—(Graduate students register for 212A.) Variation in the phonology of words according to their contexts within larger expressions. Syntactic, morphological, lexical, and stylistic factors conditioning this variation. The place of these phenomena in a theory of grammar.

2-4 units, Aut (Zwicky, A)

LINGUIST 116. Morphology—A survey of words including their structures, pronunciations, meanings, and syntactic possibilities in a wide sampling of languages to provide a laboratory for investigating the nature of morphology.

4 units, Win (Zwicky, A)

LINGUIST 120. Introduction to Syntax—Grammatical constructions, primarily English, and their consequences for a general theory of language. Practical experience in forming and testing linguistic hypotheses, reading, and constructing rules. GER:DB-SocSci

4 units, Aut (Wasow, T)

LINGUIST 124A/224A. Introduction to Formal Universal Grammar—(Graduate students register for 224A.) A formal model of universal grammar designed to explain crosslinguistic variation in syntactic structure: nonconfigurationality in Australian aboriginal languages, incorporation in native American languages and the Bantu languages of Africa, scrambling and head movement in European languages. Issues such as universal grammar design, and analytic problems from a variety of natural languages. Prerequisites: introduction to syntax and familiarity with logic or other symbolic systems, or consent of instructor. GER:DB-SocSci

4 units, Spr (Bresnan, J)

LINGUIST 130A. Introduction to Linguistic Meaning—Linguistic meaning and its role in communication. How diagnostic tests can be used to categorize and separate semantic phenomena such as ambiguity and vagueness, entailment, and presupposition. How basic set theory and logic can be used to specify meanings and explain semantic phenomena. Pragmatic complications involving the assumptions and intentions of language users. Those who have not taken logic, such as PHIL 150 or 151, should also enroll in 130C. Pre- or corequisite: 120, or consent of instructor. GER:DB-SocSci

4 units, Spr (Brasoveanu, A)

LINGUIST 130B. Introduction to Lexical Semantics—Issues in the study of word meaning. Focus is on the core semantic properties and internal organization of the four major word categories in natural languages: nouns, verbs, adjectives, and prepositions. GER:DB-SocSci

4 units, Win (Fong, V)

LINGUIST 130C. Logic Laboratory—Typically taken in conjunction with 130A/230A.

1 unit, Spr (Brasoveanu, A)

LINGUIST 140/240. Language Acquisition I—(Graduate students register for 240.) Processes of language acquisition in early childhood; stages in development; theoretical issues and research questions. Practical experience in data collection. GER:DB-SocSci

4 units, Aut (Clark, E)

LINGUIST 142. Bilingualism, Language Attrition, and Heritage Languages—Linguistic and sociolinguistic aspects of first language loss among emigrants; consequences for language teaching. GER:DB-SocSci

3-4 units, Spr (Pereltsvaig, A)

LINGUIST 144. Introduction to Cognitive Science—(Same as PHIL 190, PSYCH 130, SYMBSYS 100.) The history, foundations, and accomplishments of the cognitive sciences, including presentations by leading Stanford researchers in artificial intelligence, linguistics, philosophy, and psychology. Overview of the issues addressed in the Symbolic Systems major. GER:DB-SocSci

4 units, Spr (Davies, T)

LINGUIST 150. Language in Society—How language and society affect each other. Class, age, ethnic, and gender differences in speech. Prestige and stigma associated with different ways of speaking and the politics of language. The strategic use of language. Stylistic practice; how speakers use language to construct styles and adapt their language to different audiences and social contexts. GER:DB-SocSci, WIM

4 units, Win (Rickford, J)

LINGUIST 152/252. Sociolinguistics and Pidgin Creole Studies—(Graduate students register for 252.) Introduction to pidgins and creoles, organized around the main stages in the pidgin-creole life cycle: pidginization, creolization, and decreolization. Focus is on transformations in the English language as it was transported from Britain to Africa, Asia, the Caribbean, and the Pacific. Resultant pidginized and creolized varieties such as Nigerian Pidgin English, Chinese Pidgin English, New Guinea Tok Pisin, Suriname Sranan, and the creole continua of Guyana, Jamaica, and Hawaii. Also French, Dutch, Portugese, Chinook, Motu, and Sango.

2-4 units, Spr (Rickford, J)

LINGUIST 156. Language and Gender—The role of language in the construction of gender, the maintenance of the gender order, and social change. Field projects explore hypotheses about the interaction of language and gender. No knowledge of linguistics required. GER:DB-SocSci, EC-Gender

4 units, not given this year (Eckert, P)

LINGUIST 160. Introduction to Language Change—(Same as ANTHSCI 110.) Variation and change as the natural state of language. Differentiation of dialects and languages over time. Determination and classification of historical relationships among languages, and reconstruction of ancestral stages. Types, rates, and explanations of change. Parallels with cultural and genetic evolutionary theory. Implications for the description and explanation of language in general. GER:DB-SocSci

4-5 units, not given this year

LINGUIST 174/274A. Field Methods I—(Graduate students register for 274A.) Hands-on. The methods by which linguists gather raw linguistic data about a language and begin analyzing its structure. Working with a speaker of a language not previously studied by class participants, students develop a description of key aspects of its grammar and examine methodologies for obtaining, storing, and manipulating data.

2-4 units, not given this year

LINGUIST 180. Introduction to Computational Linguistics—Machine translation, web-based question answering, conversational agents, speech recognition and synthesis, parsing, computational semantics and pragmatics. Foundation for other language processing courses; focus is on using available online implementations of algorithms. Prerequisite: CS 106B or X. GER:DB-EngrAppSci

4 units, Aut (Jurafsky, D)

LINGUIST 182/282. Human and Machine Translation—(Graduate students register for 282.) The process of translation by professional and amateur translators, and by existing and proposed machine-translation systems; what each might learn from the others. Prerequisite: advanced knowledge of a foreign language. GER:DB-EngrAppSci

4 units, not given this year (Kay, M)

LINGUIST 187/287. Grammar Engineering—(Graduate students register for 287.) Hands-on. Techniques for implementation of linguistic grammars, drawing on grammatical theory and engineering skills. The implementation of constraints in morphology, syntax, and semantics, working within a unification-based lexicalist framework. Focus is on developing small grammars for English and at least one other language. Prerequisite: basic syntactic theory or 120. No programming skills required.
1-4 units, Win (Flickinger, D; Oepen, S)

LINGUIST 188/288. Natural Language Understanding—(Graduate students register for 288; same as CS 224U.) Machine understanding of human language. Computational semantics (determination of sense, event structure, thematic role, time, aspect, synonymy/meronymy, causation, compositional semantics, treatment of scopal operators), and computational pragmatics and discourse (coherence relations, anaphora resolution, information packaging, generation). Theoretical issues, online resources, and relevance to applications including question answering, summarization, and textual inference. Prerequisites: one of LINGUIST 180, CS 224N,S; and logic such as LINGUIST 130A or B, CS 157, or PHIL150).
2-4 units, Aut (Jurafsky, D; Manning, C)

LINGUIST 191/291. Linguistics and the Teaching of English as a Second/Foreign Language—(Graduate students register for 291.) Methodology and techniques for teaching languages, using concepts from linguistics and second language acquisition theory and research. Focus is on teaching English, but most principles and techniques applicable to any language. Optional 1-unit seminar in computer-assisted language learning.
4-5 units, Win (Hubbard, P)

LINGUIST 197. Undergraduate Research Seminar—Research goals and methods in linguistics and related disciplines. Students work on a small project to define a focus for their linguistic studies and prepare for honors research. Presentations; final paper.
2 units, Win (Clark, E)

LINGUIST 198. Honors Research
1-15 units, Win, Spr (Staff)

LINGUIST 199. Independent Study
1-15 units, Aut, Win, Spr, Sum (Staff)

LINGUIST 200. Foundations of Linguistic Theory—Theories that have shaped 20th-century linguistics; recurrent themes and descriptive practice.
4 units, alternate years, given next year

LINGUIST 205B. Advanced Phonetics—Prerequisite: LINGUIST 205A.
2-4 units, not given this year

LINGUIST 207. Seminar in Phonetics: Phonetic Variation and Speech Perception—How variation is accommodated in current models of speech perception. Systematic and more random types of variation; the effect of variation on perception. How perceptual models need to be altered to accommodate phonetic variation encountered by listeners. May be repeated for credit.
2-4 units, Win (Sumner, M)

LINGUIST 210A. Phonology—Introduction to phonological theory and analysis based on cross-linguistic evidence. Topics: phonological representations including features, syllables, metrical structure; phonological processes including assimilation and dissimilation; and phonological typology and universals.
4 units, Aut (Anttila, A)

LINGUIST 210B. Advanced Phonology—The phonological organization of the lexicon. Topics include lexical phonology, phonological subregularities, gradient phonotactics, and lexical frequency effects.
4 units, Win (Anttila, A)

LINGUIST 211. Metrics—Principles of versification from a linguistic point of view. Traditional and optimality-theoretic approaches. The canonical system of English metrics, and its varieties and offshoots. The typology of metrical systems and its linguistic basis. The ideology of normative prosodic discourse in relation to changing poetic practice.
1-4 units, not given this year (Kiparsky, P)

LINGUIST 212B. Seminar in Phonology: Intonation and Stress—May be repeated for credit.
1-4 units, Spr (Leben, W)

LINGUIST 214. Phonology Workshop—May be repeated for credit.
1-2 units, Aut, Win, Spr (Anttila, A)

LINGUIST 216. Morphology—How morphology fits into the lexicon and how the lexicon fits into grammar. Inflection and word-formation: blocking, productivity, analogy. Morphological categories. The interaction of morphology with phonology within the lexicon: level-ordering, prosodic morphology. Review of English morphology and analysis of representative material from languages with richer morphologies.
2-4 units, not given this year

LINGUIST 217. Morphosyntax—The role of morphology in grammar: how word structure serves syntax in the expression of meaning. Universal properties and typology of morphological categories; proposals towards their principled explanation in a restrictive theory of language.
2-4 units, Win (Levin, B)

LINGUIST 221A. Foundations of English Grammar—A systematic introduction to the formal analysis of English grammar using the framework of head-driven phrase structure grammar (HPSG). Topics: feature structure modeling, lexical and phrasal organization in terms of type hierarchies and constraint inheritance, clausal types, patterns of complementation, the auxiliary system, extraction dependencies, wh-constructions, and the syntax-semantics interface.
1-4 units, not given this year (Sag, I)

LINGUIST 221B. Studies in Universal Grammar—Focus is on grammatical analysis of individual languages. Builds directly on the theoretical foundations presented in 221A. Topics vary each year.
1-4 units, not given this year

LINGUIST 222A. Foundations of Syntactic Theory I—The role of the verb and lexicon in the determination of sentence syntax. The argument/adjunct distinction, subcategorization and argument structure, motivation for a lexicalist approach, principles governing argument expression, operations on argument structure and grammatical function changing rules, unbounded dependencies, and the approach to unbounded dependencies rooted in principles of lexical expression and subcategorization satisfaction.
2-4 units, Aut (Levin, B)

LINGUIST 222B. Foundations of Syntactic Theory II—The nature of unbounded dependency constructions and their treatment in modern grammatical theories. Filler-gap dependencies, island constraints, and the relation between grammar and processing. Prerequisite: 222A.
2-4 units, Win (Sag, I)

LINGUIST 223. Introduction to Minimalist Syntax—Focus is on phrase structure, movement, functional categories, features, the nature of economy conditions, and parametric differences. More general issues of the architecture of the grammar and the nature of crosslinguistic variation.
2-4 units, Win (Pereltsvaig, A)

LINGUIST 224B. Advanced Topics in Lexical Functional Grammar—May be repeated for credit.
1-4 units, not given this year

LINGUIST 225A. Seminar in Syntax—May be repeated for credit.
1-2 units, Spr (Sag, I)

LINGUIST 225B. Seminar in Syntax: Word Order—Recent research on core word order variation. Topics include VO-OV, verb-second, verb-initial, and free word order languages. May be repeated for credit.
1-4 units, Aut (Pereltsvaig, A)

LINGUIST 227C. Projects in Syntax—Group research projects using quantitative syntactic data from texts, recordings, experiments, or historical records. Skills in extracting, graphically exploring, and analyzing naturalistic syntactic data, and in presenting results. May be repeated for credit. Prerequisite: 229A, B, or D, or equivalent.
2-4 units, Spr (Bresnan, J)

LINGUIST 229A. Laboratory Syntax I—Hands-on use of methods for analyzing quantitative syntactic data, including clustering and classification, regression, and mixed models. May be repeated for credit.
1-4 units, not given this year

LINGUIST 229B,C. Laboratory Syntax II, III—Hands-on use of methods for handling syntactic data, including corpus work on ecologically natural data and controlled experimental paradigms. Explanatory models of syntactic processing and their relation to theories of grammar. May be repeated for credit.
1-4 units, not given this year

LINGUIST 229D. Empirical Syntax Research Seminar—Recent work in syntax that employs data-rich methods like corpora and laboratory studies, emphasizing research by seminar participants. May be repeated for credit.
1-2 units, Aut (Sag, I)

LINGUIST 230A. Introduction to Semantics and Pragmatics—Meaning in natural language. Topics: elementary set theory; propositional logic, predicate logic, and lambda calculus, and their relation to semantic analysis; model theoretic characterizations of meaning and semantic properties of English conjunctions and determiners. Grice's theory of implicature, speech acts, Davidson's theories of logical form, and Montague grammar. Recommended: elementary logic and set theory.
2-4 units, Win (Peters, S)

LINGUIST 230B. Semantics and Pragmatics—Expands on 230A. Standard approaches to formal semantics (Montague grammar, DRT, and basic dynamic semantics). Analyses of semantic phenomena in these frameworks. Prerequisites: 230A; or combination of 130A and PHIL 150 and 160.
2-4 units, not given this year

LINGUIST 232A. Lexical Semantics—Introduction to issues in word meaning, focused primarily around verbs. Overview of the core semantic properties of verbs and the organization of the verb lexicon. Approaches to lexical semantic representation, including semantic role lists, proto-roles, and causal and aspectual theories of event conceptualization.
2-4 units, Spr (Levin, B)

LINGUIST 232B. Seminar in Lexical Semantics—Topics have included: lexical categories; motion verbs; psych-verbs. May be repeated for credit.
1-4 units, not given this year

LINGUIST 232C. Lexical Semantics Research Seminar—May be repeated for credit. By arrangement.
1-2 units, Aut, Win, Spr (Levin, B)

LINGUIST 236. Seminar in Semantics: Indefinites—Static and dynamic approaches. Their referential versus quantificational status, scopal properties, and interaction with modal anaphora and quantification. Indefinites cross-linguistically, types of indefinites, and their semantic and pragmatic properties. Indefinite-like items in modal, temporal/aspectual, and degree domains. May be repeated for credit.
*1-4 units, Aut (*Brasoveanu, A*)*

LINGUIST 237. Seminar in Semantics: Semantics of Questions and Commands—Semantics of interrogatives and imperatives; propositional semantics of declaratives. Research emphasizing the meaning of questions. May be repeated for credit.
1-4 units, Spr (Peters, S)

LINGUIST 241. Language Acquisition II—May be repeated for credit.
1-4 units, Win (Clark, E)

LINGUIST 245. Experimental Design for Linguistics—Hypothesis formation, confound avoidance, power, general methods, and analysis of results. Students complete a pilot experiment; write-up; peer review; presentation.
4 units, Spr (Sumner, M)

LINGUIST 247. Seminar in Psycholinguistics—(Same as PSYCH 227.) May be repeated for credit.
2-4 units, not given this year

LINGUIST 250. Sociolinguistic Theory and Analysis—Methods of modeling the patterned variation of language in society. Emphasis is on variation, its relation to social structure and practice, and its role in linguistic change. Intersection between quantitative and qualitative analysis, combining insights of sociology and linguistic anthropology with quantitative linguistic data. Prerequisite: graduate standing in Linguistics or consent of instructor.
4 units, Aut (Rickford, J)

LINGUIST 251. Sociolinguistic Field Methods—Strengths and weaknesses of the principal methods of data collection in sociolinguistics.
4 units, not given this year

LINGUIST 257. Seminar in Sociolinguistics: Community Studies of Variation—May be repeated for credit.
1-4 units, Win (Eckert, P)

LINGUIST 258. Analysis of Variation—The quantitative study of linguistic variability in time, space, and society emphasizing social constraints in variation. Hands-on work with variable data. Prerequisites: 105/205 and 250, or consent of instructor.
4 units, Spr (Eckert, P)

LINGUIST 260A. Historical Morphology and Phonology—Sound change and analogical change in the perspective of linguistic theory. Internal and comparative reconstruction.
4 units, not given this year (Kiparsky, P)

LINGUIST 260B. Historical Morphosyntax—Morphological and syntactic variation and change. Reanalysis, grammaticalization. The use of corpora and quantitative evidence.
2-4 units, not given this year (Kiparsky, P)

LINGUIST 280. Natural Language Processing—(Same as CS 224N.) Methods for processing linguistic information and the underlying computational properties of natural languages. Syntactic and semantic processing from a linguistic and an algorithmic perspective. Focus is on modern quantitative techniques in NLP: using large corpora, statistical models for acquisition and interpretation, and representative systems. Prerequisites: CS 121/221 or LINGUIST 180, programming experience, familiarity with logic and probability.
3-4 units, Spr (Manning, C)

LINGUIST 281. Speech Recognition and Synthesis—(Same as CS 224S.) Automatic speech recognition, speech synthesis, and dialogue systems. Focus is on key algorithms including noisy channel model, hidden Markov models (HMMs), Viterbi decoding, N-gram language modeling, unit selection synthesis, and roles of linguistic knowledge. Prerequisite: programming experience. Recommended: CS 221 or 229.
2-4 units, not given this year (Jurafsky, D)

LINGUIST 289. Quantitative, Probabilistic, and Optimization-Based Explanation in Linguistics—Capturing the soft constraints inherent in linguistic systems, based on quantitative evidence obtained from linguistic corpora. Computer tools for collecting and modeling data. Emphasis is on syntax.
3-4 units, Aut (Manning, C)

LINGUIST 294. Linguistic Research Discussion Group—Restricted to first-year Linguistics Ph.D. students.
1 unit, Aut (Levin, B)

LINGUIST 390. M.A. Project
1-3 units, Aut, Win, Spr, Sum (Staff)

LINGUIST 394. TA Training Workshop—For second-year graduate students in Linguistics.
1 unit, Aut (Levin, B)

LINGUIST 395A,B,C. Research Workshop I—Restricted to students in the doctoral program. Student presentations of research toward qualifying papers.
1-2 units, **A:** *Spr (Clark, E),* **B:** *Spr (Anttila, A),* **C:** *Sum (Staff)*

LINGUIST 396. Research Projects in Linguistics—Mentored research project for first-year graduate students in linguistics.
2-3 units, Win (Staff)

LINGUIST 397. Directed Reading
1-15 units, Aut, Win, Spr, Sum (Staff)

LINGUIST 398. Directed Research
1-15 units, Aut, Win, Spr, Sum (Staff)

LINGUIST 399. Dissertation Research
1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CHINLIT 192/292. The History of Chinese
4 units, Aut (Sun, C)

CS 276. Text Retrieval and Web Search
3 units, not given this year

PSYCH 131/262. Language and Thought
4 units, Aut (Clark, H)

DIVISION OF LITERATURES, CULTURES, AND LANGUAGES

Division Head: Roland Greene
Division Offices: Building 260, Rooms 114-119
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The Division of Literatures, Cultures, and Languages consists of six academic departments (Asian Languages, Comparative Literature, French and Italian, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese) as well as the Language Center, which oversees language instruction at Stanford. All the departments of the division offer academic programs leading to B.A., M.A., and Ph.D. degrees. The division brings together scholars and teachers dedicated to the study of literatures, cultures, and languages from humanistic and interdisciplinary perspectives. The departments in the division are distinguished by the quality and versatility of their faculty, a wide variety of approaches to cultural tradition and expression, and the intense focus on the mastery of languages. This wealth of academic resources, together with small classes and the emphasis on individual advising, creates a superior opportunity for students who wish to be introduced to or develop a deeper understanding of non-English speaking cultures.

The division's departments and the Language Center offer instruction at all levels, including introductory and general courses that do not require knowledge of a language other than English. These courses satisfy a variety of undergraduate requirements and can serve as a basis for developing a minor or a major program in the member departments. The more advanced and specialized courses requiring skills in a particular language are listed under the relevant departments, as are descriptions of the minor and major programs.

MINORS

The Division of Literatures, Cultures, and Languages offers two minors that draw upon courses in literature and language within the division's departments and elsewhere in the University.

Course work in these minors may not duplicate work counted toward language majors or other minors. Advanced Placement credit and transfer credit do not apply to the minors. All courses must be taken for a letter grade. By University policy, no more than 36 units may be awarded in these minors.

Prospective minors should obtain a Minor Declaration form from the DLCL office of undergraduate student services.

MINOR IN LITERATURE

The minor in Literature allows students from any major to develop skills in the interpretation and criticism of literature, while acquiring a familiarity with types of literature from different national traditions and periods. Students must complete 30 units of course work on literature or literary theory. Courses may be in the original language or in translation.

The courses must include a minimum of:

1. One course on literary theory or the history of criticism.
2. One course on literature prior to the eighteenth century.
3. One course on literature reflecting perspectives outside of the European traditions.
4. One course from each of three distinct national or linguistic traditions from among Arabic, Chinese, English (including Anglophone literatures broadly conceived), French, German, Greek, Hebrew, Italian, Japanese, Korean, Latin, Persian, Portuguese, Russian, Spanish, Yiddish, and other national or linguistic traditions when appropriate courses are available. The pre-eighteenth-century course and the non-European course may be counted toward fulfilling this requirement.

5. Courses from two different genres such as poetry, drama, and prose fiction. Theory does not count as a genre.
6. One course requiring a research paper.

Students must consult with the minor adviser for approval of courses to meet these requirements. Second-year foreign language courses are not normally counted unless the syllabus reflects a primary emphasis on the reading of literature. Students are encouraged to acquire second-language skills and to explore courses in related disciplines; such courses, however, are not counted toward the 30 units required for the minor in Literature.

Course work in the minor may not duplicate work counted toward specific language majors or minors. Neither Advanced Placement credit nor transfer credit may be applied to the minor. All courses applied to the minor must be Stanford courses. At least 25 units of the course work must be taken for a letter grade.

The DLCL office of undergraduate student services verifies course work for the minor. The minor in Literature must be approved by a divisional faculty member designated by the DLCL.

MINOR IN MODERN LANGUAGES

The minor in Modern Languages is offered to students who want to supplement the course work in their major with course work in modern languages and literatures. The minor must be approved by the directors of undergraduate studies of the respective language departments. Students in any field qualify for the minor by meeting the following requirements:

1. A minimum of 20 units at the intermediate level (second year) or beyond in at least two languages other than English offered by the DLCL. Normally, this involves 12 units in each language.
2. At least one additional course whose subject code ends in -LIT or -GEN in each modern language in '1' above. These courses should be taught by Academic Council members or other senior members of the faculty. In the case of Slavic or Asian languages, the course should be marked as advanced.

Students are recommended to study, work, or intern abroad for at least eight weeks at a location where one of the languages is spoken.

COURSES

DLCL 99. Multimedia Course Lab—Designed to supplement the literature curriculum of existing undergraduate courses in DLCL departments in which a multimedia component may benefit collaborative or individual research projects. Taken for credit at the discretion of the instructor of the departmental literature course.

1 unit, Aut, Win, Spr (Chandler, Z)

DLCL 189. Honors Thesis Seminar—For undergraduate majors in DLCL departments; required for honors students. Planning, researching, and writing an honors thesis. Oral presentations and peer workshops. Research and writing methodologies, and larger critical issues in literary studies.

5 units, Aut (Surwillo, L)

DLCL 308. Comparative Literature Colloquium—Participants discuss and critique work presented by graduate students and faculty in the DLCL. Work may include conference or seminar papers, thesis chapters, or works-in-progress. Feedback focuses on writing and argumentation, and more general responses to the subject matter. Meetings open to the public. May be repeated for credit.

2 units, Aut, Win, Spr (Berman, R)

DLCL 309. The Teaching of Literature—Prepares graduate students in DLCL departments to teach literature at the undergraduate level. Topics include: the opportunities and problems of transposing a research project into a feasible course; the logic of syllabi and reading lists; the structuring of a course from week to week; and other matters relevant to first-time teachers of literature. Supervised by the graduate affairs committee of the DLCL.

2 units, Win (Levy, I), Spr (Staff)

DLCL 310. The Development of a Dissertation from Prospectus to Defense—Meets regularly throughout the year to advise and support dissertation-level students as they prepare a prospectus, begin writing, submit chapters, and complete their projects. Focus of the workshop shifts from term to term as appropriate to the participants. Supervised by the graduate affairs committee of the DLCL.

2 units, Aut (Safran, G), Win (Schnapp, J), Spr (Dornbach, M)

DLCL 311. Professional Workshop—Meets regularly throughout the year to discuss issues in the professional study of literature. Topics include the academic job market and the challenges of research and teaching at different types of institutions. Supervised by the graduate affairs committee of the DLCL.

2 units, Aut, Win, Spr (Greene, R)

MATHEMATICAL AND COMPUTATIONAL SCIENCE

Director: Bradley Efron
Associate Director: Susan Holmes
Committee in Charge: Takeshi Amemiya (Economics), Gunnar Carlsson (Mathematics), Richard Cottle (Management Science and Engineering), Thomas M. Cover (Electrical Engineering, Statistics), Bradley Efron (Statistics), Peter W. Glynn (Management Science and Engineering), Gene Golub (Computer Science), J. Michael Harrison (Graduate School of Business), Susan Holmes (Statistics), Doron Levy (Mathematics), Parviz Moin (Engineering), Art Owen (Statistics), George Papanicolaou (Mathematics), Eric Roberts (Computer Science), David Rogosa (Education), Tim Roughgarden (Computer Science), David Siegmund (Statistics), Arthur F. Veinott Jr. (Management Science and Engineering), Nancy R. Zhang (Statistics)
Program Administrator: Helen Tombropoulos

Program Offices: Sequoia Hall, 390 Serra Mall
Mail Code: 94305-4065
Phone: (650) 723-2620
Email: helen@stat.stanford.edu
Web Site: http://www.stanford.edu/group/mathcompsci

Courses given in Mathematical and Computational Science have the subject code MCS. For a complete list of subject codes, see Appendix.

This interdepartmental interschool undergraduate program provides a major for students interested in the mathematical and computational sciences, or in the use of mathematical ideas and analysis in problems in the social or management sciences. It provides a core of mathematics basic to all the mathematical sciences and an introduction to concepts and techniques of automatic computation, optimal decision making, probabilistic modeling, and statistical inference. It also provides an opportunity for elective work in any of Stanford's mathematical science disciplines.

The program uses the faculty and courses of the departments of Computer Science, Management Science and Engineering, Mathematics, and Statistics. It prepares students for graduate study or employment in the mathematical and computational sciences or in those areas of applied mathematics which center around the use of computers and are concerned with the problems of the social and management sciences.

A biology option is offered for students interested in applications of mathematics, statistics, and computer science to the biological sciences (bioinformatics, computational biology, statistical genetics, neurosciences); and in a similar spirit, an engineering option.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The requirement for the bachelor's degree, beyond the University's basic requirements, is an approved course program of 72-77 units, distributed as follows:

Mathematics (MATH): 29-31 units	*Qtr. and Units*	
MATH 41. Calculus	A	5
and MATH 42. Calculus	A,W	5
MATH 51. Linear Algebra and Differential Calculus of Several Variables	A,W,S	5
or MATH 51H. Honors Advanced Calculus	A	5
MATH 52. Integral Calculus of Several Variables	A,W,S	5
or MATH 52H. Honors Advanced Calculus	W	5
MATH 53. Ordinary Differential Equations with Linear Algebra	A,W,S	5
or MATH 53H. Honors Advanced Calculus	S	5
MATH 109. Applied Group Theory (WIM)	A	3
or MATH 110. Applied Number Theory and Field Theory (WIM)	S	3
or MATH 120. Modern Algebra (WIM)	A,S	3
MATH 113. Linear Algebra and Matrix Theory	A,W	3

Computer Science (CS): 16-18 units

CS 103X. Discrete Structures (Accelerated)	W	3-4
or CS 103A. Discrete Mathematics for Computer Science	A,W	3
and CS 103B. Discrete Structures	W,S	3
CS 106X. Programming Methodology and Abstractions (Accel.)	A, W	3-5
or CS 106A. Programming Methodology	A,W,S	3-5
and CS 106B. Programming Abstractions	W,S	3-5

And two of the following (CS or CME):

CME 108. Introduction to Scientific Computing	W	3-4
CS 107. Programming Paradigms	A,S	3-5
CS 154. Introduction to Automata and Complexity Theory	A,S	3-4
CS 161. Design and Analysis of Algorithms	A,W	3-4

Management Science and Engineering (MS&E): 8-9 units

MS&E 111. Introduction to Optimization (same as ENGR 62)	A,S	3-4
and MS&E 121. Introduction to Stochastic Modeling	W	4

or three of the following:

MS&E 211. Linear and Nonlinear Optimization	A	3-4
MS&E 212. Mathematical Programming and Combinatorial Optimization	S	3
MS&E 221. Stochastic Modeling	W	3
MS&E 251. Stochastic Decision Models	W	3

Statistics (STATS): (11 units)

STATS 116. Theory of Probability	A,S	3-5
STATS 191. Introduction to Applied Statistics	W	3-4
or STATS 203. Introduction to Regression Models and Analysis of Variance	W	3
STATS 200. Introduction to Statistical Inference	W	3

ELECTIVES (9 UNITS)

Three courses in mathematical and computational science, 100-level or above, at least 3 units each. At least one must be chosen from the following:

	Qtr. and Units	
ECON 102C. Advanced Topics in Econometrics	S	5
ECON 140. Introduction to Financial Economics	W	5
ECON 160. Game Theory and Economic Applications (prerequisite ECON 51)	W	5
ECON 179. Experimental Economics	S	5
EE 261. The Fourier Transform and its Applications	A,S	3
MS&E 211. Linear and Nonlinear Optimization	A	3-4
MS&E 212. Mathematical Programming and Combinatorial Optimization	S	3
MS&E 221. Stochastic Modeling	W	3
MS&E 251. Stochastic Decision Models	W	3
MCS 100. Mathematics of Sports (same as STATS 50)	S	3
MATH 106. Functions of a Complex Variable	W	3
MATH 108. Introduction to Combinatorics and its Applications	S	3
MATH 111. Computational Commutative Algebra	W	3
MATH 115. Functions of a Real Variable	A,W	3
MATH 116. Complex Analysis	W	3
MATH 118. Numerical Analysis (not given 2007-08)		3
MATH 131. Partial Differential Equations I	A,W	3
MATH 132. Partial Differential Equations II	S	3
MATH 135. Nonlinear Dynamics and Chaos	S	3
MATH 136. Stochastic Processes	A,W	3
PHIL 151. First-Order Logic	W	4
STATS 202. Data Analysis	A	3
STATS 217. Introduction to Stochastic Processes	W	3

For Computer Science (CS), electives can include courses not taken as units under the CS list above and the following:

CME 302. Numerical Linear Algebra	A	3
CS 108. Object-Oriented Systems Design	A,W	3-4
CS 140. Operating Systems and Systems Programming	A,W	3-4
CS 143. Compilers	A	3-4
CS 157. Logic and Automated Reasoning	A	3-4
CS 161. Design and Analysis of Algorithms	A,W	3-4
CS 194. Software Project (prerequisite CS 108)	S	3
CS 221. Artificial Intelligence: Principles and Techniques	A	3-4
CS 223A. Introduction to Robotics	W	3
CS 223B. Introduction to Computer Vision	W	3
CS 225A. Experimental Robotics	S	3
CS 228. Probabilistic Models in Artificial Intelligence	W	3
CS 229. Machine Learning	A	3
CS 243. Advanced Compiling Techniques	W	3-4
EE 282. Computer Systems Architecture	A	3

With the adviser's approval, courses other than those offered by the sponsoring departments may be used to fulfill part of the elective requirement. These may be in fields such as biology, economics, electrical engineering, industrial engineering, and medicine, that might be relevant to a mathematical sciences major, depending on a students's interests.

1. At least three quarters before graduation, majors must file with their advisers a plan for completing degree requirements.
2. All courses used to fulfill major requirements must be taken for a letter grade with the exception of courses offered satisfactory/no credit only.
3. A course used to fulfill the requirements of one section of the program may not be applied toward the fulfillment of the requirements of another section.
4. The student must have a grade point average (GPA) of 2.0 or better in all course work used to fulfill the major requirement.

MATHEMATICAL AND COMPUTATIONAL SCIENCE BIOLOGY OPTION

Replace MATH 109/110 with either:

	Qtr. and Units	
BIOSCI 221. Methods of Theoretical Population Biology (not given 2007-08)		4
or MATH 135. Nonlinear Dynamic Systems	S	3

Replace STATS 191/203 by

STATS/BIOSCI 141. Biostatistics	A	3-5

Take at least 2 courses from the Biological Sciences core:

BIOSCI 41. Genetics and Biochemistry	A	5
BIOSCI 42. Cell Biology and Animal Physiology	W	5
BIOSCI 43. Plant Biology, Evolution, and Ecology	S	5

Take a third course either from the core or

STATS 166. Statistical Methods in Computational Genetics (WIM)	A	3
BIOSCI 133. Genetics of Prokaryotes (not given 2007-08)		3
BIOSCI 134. Replication of DNA (not given 2007-08)		3
BIOSCI 135. Biological Clocks	S	3
BIOSCI 136. Evolutionary Paleobiology (not given 2007-08)		4
BIOSCI 143/243. Evolution	A	4
BIOSCI 144. Conservation Biology	W	3-4
BIOSCI 160. Developmental Biology	A	4
BIOSCI 203. Advanced Genetics	A	4
BIOSCI 230. Molecular and Cellular Immunology	A	4-5

Honors students should take 3 of the following:

STATS 166. Statistical Methods in Computational Genetics (WIM)	A	3
ANTHSCI 180. Introduction to Anthropological Genetics		5
(not given 2007-08)		5
ANTHSCI 187. The Genetic Structure of Populations	W	5
ANTHSCI 188. Research in Anthropological Genetics	A	5
BIOSCI 113. Fundamentals of Molecular Evolution	S	4
BIOSCI 146. Population Studies	W	1
BIOSCI 221. Methods of Theoretical Population Biology (not given 2007-08)		4
BIOSCI 183A/283A. Population Genetic Theory and Evolution I	W	3

MATHEMATICAL AND COMPUTATIONAL SCIENCE ENGINEERING OPTION

Students in the Engineering option take the introductory courses for the Mathematics and Computational Sciences major with the following allowable substitutions.

The MATH 51-53 series may be replaced by:

	Qtr. and Units	
CME 100/ENGR 154. Vector Calculus for Engineers	A	5
CME 102/ENGR 155A. Ordinary Differential Equations for Engineers	W	5
CME 104/ENGR 155B. Linear Algebra and Partial Differential Equations for Engineers	S	5
MATH 115. Functions of a Real Variable	A,W	3

STATS 116 may be replaced by either one of the following:

STATS 110. Statistical Methods in Engineering and Physical Sciences	A	4-5
or CME 106/ENGR 155C. Introduction to Probability and Statistics for Engineers	W	3-4

STATS 191/STATS 203 may be replaced by:

STATS 202. Data Analysis	A	3

Electives; take at least one course from the following list:

MATH 106. Introduction to Theory of Functions of a Complex Variable	W	3
MATH 108. Introduction to Combinatorics Applications	S	3
MATH 116. Complex Analysis	W	3
MATH 118. Numerical Analysis (not given 2007-08)		3
MATH 132. Partial Differential Equations II	S	3
MATH 135. Nonlinear Dynamics and Chaos	S	3
PHIL 151. First-Order Logic	W	4

Take at least two courses from the following list:

ENGR 15. Dynamics	A,S	3
ENGR 20. Introduction to Chemical Engineering	S	3
ENGR 25. Biotechnology	S	3
ENGR 30. Engineering Thermodynamics	A,W	3
ENGR 40. Introductory Electronics	A, S	5
ENGR 50. Introductory Science Materials	W, S	4
ENGR 105. Feedback Control Design	W	3

Take three additional courses from a single engineering department, and two additional courses from any engineering department(s).

MINOR

The minor in Mathematical and Computational Science is intended to provide an experience of the four constituent areas: Computer Science, Mathematics, Management Science and Engineering, and Statistics . Four basic courses are required:

CS 106X. Programming Methodology and Abstractions (Accelerated)
  or CS 106A,B. Programming Methodology
MATH 51. Linear Algebra and Differential Calculus of Several Variables
  or MATH 103. Matrix Theory and its Applications
ENGR 62. Introduction to Optimization
  or MS&E 121. Introduction to Stochastic Modeling
STATS 116. Theory of Probability
  or STATS 191. Introduction to Applied Statistics

In addition to the above, the minor requires three courses from the following, two of which must be in different departments:

CME 108. Introduction to Scientific Computing
CS 107. Programming Paradigms
CS 154. Introduction to Automata and Complexity Theory
CS 161. Design and Analysis of Algorithms
EE 261. The Fourier Transform and its Applications
ECON 102C. Advanced Topics in Econometrics
ECON 160. Game Theory and Economic Applications (prerequisite ECON 51)
ECON 181. Optimization and Economic Analysis
MS&E 211. Linear and Nonlinear Optimization
MS&E 212. Mathematical Programming and Combinatorial Optimization
MS&E 221. Stochastic Modeling
MS&E 251. Stochastic Decision Models
MATH 103. Matrix Theory and Its Applications
MATH 106. Functions of a Complex Variable
MATH 108. Introduction to Combinatorics and its Applications
MATH 109. Applied Group Theory
MATH 110. Applied Number Theory and Field Theory
MATH 115. Functions of a Real Variable
  or MATH 171. Fundamental Concepts of Analysis
MATH 131. Partial Differential Equations I
MATH 132. Partial Differential Equations II
MATH 135. Nonlinear Dynamics and Chaos
MATH 171. Fundamental Concepts of Analysis
PHIL 151. First-Order Logic
STATS 200. Introduction to Statistical Inference
STATS 202. Data Analysis
STATS 203. Introduction to Regression Models and Analysis of Variance
STATS 217. Introduction to Stochastic Processes

Other upper-division courses appropriate to the program major may be substituted with consent of the program director. Undergraduate majors in the constituent programs may not count courses in their own departments.

HONORS PROGRAM

The honors program is designed to encourage a more intensive study of mathematical sciences than the B.S. program. In addition to meeting all requirements for the B.S., the student must:

1. Maintain an average letter grade equivalent in mathematical sciences courses of at least a 3.4.
2. Complete at least 15 units in mathematical sciences in addition to the requirements for the major listed above. These courses should form a sustained effort in one area and constitute a program approved by the committee in charge of the Mathematical and Computational Science Program.
3. Include in the above 15 units at least one of the following:
   a) an approved higher-level graduate course
   b) participation in a small group seminar
   c) at least 3 units of directed reading

Students interested in doing honors work should consult with their advisers by the last quarter of the junior year to prepare a program of study for submission to the committee in charge for approval. Honors work may be concentrated in fields outside the Mathematical and Computational Science programs such as biological sciences, medicine, physics.

COURSES

MCS 100. Mathematics of Sports—(Same as STATS 50.) The use of mathematics, statistics, and probability in the analysis of sports performance, sports records, and strategy. Topics include mathematical analysis of the physics of sports and determinations of optimal strategies. New diagnostic statistics and strategies for each sport. Corequisite: STATS 116.

3 units, Spr (Cover, T)

MATHEMATICS

Emeriti: *(Professors)* Kai Lai Chung, Solomon Feferman, Robert Finn, Samuel Karlin, Joseph Keller, Georg Kreisel, Harold Levine, R. James Milgram, Donald Ornstein, Robert Osserman

Chair: Rafe Mazzeo

Professors: Gregory Brumfiel, Daniel Bump, Gunnar Carlsson, Ralph L. Cohen, Amir Dembo, Persi Diaconis, Yakov Eliashberg, Eleny Ionel, Yitzhak Katznelson, Steven Kerckhoff, Jun Li, Tai-Ping Liu, Rafe Mazzeo, George Papanicolaou, Richard Schoen, Leon Simon, Kannan Soundararajan, Ravi Vakil, Brian White

Associate Professor: Andras Vasy

Assistant Professors: Simon Brendle, Soren Galatius

Szegö Assistant Professors: Laurent Demanet, Larry Guth, Gautam Iyer, Joan Licata, Todor Milanov, Dragos Oprea, Alexandra Pettet, Antoine Toussaint, Denis Trotabas, Leo Tzou

Lecturers: Andrew Blumberg, Christopher Douglas, Victor Eliashberg, Benjamin Lee, Mark Lucianovic, Laurence Nedelec, James Nolen, Richard Siefring, Wojciech Wieczorek

Acting Assistant Professor: Samuel Payne

Courtesy Professors: Renata Kallosh, Grigori Mints

Consulting Professors: Brian Conrey, Keith Devlin, David Hoffman, Wu-chung Hsiang

Visiting Professor: Helmut Hofer

Samelson Fellows: Anthony Licata, Samuel Lisi, Matthew Kahle

Web site: http://math.stanford.edu

Courses given in Mathematics have the subject code MATH. For a complete list of subject codes, see Appendix.

The Department of Mathematics offers programs leading to the degrees of Bachelor of Science, Master of Science, and Doctor of Philosophy in Mathematics, and participates in the program leading to the B.S. in Mathematical and Computational Science. The department also participates in the M.S. and Ph.D. degree programs in Scientific Computing and Computational Mathematics and the M.S. degree program in Financial Mathematics.

ADVANCED PLACEMENT FOR FRESHMEN

Students of unusual ability in mathematics often take one or more semesters of college-equivalent courses in mathematics while they are still in high school. Under certain circumstances, it is possible for such students to secure both advanced placement and credit toward the bachelor's degree. A decision as to placement and credit is made by the department after consideration of the student's performance on the Advanced Placement Examination in Mathematics (forms AB or BC) of the College Entrance Examination Board, and also after consideration of transfer credit in mathematics from other colleges and universities.

The department does not give its own advanced placement examination. Students can receive either 5 or 10 units of advanced placement credit, depending on their scores on the CEEB Advanced Placement Examination. Entering students who have credit for two quarters of single variable calculus (10 units) are encouraged to enroll in MATH 51-53 in multivariable mathematics, or the honors version 51H-53H. These three-course sequences, which can be completed during the freshman year, supply the necessary mathematics background for most majors in science and engineering. They also serve as excellent background for the major or minor in Mathematics, or in Mathematical and Computational Science. Students who have credit for one quarter of single variable calculus (5 units) should take MATH 42 in the Autumn Quarter and 51 in Winter Quarter. Options available in the Spring Quarter include MATH 52, 53, or 103. For proper placement, contact the Department of Mathematics.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The following department requirements are in addition to the University's basic requirements for the bachelor's degree:

MAJOR

Students wishing to major in Mathematics must satisfy the following requirements:

1. Department of Mathematics courses (other than MATH 100) totaling at least 49 units credit; such courses must be taken for a letter grade. For the purposes of this requirement, STATS 116, PHIL 151, and PHIL 152 count as Department of Mathematics courses.
2. Additional courses taken from Department of Mathematics courses numbered 101 and above or from approved courses in other disciplines with significant mathematical content, totaling at least 15 units credit. At least 9 of these units must be taken for a letter grade.
3. A Department of Mathematics adviser must be selected, and the courses selected under items '1' and '2' above must be approved by the department's director of undergraduate study, acting under guidelines laid down by the department's Committee for Undergraduate Affairs. The Department of Mathematics adviser can be any member of the department's faculty.
4. To receive the department's recommendation for graduation, a student must have been enrolled as a major in the Department of Mathematics for a minimum of two full quarters, including the quarter immediately before graduation. In any case, students are strongly encouraged to declare as early as possible, preferably by the end of the sophomore year.

Students are normally expected to complete either the sequence 19, 20, 21 or the sequence 41, 42 (but not both). Students with an Advanced Placement score of at least 4 in BC math or 5 in AB math may receive 10 units credit and fulfill requirement '1' by taking at least 39 units of Department of Mathematics courses numbered 51 and above. Students with an Advanced Placement score of at least 3 in BC math or at least 4 in AB math may receive 5 units credit and fulfill requirement '1' by taking at least 44 units of Department of Mathematics courses numbered 42 and above.

Sophomore seminar courses may be counted among the choice of courses under item '1'. Other variations of the course requirements laid down above (under items '1' and '2') may, in some circumstances, be allowed. For example, students transferring from other universities may be allowed credit for some courses completed before their arrival at Stanford. However, at least 24 units of the 49 units under item '1' above and 9 of the units under item '2' above must be taken at Stanford. In all cases, approval for variations in the degree requirements must be obtained from the department's Committee for Undergraduate Affairs. Application for such approval should be made through the department's director of undergraduate study.

It is to be emphasized that the above regulations are minimum requirements for the major; students contemplating graduate work in mathematics are strongly encouraged to include the courses 116, 120, 121, 147 or 148, and 171 in their selection of courses, and in addition, take at least three Department of Mathematics courses over and above the minimum requirements laid out under items '1' and '2' above, including at least one 200-level course. Such students are also encouraged to consider the possibility of taking the honors program, discussed below.

To help develop a sense of the type of course selection (under items '1' and '2' above) that would be recommended for math majors with various backgrounds and interests, see the following examples. These represent only a few of a very large number of possible combinations of courses that could be taken in fulfillment of the Mathematics major requirements:

Example 1—A general program (a balanced program of both pure and applied components, without any particular emphasis on any one field of mathematics or applications) as follows:

a) either MATH 19, 20, and 21, or 41 and 42 (or satisfactory Advanced Placement credit); 51, 52, 53; 103; 106; 109; 110; 111; 115

b) plus any selection of at least eight of the following courses, including three Department of Mathematics courses: MATH 108, 131, 132, 143, 146, 147, 148, 152, 161; CS 137; ECON 50; PHYSICS 41, 43, 45; STATS 115. These courses from other departments are only meant as examples; there are many suitable courses in several departments that can be taken to fulfill part or all of requirement '2.'

Example 2—A theoretical program recommended for those contemplating possible later graduate work providing an introduction to the main areas of mathematics both broader and deeper than the general program outlined above; see, also, the discussion of the honors program below:

a) either MATH 19, 20 and 21, or 41 and 42 (or satisfactory Advanced Placement credit)
b) either the sequence 51, 52, 53, or the sequence 51H, 52H, 53H; 106 or 116; 113; 120; 171
c) plus nine or more of the following courses, including at least one from each group: algebra sequence 114, 121, 152, 156; analysis sequence 131, 132, 135, 151, 174A,B, 175; geometry/topology sequence 143, 145, 146, 147, 148; logic and set theory sequence PHIL 151, 152; MATH 161.

In addition, those contemplating eventual graduate work in Mathematics should consider including at least one graduate-level math course such as MATH 205A, 210A, or 215A or B. Such students should also consider the possibility of entering the honors program.

*Example 3**—An applied mathematics program:

a) either MATH 19, 20, and 21; or 41 and 42 (or satisfactory Advanced Placement credit); 51, 52, 53; 103; 106; 108; 109; 110; 111; 115; 131; STATS 116
b) plus at least 15 units of additional courses in Applied Mathematics, including, for example, suitable courses from the departments of Physics, Computer Science, Economics, Engineering, and Statistics.

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* Students with interests in applied mathematics, but desiring a broader-based program than the type of program suggested in Example 3, including significant computational and/or financial and/or statistical components, are encouraged to also consider the Mathematics and Computational Science program.

MINOR

To qualify for the minor in Mathematics, a student should complete, for a letter grade, at least six Department of Mathematics courses (other than MATH 100) numbered 51 or higher, totaling a minimum of 24 units. It is recommended that these courses include either the sequence 51, 52, 53 or the sequence 51H, 52H, 53H. At least 12 of the units applied toward the minor in Mathematics must be taken at Stanford. The policy of the Mathematics Department is that no courses other than the MATH 50 series and below may be double-counted toward any other University major or minor.

HONORS PROGRAM

The honors program is intended for students who have strong theoretical interests and abilities in mathematics. The goal of the program is to give students a thorough introduction to the main branches of mathematics, especially analysis, algebra, and geometry. Through the honors thesis, students may be introduced to a current or recent research topic, although occasionally more classical projects are encouraged. The program provides an excellent background with which to enter a master's or Ph.D. program in Mathematics. Students completing the program are awarded a B.S. in Mathematics with Honors.

It is recommended that the sequence 51H, 52H, 53H be taken in the freshman year. Students who have instead taken the sequence 51, 52, 53 in their freshman year may be permitted to enter the honors program, but such entry must be approved by the Department of Mathematics Committee for Undergraduate Affairs.

To graduate with a B.S. in Mathematics with Honors, the following conditions apply in addition to the usual requirements for math majors:

1. The selection of courses under items '1' and '2' above must include all the math courses 106 or 116, 120, 171 and also must include seven or more additional courses, with at least one from each of the groups: algebra sequence 114, 121, 152, 153, 156; analysis sequence 131, 132, 135, 136, 151, 174A, 174B, 175, 176; geometry/topology sequence 143, 145, 146, 147, 148; logic and set theory sequence PHIL 151, PHIL 152, and MATH 161.
2. Students in the honors program must write a senior thesis. In order to facilitate this, the student must, by the end of the junior year, choose an undergraduate thesis adviser from the Department of Mathematics faculty, and map out a concentrated reading program under the direction and guidance of the adviser. During the senior year, the student must enroll in MATH 197 for a total of 6 units (typically spread over two quarters), and work toward completion of the thesis under the direction and guidance of the thesis adviser. The thesis may contain original material, or be a synthesis of work in current or recent research literature. The 6 units of credit for MATH 197 are required in addition to the course requirements laid out under items '1' and '2' above and in addition to all other requirements for math majors.

In addition to the minimum requirements laid out above, it is strongly recommended that students take at least one graduate-level course (that is, at least one course in the 200 plus range). MATH 205A, 210A, and 215A or B are especially recommended in this context.

Students with questions about the honors program should see the director of undergraduate advising.

BACHELOR OF SCIENCE IN MATHEMATICAL AND COMPUTATIONAL SCIENCE

The Department of Mathematics participates with the departments of Computer Science, Management Science and Engineering, and Statistics in a program leading to a B.S. in Mathematical and Computational Science. See the "Mathematical and Computational Science" section of this bulletin.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The University's basic requirements for the master's degree are discussed in the "Graduate Degrees" section of this bulletin. Students should pay particular attention to the University's course requirements for graduate degrees. The following are specific departmental requirements:

Candidates must complete an approved course program of 45 units of courses beyond the department requirements for the B.S. degree, of which at least 36 units must be Mathematics Department courses, taken for a letter grade. The Mathematics courses must include at least 18 units numbered 200 or above. The candidate must have a grade point average (GPA) of 3.0 (B) over all course work taken in Mathematics, and a GPA of 3.0 (B) in the 200-level courses considered separately. Course work for the M.S. degree must be approved during the first quarter of enrollment in the program by the department's Director of Graduate Studies.

For the M.S. degree in Financial Mathematics, see the "Financial Mathematics" section of this bulletin.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, see the "School of Education" section of this bulletin or address inquiries to Credential Secretary, School of Education.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the doctorate (residence, dissertation, examinations, etc.) are discussed in the "Graduate Degrees" section of this bulletin. The following are specific departmental requirements.

To be admitted to candidacy, the student must have successfully completed 27 units of graduate courses (that is, courses numbered 200 and above). In addition, the student must pass qualifying examinations given by the department.

Beyond the requirements for candidacy, the student must complete a course of study approved by the Graduate Affairs Committee of the Department of Mathematics and submit an acceptable dissertation. In accordance with University requirements, Ph.D. students must complete a total of 135 course units beyond the bachelor's degree. These courses should be Department of Mathematics courses or approved courses from other departments. The course program should display substantial breadth in mathematics outside the student's field of application. The student must receive a grade point average (GPA) of 3.0 (B) or better in courses used to satisfy the Ph.D. requirement. In addition, the student must pass the Department area examination and the University oral examination and pass a reading examination in one foreign language, chosen from French, German, or Russian.

Experience in teaching is emphasized in the Ph.D. program. Each student is required to complete nine quarters of such experience. The nature of the teaching assignment for each of those quarters is determined by the department in consultation with the student. Typical assignments include teaching or assisting in teaching an undergraduate course or lecturing in an advanced seminar.

For further information concerning degree programs, fellowships, and assistantships, inquire of the academic associate of the department.

PH.D. MINOR

The student should complete both of the following:*

1. MATH 106 or 116, 131, 132
2. MATH 113, 114, 120 or 152

These courses may have been completed during undergraduate study, and their equivalents from other universities are acceptable.

In addition, the student should complete 21 units of 200-level courses in Mathematics. These must be taken at Stanford and approved by the Department of Mathematics Ph.D. minor adviser.

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* A third coherent sequence designed by the student, subject to the approval of the graduate committee, may be considered as a substitute for items '1' or '2'.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

INTRODUCTORY AND UNDERGRADUATE

The department offers two sequences of introductory courses in single variable calculus.

1. MATH 41, 42 present single variable calculus. Differential calculus is covered in the first quarter, integral calculus in the second.
2. MATH 19, 20, 21 cover the material in 41, 42 in three quarters instead of two.

There are options for studying multivariable mathematics:

1. MATH 51, 52, 53 cover differential and integral calculus in several variables, linear algebra, and ordinary differential equations. These topics are taught in an integrated fashion and emphasize application. MATH 51 covers differential calculus in several variables and introduces matrix theory and linear algebra, 52 covers integral calculus in several variables and vector analysis, 53 studies further topics in linear algebra and applies them to the study of ordinary differential equations. This sequence is strongly recommended for incoming freshmen with 10 units of advanced placement credit.
2. MATH 51H, 52H, 53H cover the same material as 51, 52, 53, but with more emphasis on theory and rigor.

The introductory course in linear algebra is 103 or 113. There are no formal prerequisites for these courses, but appropriate mathematical maturity is expected. Much of the material in 103 is covered in the sequence 51, 52, 53.

MATH 15. Overview of Mathematics—Broad survey of mathematics; its nature and role in society. GER:DB-Math
3 units, Win (Devlin, K)

MATH 19. Calculus—The content of MATH 19, 20, 21 is the same as the sequence MATH 41, 42 described below, but covered in three quarters, rather than two. GER:DB-Math
3 units, Aut (Lee, B), Win, Sum (Staff)

MATH 20. Calculus—Continuation of 19. Prerequisite: 19. GER:DB-Math
3 units, Win (Lee, B), Spr (Staff)

MATH 21. Calculus—Continuation of 20. Prerequisite: 20. GER:DB-Math
4 units, Spr (Lee, B)

MATH 41. Calculus—Introduction to differential and integral calculus of functions of one variable. Topics: review of elementary functions including exponentials and logarithms, rates of change, and the derivative. Introduction to the definite integral and integration. Prerequisites: algebra, trigonometry. GER:DB-Math
5 units, Aut (Lucianovic, M)

MATH 41A. Calculus ACE—Students attend MATH 41 lectures with different recitation sessions, four hours instead of two, emphasizing engineering applications. Prerequisite: application; see http://soe.stanford.edu/edp/programs/ace.html. GER:DB-Math
6 units, Aut (Lucianovic, M)

MATH 42. Calculus—Continuation of 41. Methods of symbolic and numerical integration, applications of the definite integral, introduction to differential equations. Infinite series. Prerequisite: 41 or equivalent. GER:DB-Math
5 units, Aut, Win (Butscher, A)

MATH 42A. Calculus ACE—Students attend MATH 41 lectures with different recitation sessions, four hours instead of two, emphasizing engineering applications. Prerequisite: application; see http://soe.stanford.edu/edp/programs/ace.html. GER:DB-Math
6 units, Aut, Win (Butscher, A)

MATH 51. Linear Algebra and Differential Calculus of Several Variables—Geometry and algebra of vectors, systems of linear equations, matrices, vector valued functions and functions of several variables, partial derivatives, gradients, chain rule in several variables, vector fields, optimization. Prerequisite: 21, 42, or a score of 4 on the BC Advanced Placement exam or 5 on the AB Advanced Placement exam, or consent of instructor. GER:DB-Math
5 units, Aut, Win, Spr, Sum (Staff)

MATH 51A. Linear Algebra and Differential Calculus of Several Variables, ACE—Students attend MATH 51 lectures with different recitation sessions: four hours per week instead of two, emphasizing engineering applications. Prerequisite: application; see http://soe.stanford.edu/edp/programs/ace.html. GER:DB-Math
6 units, Aut, Win, Spr (Staff)

MATH 51H. Honors Multivariable Mathematics—For prospective Mathematics majors in the honors program and students from other areas of science or engineering who have a strong mathematics background. Three quarter sequence covers the material of 51, 52, 53, and additional advanced calculus and ordinary and partial differential equations. Unified treatment of multivariable calculus, linear algebra, and differential equations with a different order of topics and emphasis from standard courses. Students should know one-variable calculus and have an interest in a theoretical approach to the subject. Prerequisite: score of 5 on BC Advanced Placement exam, or consent of instructor. GER:DB-Math
5 units, Aut (Simon, L)

MATH 52. Integral Calculus of Several Variables—Iterated integrals, line and surface integrals, vector analysis with applications to vector potentials and conservative vector fields, physical interpretations. Divergence theorem and the theorems of Green, Gauss, and Stokes. Prerequisite: 51. GER:DB-Math
5 units, Aut (Oprea, D), Win (Demanet, L; Lucianovic, M), Spr (Butscher, A)

MATH 52H. Honors Multivariable Mathematics—Continuation of 51H. Prerequisite: 51H. GER:DB-Math
5 units, Win (Simon, L)

MATH 53. Ordinary Differential Equations with Linear Algebra—Linear ordinary differential equations, applications to oscillations, matrix methods including determinants, eigenvalues and eigenvectors, matrix exponentials, systems of linear differential equations with constant coefficients, stability of non-linear systems and phase plane analysis, numerical methods, Laplace transforms. Integrated with topics from linear algebra (103). Prerequisite: 51. GER:DB-Math

5 units, Aut (Staff), Win (Liu, T), Spr (Guth, L; Siefring, R), Sum (Staff)

MATH 53H. Honors Multivariable Mathematics—Continuation of 52H. Prerequisite: 52H. GER:DB-Math

5 units, Spr (Brendle, S)

MATH 80Q. Capillary Surfaces: Explored and Unexplored Territory—Stanford Introductory Seminar. Preference to sophomores. Capillary surfaces: the interfaces between fluids that are adjacent to each other and do not mix. Recently discovered phenomena, predicted mathematically and subsequently confirmed by experiments, some done in space shuttles. Interested students may participate in ongoing investigations with affinity between mathematics and physics.

3 units, Win (Finn, R)

MATH 87Q. Mathematics of Knots, Braids, Links, and Tangles—Stanford Introductory Seminar. Preference to sophomores. Types of knots and how knots can be distinguished from one another by means of numerical or polynomial invariants. The geometry and algebra of braids, including their relationships to knots. Topology of surfaces. Brief summary of applications to biology, chemistry, and physics.

3 units, Spr (Wieczorek, W)

UNDERGRADUATE AND GRADUATE

Unless stated, there are no prerequisites for the courses listed below. Where a prerequisite is stated, it may be waived by the instructor.

MATH 100. Mathematics for Elementary School Teachers—Mathematics and pedagogical strategies. Core mathematical content in grades K-6, classroom presentation, how to handle student errors, and mathematical issues that come up during instruction.

4 units, Spr (Milgram, R)

MATH 103. Matrix Theory and Its Applications—Linear algebra and matrices, emphasizing the computational and algorithmic aspects and the scientific problems in which matrix theory is applied. Solution of linear equations. Linear spaces and matrices. Orthogonal projection and least squares. Determinants, eigenvalues, and eigenvectors. GER:DB-Math

3 units, Aut (Milanov, T), Win, Spr (Nedelec, L), Sum (Staff)

MATH 106. Functions of a Complex Variable—Complex numbers, analytic functions, Cauchy-Riemann equations, complex integration, Cauchy integral formula, residues, elementary conformal mappings. Prerequisite: 52. GER:DB-Math

3 units, Win (Licata, J), Sum (Brumfiel, G)

MATH 108. Introduction to Combinatorics and Its Applications—Topics: graphs, trees (Cayley's Theorem, application to phylogony), eigenvalues, basic enumeration (permutations, Stirling and Bell numbers), recurrences, generating functions, basic asymptotics. Prerequisites: 51 or 103 or equivalent. GER:DB-Math

3 units, Spr (Diaconis, P)

MATH 109. Applied Group Theory—Applications of the theory of groups. Topics: elements of group theory, groups of symmetries, matrix groups, group actions, and applications to combinatorics and computing. Applications: rotational symmetry groups, the study of the Platonic solids, crystallographic groups and their applications in chemistry and physics. GER:DB-Math, WIM

3 units, Aut (Ionel, E)

MATH 110. Applied Number Theory and Field Theory—Number theory and its applications to modern cryptography. Topics: congruences, finite fields, primality testing and factorization, public key cryptography, error correcting codes, and elliptic curves, emphasizing algorithms. GER:DB-Math, WIM

3 units, Spr (Brumfiel, G)

MATH 111. Computational Commutative Algebra—Introduction to the theory of commutative rings, ideals, and modules. Systems of polynomial equations in several variables from the algorithmic viewpoint. Groebner bases, Buchberger's algorithm, elimination theory. Applications to algebraic geometry and to geometric problems. GER:DB-Math

3 units, Win (Galatius, S)

MATH 113. Linear Algebra and Matrix Theory—Algebraic properties of matrices and their interpretation in geometric terms. The relationship between the algebraic and geometric points of view and matters fundamental to the study and solution of linear equations. Topics: linear equations, vector spaces, linear dependence, bases and coordinate systems; linear transformations and matrices; similarity; eigenvectors and eigenvalues; diagonalization. GER:DB-Math

3 units, Aut (Vasy, A), Win (Cohen, R)

MATH 114. Linear Algebra and Matrix Theory II—Advanced topics in linear algebra such as: invariant subspaces; canonical forms of matrices; minimal polynomials and elementary divisors; vector spaces over arbitrary fields; inner products; Jordan normal forms; Hermitian and unitary matrices; multilinear algebra; and applications. Prerequisite: 51H or 113. GER:DB-Math

3 units, Spr (Katznelson, Y)

MATH 115. Functions of a Real Variable—The development of real analysis in Euclidean space: sequences and series, limits, continuous functions, derivatives, integrals. Basic point set topology. Honors math majors and students who intend to do graduate work in mathematics should take 171. Prerequisite: 51. GER:DB-Math

3 units, Aut (Ornstein, D), Win (Toussaint, A), Sum (Brumfiel, G)

MATH 116. Complex Analysis—Analytic functions, Cauchy integral formula, power series and Laurent series, calculus of residues and applications, conformal mapping, analytic continuation, introduction to Riemann surfaces, Fourier series and integrals. Prerequisites: 52, and 115 or 171. GER:DB-Math

3 units, Win (Li, J)

MATH 120. Modern Algebra—Basic structures in algebra: groups, rings, and fields. Elements of group theory: permutation groups, finite Abelian groups, p-groups, Sylow theorems. Polynomial rings, principal ideal domains, unique factorization domains. GER:DB-Math, WIM

3 units, Aut (Li, J), Spr (Cohen, R)

MATH 121. Modern Algebra II—Continuation of 120. Fields of fractions. Solvable and simple groups. Elements of field theory and Galois theory. Prerequisite: 120. GER:DB-Math

3 units, Win (White, B)

MATH 131. Partial Differential Equations I—First-order equations, classification of second-order equations. Initial-boundary value problems for heat, wave, and related equations. Separation of variables, eigenvalue problems, Fourier series, existence and uniqueness questions. Prerequisite: 53 or equivalent. GER:DB-Math

3 units, Aut, Win (Iyer, G)

MATH 132. Partial Differential Equations II—Laplace's equation and properties of harmonic functions. Green's functions. Distributions and Fourier transforms. Eigenvalue problems and generalized Fourier series. Numerical solutions. Prerequisite: 131. GER:DB-Math

3 units, Spr (Nedelec, L)

MATH 135. Nonlinear Dynamics and Chaos—Topics: one- and two-dimensional flows, bifurcations, phase plane analysis, limit cycles and their bifurcations. Lorenz equations, fractals and strange attractors. Prerequisite: 51 and 53 or equivalent. GER:DB-Math

3 units, Spr (Iyer, G)

MATH 136. Stochastic Processes—(Same as STATS 219.) Introduction to measure theory, Lp spaces and Hilbert spaces. Random variables, expectation, conditional expectation, conditional distribution. Uniform integrability, almost sure and Lp convergence. Stochastic processes: definition, stationarity, sample path continuity. Examples: random walk,

Markov chains, Gaussian processes, Poisson processes, Martingales. Construction and basic properties of Brownian motion. Prerequisite: STATS 116 or MATH 151 or equivalent. Recommended: MATH 115 or equivalent. GER:DB-Math
3 units, Aut (Ross, K), Win (Dembo, A)

MATH 138. Celestial Mechanics—Mathematically rigorous introduction to the classical N-body problem: the motion of N particles evolving according to Newton's law. Topics include: the Kepler problem and its symmetries; other central force problems; conservation theorems; variational methods; Hamilton-Jacobi theory; the role of equilibrium points and stability; and symplectic methods. Prerequisites: 53, and 115 or 171. GER:DB-Math
3 units, not given this year

MATH 143. Differential Geometry—Geometry of curves and surfaces in three-space and higher dimensional manifolds. Parallel transport, curvature, and geodesics. Surfaces with constant curvature. Minimal surfaces. GER:DB-Math
3 units, Win (Schoen, R)

MATH 145. Algebraic Geometry—Real algebraic curves, Hilbert's nullstellensatz, complex affine and projective curves, Bezout's theorem, the degree/genus formula, Riemann surfaces, Riemann-Roch theorem. Prerequisites: 106 or 116, and 109 or 120. Recommended: familiarity with surfaces equivalent to 143, 146, 147, or 148. GER:DB-Math
3 units, Spr (Oprea, D)

MATH 146. Analysis on Manifolds—Differentiable manifolds, tangent space, submanifolds, implicit function theorem, differential forms, vector and tensor fields. Frobenius' theorem, DeRham theory. Prerequisite: 52 or 52H. GER:DB-Math
3 units, Win (Wieczorek, W)

MATH 147. Differential Topology—Smooth manifolds, transversality, Sards' theorem, embeddings, degree of a map, Borsuk-Ulam theorem, Hopf degree theorem, Jordan curve theorem. Prerequisite: 115 or 171. GER:DB-Math
3 units, Spr (Wieczorek, W)

MATH 148. Algebraic Topology—Fundamental group, covering spaces, Euler characteristic, homology, classification of surfaces, knots. Prerequisite: 109 or 120. GER:DB-Math
3 units, alternate years, not given this year

MATH 151. Introduction to Probability Theory—Counting; axioms of probability; conditioning and independence; expectation and variance; discrete and continuous random variables and distributions; joint distributions and dependence; central limit theorem and laws of large numbers. Prerequisite: 52 or consent of instructor. GER:DB-Math
3 units, Win (Liu, T)

MATH 152. Elementary Theory of Numbers—Euclid's algorithm, fundamental theorems on divisibility; prime numbers, congruence of numbers; theorems of Fermat, Euler, Wilson; congruences of first and higher degrees; Lagrange's theorem and its applications; quadratic residues; introduction to the theory of binary quadratic forms. GER:DB-Math
3 units, not given this year

MATH 154. Introduction to Algebraic Number Theory—Core concepts, including number fields, Dedekind domains, unique factorization of ideals, quadratic reciprocity theorems, and Fermat's last theorem for regular prime exponents. Prerequisites: 120, 121. GER:DB-Math
3 units, not given this year

MATH 155. Topics in Elementary Number Theory—Theory of quadratic forms, including the results of Fermat, Lagrange, Gauss, the recent fifteen theorem, and Dirichlet's class number formula. Topics may include continued fractions and Pell's equation, algebraic and transcendental numbers, quadratic fields, Fermat's theorem in some special cases, and an introduction to elliptic curves. Prerequisites: 152, or familiarity with the Euclidean algorithm, congruences, residue classes and reduced residue classes, primitive roots, and quadratic reciprocity. Recommended: 120, 121.
3 units, Aut (Soundararajan, K)

MATH 156. Group Representations—Group representations and their characters, classification of permutation group representations using partitions and Young tableaux, group actions on sets and the Burnside ring, and spherical space forms. Applications to geometric group actions and to combinatorics. Prerequisites: linear algebra (51 and 53, or 103 or 113) and group theory (109 or 120). GER:DB-Math
3 units, Spr (Milgram, R)

MATH 161. Set Theory—Informal and axiomatic set theory: sets, relations, functions, and set-theoretical operations. The Zermelo-Fraenkel axiom system and the special role of the axiom of choice and its various equivalents. Well-orderings and ordinal numbers; transfinite induction and transfinite recursion. Equinumerosity and cardinal numbers; Cantor's Alephs and cardinal arithmetic. Open problems in set theory. GER:DB-Math
3 units, Win (Feferman, S)

MATH 171. Fundamental Concepts of Analysis—Recommended for Mathematics majors and required of honors Mathematics majors. Similar to 115 but altered content and more theoretical orientation. Properties of Riemann integrals, continuous functions and convergence in metric spaces; compact metric spaces, basic point set topology. Prerequisites: 51 and 52, or 51H and 52H. GER:DB-Math, WIM
3 units, Aut (Schoen, R), Spr (Licata, J)

MATH 174A. Topics in Analysis and Differential Equations with Applications—For students planning graduate work in mathematics or physics, and for honors math majors and other students at ease with rigorous proofs and qualitative discussion. Topics may include: geometric theory of ODE's with applications to dynamics; mathematical foundations of classical mechanics including variational principles, Lagrangian and Hamiltonian formalisms, theory of integrable systems; theorems of existence and uniqueness; Sturm-Liouville theory. Prerequisite: 53H or 171, or consent of instructor. GER:DB-Math
3 units, Win (Katznelson, Y)

MATH 174B. Honors Analysis—Continuation of 174A. Topics may include: introduction to PDEs including transport equations, Laplace, wave, and heat equations; techniques of solution including separation of variables and Green's functions; Fourier series and integrals; introduction to the theory of distributions; mathematical foundations of quantum mechanics. Prerequisite: 174A. GER:DB-Math
3 units, not given this year

MATH 175. Elementary Functional Analysis—Linear operators on Hilbert space. Spectral theory of compact operators; applications to integral equations. Elements of Banach space theory. Prerequisite: 115 or 171. GER:DB-Math
3 units, Spr (Simon, L)

MATH 180. Introduction to Financial Mathematics—Financial derivatives: contracts and options. Hedging and risk management. Arbitrage, interest rate, and discounted value. Geometric random walk and Brownian motion as models of risky assets. Initial boundary value problems for the heat and related partial differential equations. Self-financing replicating portfolio. Black-Scholes pricing of European options. Dividends. Implied volatility. Optimal stopping and American options. Prerequisite: 53. Corequisites: 131, 151 or STATS 116. GER:DB-Math
3 units, Aut (Toussaint, A)

MATH 197. Senior Honors Thesis
1-6 units, Aut, Win, Spr (Staff)

MATH 199. Independent Work—Undergraduates pursue a reading program; topics limited to those not in regular department course offerings. Credit can fulfill the elective requirement for math majors. Approval of Undergraduate Affairs Committee is required to use credit for honors majors area requirement.
1-3 units, Aut, Win, Spr (Staff)

PRIMARILY FOR GRADUATE STUDENTS

MATH 205A. Real Analysis—Basic measure theory and the theory of Lebesgue integration. Prerequisite: 171 or equivalent.
3 units, Aut (White, B)

MATH 205B. Real Analysis—Point set topology, basic functional analysis, Fourier series, and Fourier transform. Prerequisites: 171 and 205A or equivalent.
3 units, Win (Vasy, A)

MATH 205C. Real Analysis—Continuation of 205B.
3 units, Spr (Katznelson, Y)

MATH 210A. Modern Algebra—Groups, rings, and fields; introduction to Galois theory. Prerequisite: 120 or equivalent.
3 units, Aut (Milgram, R)

MATH 210B. Modern Algebra—Galois theory. Ideal theory, introduction to algebraic geometry and algebraic number theory. Prerequisite: 210A.
3 units, Win (Brumfiel, G)

MATH 210C. Modern Algebra—Continuation of 210B. Representations of groups and noncommutative algebras, multilinear algebra.
3 units, Spr (Bump, D)

MATH 215A. Complex Analysis, Geometry, and Topology—Analytic functions, complex integration, Cauchy's theorem, residue theorem, argument principle, conformal mappings, Riemann mapping theorem, Picard's theorem, elliptic functions, analytic continuation and Riemann surfaces.
3 units, Aut (Li, J)

MATH 215B. Complex Analysis, Geometry, and Topology—Topics: fundamental group and covering spaces, homology, cohomology, products, basic homotopy theory, and applications. Prerequisites: 113, 120, and 171, or equivalent; 215A is not a prerequisite for 215B.
3 units, Win (Carlsson, G)

MATH 215C. Complex Analysis, Geometry, and Topology—Differentiable manifolds, transversality, degree of a mapping, vector fields, intersection theory, and Poincare duality. Differential forms and the DeRham theorem. Prerequisite: 215B or equivalent.
3 units, Spr (Galatius, S)

MATH 216A,B,C. Introduction to Algebraic Geometry—Algebraic curves, algebraic varieties, sheaves, cohomology, Riemann-Roch theorem. Classification of algebraic surfaces, moduli spaces, deformation theory and obstruction theory, the notion of schemes. May be repeated for credit.
3 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Vakil, R)*

MATH 217A. Differential Geometry—Smooth manifolds and submanifolds, tensors and forms, Lie and exterior derivative, DeRham cohomology, distributions and the Frobenius theorem, vector bundles, connection theory, parallel transport and curvature, affine connections, geodesics and the exponential map, connections on the principal frame bundle. Prerequisite: 173 or equivalent.
3 units, Aut (Schoen, R)

MATH 217B. Differential Geometry—Riemannian manifolds, Levi-Civita connection, Riemann curvature tensor, Riemannian exponential map and geodesic normal coordinates, Jacobi fields, completeness, spaces of constant curvature, bi-invariant metrics on compact Lie groups, symmetric and locally symmetric spaces, equations for Riemannian submanifolds and Riemannian submersions. Prerequisite: 217A.
3 units, Win (Brendle, S)

MATH 220. Partial Differential Equations of Applied Mathematics—(Same as CME 303.) First-order partial differential equations, method of characteristics, weak solutions, conservation laws, hyperbolic equations, separation of variables, Fourier series, Kirchoff's formula, Huygen's principle, and hyperbolic systems. Prerequisite: foundation in multivariable calculus and ordinary differential equations.
3 units, Aut (Nolen, J)

MATH 221. Mathematical Methods of Imaging—Mathematical methods of imaging: array imaging using Kirchhoff migration and beamforming, resolution theory for broad and narrow band array imaging in homogeneous media, topics in high-frequency, variable background imaging with velocity estimation, interferometric imaging methods, the role of noise and inhomogeneities, and variational problems that arise in optimizing the performance of imaging algorithms and the deblurring of images. Prerequisite: 220.
3 units, Spr (Papanicolaou, G)

MATH 222. Computational Methods for Fronts, Interfaces, and Waves—High-order methods for multidimensional systems of conservation laws and Hamilton-Jacobi equations (central schemes, discontinuous Galerkin methods, relaxation methods). Level set methods and fast marching methods. Computation of multi-valued solutions. Multi-scale analysis, including wavelet-based methods. Boundary schemes (perfectly matched layers). Examples from (but not limited to) geometrical optics, transport equations, reaction-diffusion equations, imaging, and signal processing.
3 units, not given this year

MATH 227. Partial Differential Equations and Diffusion Processes—Parabolic and elliptic partial differential equations and their relation to diffusion processes. First order equations and optimal control. Emphasis is on applications to mathematical finance. Prerequisites: MATH 131 and MATH 136/STATS 219, or equivalents.
3 units, Win (Nolen, J)

MATH 232. Topics in Probability: Geometry and Markov Chains—Dirichlet forms; Nash, Sobolev, and log-Sobolev inequalities; and applications to card shuffling and random walk on graphs. May be repeated for credit.
3 units, not given this year

MATH 234. Large Deviations—(Same as STATS 374.) Combinatorial estimates and the method of types. Large deviation probabilities for partial sums and for empirical distributions, Cramer's and Sanov's theorems and their Markov extensions. Applications in statistics, information theory, and statistical mechanics. Prerequisite: MATH 230A or STATS 310.
3 units, not given this year

MATH 235. Ergodic Theory and Combinatorial Applications—Classical ergodic theory, with applications to combinatorics, including proofs of Szemeredi's theorem and of some extensions of it. May be repeated for credit. Prerequisite: 205A.
3 units, Win (Katznelson, Y)

MATH 236. Introduction to Stochastic Differential Equations—Brownian motion, stochastic integrals, and diffusions as solutions of stochastic differential equations. Functionals of diffusions and their connection with partial differential equations. Random walk approximation of diffusions. Prerequisite: 136 or equivalent and differential equations.
3 units, Win (Papanicolaou, G)

MATH 237. Stochastic Equations and Random Media—Topics in stochastic differential equations relevant for the analysis of processes in random environments emphasizing asymptotic methods and estimation methods. Examples from financial mathematics including stochastic volatility models, credit default models, and interest rate models that deal with the whole yield curve. Prerequisite: 236 or equivalent. Recommended: knowledge of financial mathematics.
3 units, Spr (Papanicolaou, G)

MATH 238. Mathematical Finance—(Same as STATS 250.) Stochastic models of financial markets. Forward and futures contracts. European options and equivalent martingale measures. Hedging strategies and management of risk. Term structure models and interest rate derivatives. Optimal stopping and American options. Corequisites: MATH 236 and 227 or equivalent.
3 units, Win (Papanicolaou, G)

MATH 239. Computation and Simulation in Finance—Monte Carlo, finite difference, tree, and transform methods for the numerical solution of partial differential equations in finance. Emphasis is on derivative security pricing. Prerequisite: 238 or equivalent.
3 units, Spr (Toussaint, A)

MATH 240. Topics in Financial Mathematics: Fixed Income Models—Introduction to continuous time models for arbitrage-free pricing of interest rate derivatives. Bonds, yields, and the construction of yield curves. Caps, floors, swaps, swaptions, and bond options. Short rate models. Yield curve models. Forward measures. Forward and futures. LIBOR and swap market models. Prerequisite: MATH 238.
3 units, Spr (Toussaint, A)

MATH 244. Riemann Surfaces—Compact Riemann surfaces and algebraic curves; cohomology of sheaves; Serre duality; Riemann-Roch theorem and application; Jacobians; Abel's theorem. May be repeated for credit.
3 units, Spr (Oprea, D)

MATH 245A. Topics in Algebraic Geometry: Moduli Theory—Intersection theory on the moduli spaces of stable curves, stable maps, and stable vector bundles. May be repeated for credit.
3 units, not given this year

MATH 245B. Topics in Algebraic Geometry: *Dessin d'Enfants*—Grothendieck's theory of *dessin d'enfants,* a study of graphs on surfaces and their connection with the absolute Galois group of the rational numbers. Belyi's theorem, representations of the absolute Galois group as automorphisms of profinite groups, Grothendieck-Teichmuller theory, quadratic differentials, and the combinatorics of moduli spaces of surfaces. May be repeated for credit.
3 units, not given this year

MATH 248. Algebraic Number Theory—Introduction to modular forms and L-functions. May be repeated for credit.
1-3 units, not given this year

MATH 249A. Distribution Questions in Number Theory—Rigorous results and conjectures about the distributions of objects of number theoretic interest such as: the spacings between consecutive prime numbers; the spacings between consecutive zeros of the Riemann zeta-function; the class numbers of imaginary quadratic fields; and the values L-functions. Prerequisites: 205A,B,C, or comparable knowledge of probability and Fourier analysis.
3 units, Aut (Soundararajan, K)

MATH 249B. Topics in Number Theory: Class Field Theory and Central Simple Algebras—Algebraic number theory; the development of class field theory emphasizing the role of central simple algebras. May be repeated for credit.
3 units, Win (Bump, D)

MATH 249C. Topics in Number Theory: Class Field Theory and the Langlands Conjectures
3 units, Spr (Bump, D)

MATH 254. Geometric Methods in the Theory of Ordinary Differential Equations—Topics may include: structural stability and perturbation theory of dynamical systems; hyperbolic theory; first order PDE; normal forms, bifurcation theory; Hamiltonian systems, their geometry and applications. May be repeated for credit.
3 units, not given this year

MATH 256A. Partial Differential Equations—The theory of linear and nonlinear partial differential equations, beginning with linear theory involving use of Fourier transform and Sobolev spaces. Topics: Schauder and L2 estimates for elliptic and parabolic equations; De Giorgi-Nash-Moser theory for elliptic equations; nonlinear equations such as the minimal surface equation, geometric flow problems, and nonlinear hyperbolic equations.
3 units, Aut (Vasy, A)

MATH 256B. Partial Differential Equations—Continuation of 256A.
3 units, Win (Iyer, G)

MATH 257A,B,C. Symplectic Geometry and Topology—Linear symplectic geometry and linear Hamiltonian systems. Symplectic manifolds and their Lagrangian submanifolds, local properties. Symplectic geometry and mechanics. Contact geometry and contact manifolds. Relations between symplectic and contact manifolds. Hamiltonian systems with symmetries. Momentum map and its properties. May be repeated for credit.
3 units, **A:** *not given this year,* **B:** *not given this year,* **C:** *Aut (Ionel, E)*

MATH 258. Topics in Geometric Analysis—May be repeated for credit.
3 units, Win (Mazzeo)

MATH 263A,B. Lie Groups and Lie Algebras—Definitions, examples, properties. Semi-simple Lie algebras, their structure and classification. Cartan decomposition: real Lie algebras. Representation theory: Cartan-Stiefel diagram, weights. Weyl character formula. Orthogonal and symplectic representations. May be repeated for credit. Prerequisite: 210 or equivalent.
3 units, not given this year

MATH 266. Computational Signal Processing and Wavelets—Theoretical and computational aspects of signal processing. Topics: time-frequency transforms; wavelet bases and wavelet packets; linear and nonlinear multiresolution approximations; estimation and restoration of signals; signal compression. May be repeated for credit.
3 units, not given this year

MATH 269A. Gromov-Witten Invariants—Riemann surfaces and their moduli spaces, Deligne-Mumford compactification, line bundles over Riemann surfaces, Riemann-Roch theorem. J-holomorphic curves in symplectic manifolds, gradient trajectories of the action functional. Elliptic boundary value problems for J-holomorphic curves, index formulas, coherent orientation theory, transversality. Gromov compactness theorem for J-holomorphic curves, symplectic topology via theory of holomorphic curves, Floer homology theory. Applications of holomorphic curves to low dimensional topology. Gromov-Witten invariants, quantum cohomology, and associated algebraic structures. Symplectic field theory and its applications.
3 units, Aut (Milanov, T)

MATH 269B. Fredholm Theory in Polyfolds and Symplectic Field Theory I—Fredholm theory in the new class of spaces called polyfolds, with applications to Gromov-Witten theory and more generally to symplectic field theory. May be repeated for credit.
3 units, Win (Hofer, H)

MATH 269C. Fredholm Theory in Polyfolds and Symplectic Field Theory II
3 units, Spr (Hofer, H)

MATH 270. Geometry and Topology of Complex Manifolds—Complex manifolds, Kahler manifolds, curvature, Hodge theory, Lefschetz theorem, Kahler-Einstein equation, Hermitian-Einstein equations, deformation of complex structures. May be repeated for credit.
3 units, Win (Li, J)

MATH 282A. Low Dimensional Topology—The theory of surfaces and 3-manifolds. Curves on surfaces, the classification of diffeomorphisms of surfaces, and Teichmuller space. The mapping class group and the braid group. Knot theory, including knot invariants. Decomposition of 3-manifolds: triangulations, Heegaard splittings, Dehn surgery. Loop theorem, sphere theorem, incompressible surfaces. Geometric structures, particularly hyperbolic structures on surfaces and 3-manifolds.
3 units, not given this year

MATH 282B. Homotopy Theory—Homotopy groups, fibrations, spectral sequences, simplicial methods, Dold-Thom theorem, models for loop spaces, homotopy limits and colimits, stable homotopy theory.
3 units, Win (Carlsson, G)

MATH 282C. Fiber Bundles and Cobordism—Possible topics: principal bundles, vector bundles, classifying spaces. Connections on bundles, curvature. Topology of gauge groups and gauge equivalence classes of connections. Characteristic classes and K-theory, including Bott periodicity, algebraic K-theory, and indices of elliptic operators. Spectral sequences of Atiyah-Hirzebruch, Serre, and Adams. Cobordism theory, Pontryagin-Thom theorem, calculation of unoriented and complex cobordism. May be repeated for credit.
3 units, Spr (Cohen, R)

MATH 283. Topics in Algebraic and Geometric Topology—May be repeated for credit.
3 units, Win (Cohen, R)

MATH 286. Topics in Differential Geometry—May be repeated for credit.
3 units, Win (Schoen, R), Spr (White, B)

MATH 290B. Finite Model Theory—(Same as PHIL 350B.) Classical model theory deals with the relationship between formal languages and their interpretation in finite or infinite structures; its applications to mathematics using first-order languages. The recent development of the model theory of finite structures in connection with complexity classes as measures of computational difficulty; how these classes are defined within certain languages that go beyond first-order logic in expressiveness, such as fragments of higher order or infinitary languages, rather than in terms of models of computation.
3 units, not given this year

MATH 292A. Set Theory—(Same as PHIL 352A.) The basics of axiomatic set theory; the systems of Zermelo-Fraenkel and Bernays-Gödel. Topics: cardinal and ordinal numbers, the cumulative hierarchy and the role of the axiom of choice. Models of set theory, including the constructible sets and models constructed by the method of forcing. Consistency and independence results for the axiom of choice, the continuum hypothesis, and other unsettled mathematical and set-theoretical problems. Prerequisites: PHIL160A,B, and MATH 161, or equivalents.
3 units, Aut (Staff)

MATH 292B. Set Theory—(Same as PHIL 352B.) The basics of axiomatic set theory; the systems of Zermelo-Fraenkel and Bernays-Gödel. Topics: cardinal and ordinal numbers, the cumulative hierarchy and the role of the axiom of choice. Models of set theory, including the constructible sets and models constructed by the method of forcing. Consistency and independence results for the axiom of choice, the continuum hypothesis, and other unsettled mathematical and set-theoretical problems. Prerequisites: PHIL160A,B, and MATH 161, or equivalents.
3 units, Win (Staff)

MATH 293A. Proof Theory—(Same as PHIL 253A/353A.) Gentzen's natural deduction and sequential calculi for first-order propositional and predicate logics. Normalization and cut-elimination procedures. Relationships with computational lambda calculi and automated deduction. Prerequisites: 151, 152, and 161, or equivalents.
3 units, not given this year

MATH 295. Computation and Algorithms in Mathematics—Use of computer and algorithmic techniques in various areas of mathematics. Computational experiments. Topics may include polynomial manipulation, Groebner bases, computational geometry, and randomness. May be repeated for credit.
3 units, not given this year

MATH 299. Mathematics of the Brain—Computational models of neurons and neural networks. Ensembles of membrane proteins as statistical molecular computers; extension of the Hodgkin and Huxley theory. The whole brain as a dynamical symbolic system. Context-sensitive associative memory, working memory, and computational universality. Programmable and learning neurocomputers.
3 units, Spr (Eliashberg, Y)

MATH 355. Graduate Teaching Seminar—Required of and limited to first-year Mathematics graduate students.
1 unit, Win (Simon, L; White, B)

MATH 360. Advanced Reading and Research
1-9 units, Aut, Win, Spr, Sum (Staff)

MATH 361. Research Seminar Participation—Participation in a faculty-led seminar which has no specific course number.
1-3 units, Aut, Win (White, B), Spr (Kerckhoff, S), Sum (Staff)

MATH 380-389. Graduate Seminars—By arrangement. May be repeated for credit.

MATH 380. Seminar in Applied Mathematics
1-3 units, Aut, Win, Spr (Staff)

MATH 381. Seminar in Analysis
1-3 units, Aut, Win, Spr (Staff)

MATH 384. Seminar in Geometry
1-3 units, Aut, Win, Spr (Staff)

MATH 385. Seminar in Topology
1-3 units, Aut, Win, Spr (Staff)

MATH 386. Seminar in Algebra
1-3 units, Aut, Win, Spr (Staff)

MATH 387. Seminar in Number Theory
1-3 units, Aut, Win, Spr (Staff)

MATH 388. Seminar in Probability and Stochastic Processes
1-3 units, Aut, Win, Spr (Staff)

MATH 389. Seminar in Mathematical Biology
1-3 units, Aut, Win, Spr (Staff)

MATH 391. Research Seminar in Logic and the Foundations of Mathematics—(Same as PHIL 391.) Contemporary work. May be repeated a total of three times for credit.
1-3 units, Aut, Win, Spr (Mints, G; Feferman, S)

MATH 395. Classics in Geometry and Topology—Original papers in geometry and in algebraic and geometric topology. May be repeated for credit.
3 units, Win, Spr (Staff)

MATH 396. Graduate Progress—Results and current research of graduate and postdoctoral students. May be repeated for credit.
1 unit, Aut, Win, Spr (Staff)

MATH 397. Physics for Mathematicians—Topics from physics essential for students studying geometry and topology. Topics may include quantum mechanics, quantum field theory, path integral approach and renormalization, statistical mechanics, and string theory. May be repeated for credit.
1 unit, Aut, Win (Staff)

COGNATE COURSES

PHIL 151/252. First-Order Logic
4 units, Win (Pauly, M)

PHIL 152/252. Computability and Logic
4 units, Spr (Pauly, M)

PHIL 162/262. Philosophy of Mathematics
4 units, Spr (Feferman, S)

STATS 116. Theory of Probability
3-5 units, Aut (Donoho, D), Spr (Wong, W), Sum (Staff)

STATS 310A. Theory of Probability
2-4 units, Aut (Dembo, A)

STATS 310B. Theory of Probability
2-4 units, Win (Siegmund, D)

STATS 310C. Theory of Probability
2-4 units, Spr (Lai, T)

MEDIEVAL STUDIES

Director: Jennifer Summit

Committee in Charge: Philippe Buc, Hester Gelber, Hans Ulrich Gumbrecht, Robert P. Harrison, Nancy S. Kollmann, Seth Lerer, William Mahrt, Bissera Pentcheva, Jennifer Summit, Rega Wood

Affiliated Faculty: George H. Brown (English), Philippe Buc (History), Charlotte Fonrobert (Religious Studies), Hester Gelber (Religious Studies), Hans Ulrich Gumbrecht (French and Italian), Robert Harrison (French and Italian), Nancy S. Kollmann (History), Seth Lerer (English, Comparative Literature), Mark E. Lewis (History), William Mahrt (Music), Kathryn Miller (History), Bissera Pentcheva (Art and Art History, on leave), Orrin W. Robinson (German Studies), Jeffrey Schnapp (French and Italian), Jennifer Summit (English), Rega Wood (Philosophy)

Program Offices: Building 240
Mail Code: 94305-2152
Department Phone: (650) 723-3413
Email: idstudies.moore@stanford.edu
Web Site: http://www.stanford.edu/dept/medieval/

Courses given in Medieval Studies have the subject code MEDVLST. For a complete list of subject codes, see Appendix.

The Medieval Studies Program is administered through Interdisciplinary Studies in Humanities, but the degree is conferred by the Dean of Undergraduate Studies Advisory Committee on Individually Designed Majors. The committee has approved the program as listed below. Students interested in pursuing a Medieval Studies major or minor should visit the program office in Building 240 and consult the Director of Medieval Studies. The major is normally declared by the beginning of the student's third year.

The major combines interdisciplinary breadth with a disciplinary focus. The interdisciplinary emphasis is provided by MEDVLST 165, Crusades: Interdisciplinary Approaches, by upper-division interdisciplinary colloquia, and by the requirement that students take courses in three different areas. Depth is ensured by the requirement that students take at least four courses in one area. A faculty adviser helps each student choose courses that integrate the requirements of breadth and depth. To that end, the following guidelines are provided.

The student should take a minimum of 60 units of course work from the list of Medieval Studies courses or appropriate alternatives approved by the director, including ten courses as follows:

1. The introductory course, MEDVLST 165, Crusades: Interdisciplinary Approaches.
2. Two upper-division courses, ideally with an interdisciplinary component, in any field dealing with the Middle Ages.
3. Four courses in one of the following categories:
   a) Literature: English, French, German and Scandinavian, Italian, Latin, Slavic, Spanish
   b) History
   c) Art History, Drama, Music
   d) Humanities, Philosophy, Religious Studies (certain Humanities courses may fulfill requirements within other categories)
4. Two courses in a second category from the above list.
5. One course in a third category from the above list.

Students doing the Medieval Studies concentration for the Humanities major should use these requirements as guidelines for developing their programs of study.

In addition to the ten courses, a language proficiency equal to two years of college-level study is suggested in Latin or one of the following: French, German, Italian, or Spanish.

Medieval Studies has a Writing in the Major (WIM) requirement. It can be fulfilled in one of three ways:

1. Through a course designated as WIM by a department contributing to the Medieval Studies major.
2. Through a paper in a Medieval Studies course.
3. Through an independent paper with a member of the Medieval Studies faculty.

Check with the program office regarding specific requirements for each of these options. Courses used to satisfy Medieval Studies major requirements must be taken for a grade.

MINOR

An undergraduate minor in Medieval Studies is available through the program. Students interested in completing the minor should inquire about enrollment procedures at the office of Interdisciplinary Studies in Humanities.

Requirements are as follows:

1. *Language:* in addition to the University foreign language requirement, at least a one quarter course in a classical and/or medieval vernacular language is recommended, which may count as one of the five required courses for the minor listed under item 2b.
2. The minor consists of six courses, which include:
   a) MEDVLST 165, Crusades: Interdisciplinary Approaches (core course). If 165 is not offered in a given year, students may petition to take a substitute course if necessary. Petitions should be directed to the Director of Medieval Studies.
   b) an additional five courses dealing directly with the Middle Ages. If the student's major department or program offers medieval courses, he/she should take two of them for the Medieval Studies minor, but those courses may not also count for the major. At least three courses must be taken outside the student's major, selected from two or more of the following categories:
      1) Language and Literature
      2) History
      3) Art History, Drama, Music
      4) Humanities, Philosophy, Religious Studies
      5) From among the Medieval Studies faculty listed above, the student chooses an adviser, who assists in the selection of courses and the design of the program.

Courses applied to the minor in Medieval Studies must be taken for a letter grade. Courses applied to the minor cannot also be applied to a student's major or another minor.

COURSES

MEDVLST 165. Crusades: Interdisciplinary Approaches—(Same as ENGLISH 103, HISTORY 215, RELIGST 140.) Causes, meanings, meaningfulness, and commemoration of the Christian expeditions against Muslims, pagans, and heretics. Primary and secondary sources.
3-5 units, Spr (Buc, P; Summit, J; Gelber, H)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ECON 228. Institutions and Organizations in Historical Perspective
2-5 units, Aut (Greif, A)

ENGLISH 201. The Bible and Literature
5 units, Spr (Parker, P)

ENGLISH 271B. The Other Chaucer
4-5 units, Spr (Lerer, S)

ENGLISH 301B. Medieval Devotion
5 units, Aut (Summit, J)

FRENLIT 130. Authorship, Book Culture, and National Identity in Medieval and Renaissance France
4 units, Win (Alduy, C)

GERGEN 50N. Charlemagne's Germany
3-4 units, Aut (Andersson, T)

HISTORY 185G/385G. Coexistence and Conflict: Jews in Premodern Christian and Muslim Lands
4-5 units, Aut (Staff)

HISTORY 212/312. Holy Wars: Medieval Perspectives
4-5 units, Aut (Buc, P)

HISTORY 217B/317B. Land of Three Religions: Medieval Spain
4-5 units, Win (Miller, K)

HISTORY 314. Graduate Core Colloquium in Medieval European History
4-5 units, Win (Miller, K)

HUMNTIES 322. Medieval Seminar—(Same as ENGLISH 370A.)
3-5 units, Win (Steidle, E)

ITALGEN 236E. Purgatorio/Paradiso
4-5 units, Win (Harrison, R; Jacoff, R)

MUSIC 40. Music History to 1600
4 units, Aut (Markham, M)

MUSIC 141/241. Studies in Renaissance Music
3-4 units, Spr (Rodin, J)

MUSIC 221. Topics in the History of Theory
3-5 units, Win (Markham, M)

MUSIC 301A. Analysis of Music: Modal
4 units, Aut (Mahrt, W)

MUSIC 310. Research Seminar in Musicology
3-5 units, Aut (Rodin, J).

PHIL 115/215. Problems in Medieval Philosophy
3-5 units, Spr (Wood, R)

RELIGST 8N. Francis of Assisi: An Exemplary Saint
3 units, Aut (Gelber, H)

RELIGST 201/301. Classical Islamic Law—(Same as LAW 586.)
4 units, Win (Sadeki, B)

RELIGST 222. Literature and Society in Medieval Islam
4 units, Aut (Bashir, S)

RELIGST 223. Studying Islam: History, Methods, Debates
4 units, Win (Bashir, S)

RELIGST 226/326. Philosophy and Kabbalah in Jewish Society During the Middle Ages and Early Modern Period
5 units, Win (Malkiel, D)

RELIGST 227/327. The Qur'ân
5 units, Aut (Sadeki, B)

RELIGST 258. Japanese Buddhist Texts
4 units, Win (Bielefeldt, C)

SPANLIT 157. Introduction to Medieval and Early Modern Iberian Literatures—(Same as PORTLIT 157.)
3-5 units, Aut (Barletta, V)

SPANLIT 216. Other Words: Crypto-Muslims in Early Modern Iberia
3-5 units, Spr (Barletta, V)

SPANLIT 314. Poetic Form and Performance: The Medieval Iberian Lyric
3-5 units, Win (Barletta, V)

MODERN THOUGHT AND LITERATURE

Director: Elisabeth Mudimbe-Boyi
Committee in Charge: Elisabeth Mudimbe-Boyi (Chair), Lanier Anderson, Jean-Pierre Dupuy, Shelley Fisher Fishkin, Gregory Freidin, Hans U. Gumbrecht, Ursula Heise, Sean Hanretta, Andrea A. Lunsford, Liisa Malkki (on leave), Barbaro Martinez-Ruiz, Paula Moya, Helen Stacy
Affiliated Faculty: Lanier Anderson (Philosophy), Shahzad Bashir (Religious Studies), Eamonn Callan (Education), Jean-Pierre Dupuy (French and Italian), Paulla Ebron (Anthropology), Dan Edelstein (French and Italian), Harry Elam (Drama), Michele Elam (English), Amir Eshel (German Studies), Shelley Fisher Fishkin (English), James Ferguson (Anthropology), Gregory Freidin (Slavic Languages and Literatures), Theodore Glasser (Communication), Roland Greene (English, Comparative Literature), Hans U. Gumbrecht (French and Italian, Comparative Literature), Sean Hanretta (History), Ursula Heise (English), Matthew Kohrman (Anthropology), Joshua Landy (French and Italian), Helen Longino (Philosophy), Andrea A. Lunsford (English), Saikat Majumdar (English), Liisa Malkki (Anthropology, on leave), Barbaro Martinez-Ruiz (Art and Art History), Franco Moretti (English, Comparative Literature), Paula Moya (English), Elisabeth Mudimbe-Boyi (French and Italian), David Palumbo-Liu (Comparative Literature), Arnold Rampersad (English), Richard Roberts (History, on leave), Ramón Saldívar (English, Comparative Literature), Priya Satia (History), Debra Satz (Philosophy), Londa Schiebinger (History), Stephen Sohn (English), Helen Stacy (Law), Richard White (History), Bryan Wolf (Art and Art History), Alex Woloch (English), Sylvia Yanagisako (Anthropology), Yvonne Yarbro-Bejarano (Spanish and Portuguese)
Program Offices: Building 240
Mail Code: 94305-2152
Phone: (650) 723-3413
Email: idstudies.moore@stanford.edu
Web Site: http://www.stanford.edu/dept/MTL

Courses given in Modern Thought and Literature have the subject code MTL. For a complete list of subject codes, see Appendix.

The Program in Modern Thought and Literature is administered through the office of Interdisciplinary Studies in Humanities. The program admits students for the Ph.D. and a very limited number for a coterminal B.A./M.A. Program.

UNDERGRADUATE PROGRAMS

Although Modern Thought and Literature has no formal undergraduate degree granting program, undergraduates interested in completing a major in this field may do so through the undergraduate major in Interdisciplinary Studies in Humanities. This program is designed for students with a commitment to interdisciplinary study in the humanities. Students may devise majors that incorporate modern literature (since the 18th century), cultural history, and critical theory. Students may also create majors in other interdisciplinary concentrations. For course guidelines, see the *Handbook for the Major in Interdisciplinary Studies in Humanities.* Students wishing to declare the major in Interdisciplinary Studies in Humanities must apply for admission to the Humanities honors program and for graduation with honors in Humanities.

COTERMINAL BACHELOR'S AND MASTER'S PROGRAM

Each year, one or two undergraduates, who are exceptionally well prepared in literature and at least one foreign language and whose undergraduate course work includes a strong interdisciplinary component, may petition to be admitted to the program for the purpose of completing a coterminal M.A. degree. Admission to this program is granted only on condition that in the course of working on their master's degree they do not apply to enter the Ph.D. program in Modern Thought and Literature. The deadline for application is early February.

To apply, applicants submit:

1. An unofficial grade transcript from Axess.
2. A Petition for Admission to the Coterminal Program from the Registrar's Office.
3. A statement giving the reasons the student wishes to pursue this program and its place in his or her future plans. This statement should pay particular attention to the reasons why the student could not pursue the studies he or she desires in some other way.
4. A plan of study listing, quarter by quarter, each course by name, units, and instructor, to be taken in order to fulfill the requirements for the degree for a total of 45 units, including at least 20 units of advanced work in one literature, and at least 20 units in a coherent interdisciplinary program of courses taken in non-literature departments.
5. A writing sample of critical or analytical prose.
6. Two letters of recommendation from members of the faculty who know the applicant well and who can speak directly to the question of his or her ability to do graduate-level work.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

REQUIREMENTS

The candidate for the M.A. must complete at least 45 units of graduate work, to be divided in the following manner:

1. The introductory seminar, MTL 334A, 5 units, or another graduate-level seminar offered by a member of the committee in charge and approved by the student's graduate program adviser.
2. At least 20 units of advanced course work in literature, to be approved by the director.
3. At least 20 units of course work in a coherent and individually arranged interdisciplinary program, to be approved by the director.

By the end of the course of study, each candidate must also demonstrate a reading knowledge of at least one foreign language.

GRADUATE PROGRAMS

The Ph.D. in Modern Thought and Literature is an interdisciplinary program combining work in modern literary/cultural studies with work in one or more other modern disciplines. It is designed for students who have a strong interest in literature or culture, but whose approach or focus requires an interdisciplinary program, such as students interested in anthropological or philosophical approaches to literature and culture, gender studies, ethnic studies, or in topics such as legal humanities, popular culture, and social or cultural theory.

Modern Thought and Literature is intended for students who plan to teach and write in literature departments or in interdisciplinary programs in the humanities, cultural studies, or humanistic social sciences, or for students intending to formulate cultural policy.

Course work in the program is divided about evenly between advanced courses in literature departments and advanced courses in non-literary departments.

MASTER OF ARTS

The Master of Arts is available to students who are admitted to the doctoral program. Students are not admitted into the program for the purpose of earning a terminal Master of Arts degree. Candidates for the Ph.D. who satisfy the committee of their progress and satisfactorily complete 45 units of course work forming a coherent program of study, may apply for an M.A. in Modern Thought and Literature.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are discussed in the "Graduate Degrees" section of this bulletin.

A candidate for the Ph.D. degree in Modern Thought and Literature must complete three years (nine quarters) of full-time work, or the equivalent, in graduate study beyond the B.A. degree. He or she is expected to complete at least 18 courses of graduate work in addition to the dissertation. Students may spend one year of graduate study abroad.

Requirements for the Ph.D. in Modern Thought and Literature are:

1. A two quarter introductory seminar, MTL 334A,B, The Modern Tradition I and II (5 units each, Autumn, Winter) followed by MTL 300, The Modern Thought and Literature Colloquium (1 unit, Spring).
2. A coherent program of eight courses of advanced work in literary studies to be worked out with the adviser, of which at least six must be regularly scheduled courses in literature. Courses in the teaching of composition (ENGLISH 396, 397), ad hoc graduate seminars (MTL 395), research courses (MTL 398), and thesis registration (MTL 802) may not be counted among these six courses; MTL 396L, 397, 399, 802 may not be counted toward these requirements under any circumstances.
3. Eight courses of advanced work in non-literature departments, the core of which is completion of either a departmental minor or an interdepartmental concentration, typically consisting of six courses. Departmental minors are available from the departments of Anthropology, Art and Art History, Communication, History, Philosophy, Political Science, Religious Studies, and Sociology (see the relevant information in those sections of this bulletin). Approved interdepartmental concentrations have been established in popular culture, ethnic studies, feminist and gender studies, and science and technology studies (specific course requirements are available from the program office). Individually designed concentrations may be approved by petition to the director. In addition to the required six courses in a minor or a concentration, two additional courses from non-literature departments are chosen in consultation with each student's academic adviser. Course restrictions noted above in item 2 also apply.
4. *Qualifying Paper:* this certifies that students are likely to be able to undertake the quality of research, sustained argumentation, and cogent writing demanded in a doctoral dissertation. The qualifying paper must be a substantial revision of a seminar paper written at Stanford during the first year and should embody a substantial amount of independent research, develop an intellectual argument with significant elements of original thinking, and demonstrate the ability to do interdisciplinary work. Each paper is evaluated by two or three readers (designated before the end of the first year of graduate study), one of whom must be a member of the Committee in Charge. Qualifying papers must be submitted to the program office no later than the end of the third week of the fifth quarter of enrollment, normally, winter of the second year.
5. Teaching, an essential part of the program, is normally undertaken in conjunction with the Department of English. Candidates are required to demonstrate competence in teaching.
6. Students must demonstrate, by the end of the third quarter of the first year, a reading knowledge of one foreign language and, by the beginning of the first quarter of the third year, a reading knowledge of one other foreign language. Reading knowledge means the ability to make a genuine scholarly use of the language: that is, to read prose of ordinary difficulty.

   Students may not take the University oral examination before completion of the foreign language requirement.
7. *Candidacy:* at the end of the second year, students apply for candidacy. The following qualifications are required before candidacy can be certified: the earlier submission of a satisfactory qualifying paper; demonstration of a reading knowledge of one foreign language; satisfactory progress in course work; a list of courses applicable to the degree, distinguishing between courses appropriate to the literary component and courses appropriate to the interdisciplinary component; designation of a departmental minor or an interdisciplinary concentration; and the submission of a statement outlining the scope

and coherence of the interdisciplinary component of the program in relation to the literary component and noting the relevance of the course work to that program.

8. *Annual Review:* the program and progress of each student must be approved by the Committee in Charge at the end of each academic year.
9. *University Oral Examination:* this examination, covering the student's areas of concentration, normally is taken in the third year of graduate study. It is a two-hour oral examination administered by four faculty members specializing in the student's areas of concentration, and a chair from another department. The exam is based on a substantial reading list prepared by the student in conjunction with the faculty committee and designed to cover the areas of expertise pertinent to the student's dissertation project.
10. *Colloquium on the Dissertation Proposal:* sometime after the University oral examination, or in conjunction with that examination, the dissertation committee assembles for up to one hour to discuss the dissertation proposal with the student. Prior to this meeting, the student should have consulted each member of the committee to discuss the proposal and compile a bibliography.
11. *Dissertation:* the fourth and fifth years are devoted to the dissertation, which should be a substantial and original contribution acceptable to the Committee on Modern Thought and Literature. The subject is drawn from the literature of specialization and the area of nonliterary studies.

HUMANITIES

The program participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in Modern Thought and Literature and Humanities. For a description of the Humanities program, see the "Interdisciplinary Studies in Humanities" section of this bulletin.

COURSES

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Classics, Comparative Literature, English, French and Italian, German Studies, Slavic Languages and Literatures, and Spanish and Portuguese, and in the Division of Literatures, Cultures, and Languages. For other offerings, students should consult listings in the individual departments of interest. Consent of instructor is often required.

Students in the doctoral program in Modern Thought and Literature are advised to read through the offerings in English as well as offerings of the non-literature departments in which they wish to concentrate: for example, courses dealing with culture listed under Anthropology, courses dealing with film under Communication or Art and Art History, courses in intellectual and cultural history under History. If the area of nonliterary interest is thematic rather than disciplinary, doctoral students should look under program listings such as Feminist Studies, African and African American Studies, or Comparative Studies in Race and Ethnicity.

MTL 300. Modern Thought and Literature Colloquium—Required of first-year graduate students in the program; open to all students in the program and to others by consent of instructor. Weekly meeting of students in the program to discuss interdisciplinary scholarship, writing, and issues pertaining to the requirements for the Ph.D. Presentations by affiliated faculty and by student panels.
1-3 units, Spr (Boyi, E)

MTL 334A. The Modern Tradition I—(Same as LAW 501.) The development over the modern period of ideas about state regulatory power and legal rationality; recent critiques of those ideas. Focus is on justice, legal interpretation, individual agency and moral choice, equality, punishment, legislation, the nation state, and international society. Readings from Sophocles, Grotius, Kant, Rousseau, Hegel, Montesquieu, Wollstonecraft, Austin, Bentham, Marx, Weber, Arendt, Foucault, Said, Spivak, Butler, Habermas, MacKinnon, Rose, and Kennedy.
5 units, Aut (Stacy, H)

MTL 334B. The Modern Tradition II: Self-Deception in Literature, Film, and Philosophy—(Same as FRENGEN 290E.) Possibilities of cross-fertilization between continental philosophy (such as Sartre) and analytic philosophy (such as Donald Davidson) by reference to the topic of self-deception or bad faith. Literary works by Molière, Benjamin Constant, Dostoevsky, Camus, Sartre, Borges, and contemporary writers; films by Hitchcock, Losey, and Bergman.
3-5 units, Win (Dupuy, J)

MTL 390. Qualifying Paper—Preparation and writing of the qualifying paper for the Ph.D. in Modern Thought and Literature.
1-5 units, Aut, Win, Spr, Sum (Staff)

MTL 395. Ad Hoc Graduate Seminar—Graduate students (three or more) who wish to study a subject or an area not covered by regular courses and seminars may plan an informal seminar and approach a member of the faculty to supervise it. May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

MTL 398. Research—Students pursue a special subject of investigation under supervision of a member of the committee or another faculty member. May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

MTL 399. Reading for Orals—Reading in preparation for the University Oral Examination. May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

MUSIC

Emeriti: *(Professors)* John M. Chowning, Albert Cohen, George Houle, William H. Ramsey, Leonard G. Ratner, Leland C. Smith; *(Professors, Performance)* Arthur P. Barnes, Marie Gibson; *(Professor, Research)* Max V. Mathews

Chair: Stephen M. Sano

Professors: Karol Berger, Chris Chafe, Brian Ferneyhough (on leave), Thomas Grey (on leave Autumn), Stephen Hinton, Julius O. Smith (on leave Autumn)

Associate Professors: Mark Applebaum, Jonathan Berger, Heather Hadlock, William P. Mahrt (on leave Winter)

Assistant Professors: Jesse Rodin, Ge Wang (subject to Ph.D.)

Professor (Teaching): George Barth (Piano)

Associate Professor (Teaching): Stephen M. Sano (Director of Choral Studies)

Associate Professor (Performance): Jindong Cai (Director of Orchestral Studies)

Senior Lecturers: Giancarlo Aquilanti (Director of Theory; Wind Ensemble), Stephen Harrison (Violoncello), Thomas Schultz (Piano), Gregory A. Wait (Voice; Director of Vocal Studies), Frederick R. Weldy (Piano)

Lecturers: Kumaran Arul (Piano), Talya Berger (Theory), Fredrick Berry (Jazz Ensemble), Frances Blaisdell (Flute), Mark Brandenburg (Clarinet), Marjorie Chauvel (Harp), Tony Clements (Tuba), Laura Dahl (Resident Collaborative Pianist), Natasha Daniels (Viola), Anthony Doheny (Violin), John Dornenburg (Viola da Gamba), Charles A. Ferguson (Guitar), Debra Fong (Violin), Claire Giovannetti (Voice), Dawn Harms (Violin, Viola), Alexandra Hawley (Flute), Melody Holmes-Schaefle (Flute), Robert Hubbard (Oboe), Graeme Jennings (Violin), Joyce Johnson-Hamilton (Trumpet), Christopher Jones (Composition, Theory), Jay Kadis (Audio Recording), McDowell Kenley (Trombone), Josh Levine (Composition), Mary Linduska (Voice), Fernando Lopez-Lezcano (CCRMA), Murray Low (Jazz Piano), Janet Maestre (Flute), Anthony Martin (Baroque Violin), James Matheson (Oboe), Robert Huw Morgan (University Organist, Organ), Bruce Moyer (Contrabass), Herbert Myers (Early Winds), James Nadel (Jazz), Rufus Olivier (Bassoon), Larry S. Ragent (French Horn), Amy Schneider (Voice), Jerome Simas (Clarinet), Livia Sohn (Violin), Harold Stein (Saxophone), Elaine Thornburgh (Harpsichord), Erik Ulman (Composition, Theory), Linda Uyechi (Taiko), Mark Veregge (Percussion), William L. Verplank (Human Computer Interface Design), Hui (Daisy) You (Guzheng), Timothy Zerlang (University Carillonneur, Piano)

Consulting Professors: Jonathan Abel (CCRMA), David Berners (CCRMA), Marina Bosi-Goldberg (CCRMA), Walter Hewlett (Computer-Assisted Research in the Humanities), Eleanor Selfridge-Field (Computer-Assisted Research in the Humanities), Malcolm Slaney (CCRMA)

Visiting Professors: Thomas Rossing (CCRMA), Izaly Zemtsovsky (Music History)

Artists-in-Residence (St. Lawrence String Quartet): Geoff Nuttall (Violin 1), Scott St. John (Violin 2), Lesley Robertson (Viola), Christopher Costanza (Violincello)

Mellon Fellows: James Kennaway (Music History), Michael Markham (Music History)

Department Offices: Braun Music Center, Room 101
Mail Code: 94305-3076
Phone: (650) 723-3811
Email: musicdept@stanford.edu
Web Site: http://music.stanford.edu/

Courses given in Music have the subject code MUSIC. For a complete list of subject codes, see Appendix.

The Department of Music's aims are to provide specialized training for those who plan careers in music as composers, performers, teachers, and research scholars; and to promote the understanding and enjoyment of music in the University at large through its courses and abundant performance offerings.

Varied opportunities for instrumental and vocal study and performance are available to majors and nonmajors alike. Students wishing to obtain individual instruction, to participate in chamber music, or to play in departmental ensembles should note that auditions are held during registration week in Autumn Quarter. While there may be openings in some private studios and ensembles for qualified students during other quarters, it is to the student's advantage to audition in autumn, as most slots are filled for the entire year.

The department is housed in Braun Music Center, Dinkelspiel Auditorium, and The Knoll, including three concert halls for concert and recital productions, two rehearsal halls, a small chamber hall, and a state-of-the-art, heptagonal listening/research room. Pianos, organs, harpsichords, and a variety of early stringed and wind instruments are available for student use. In addition, advanced students may use fine old stringed instruments and bows from the Harry R. Lange Historical Collection (http://music.stanford.edu/DeptInfo/Langecol.html).

The Music Library (http://www-sul.stanford.edu/depts/music/index.html) contains a comprehensive collection of scores, books, and recordings with an emphasis on Western art music. In addition, the Department of Special Collections holds an invaluable collection of musical manuscripts and first and early editions, and the Archive of Recorded Sound has a superb collection of historical recordings of all types.

The Stanford Center for Computer Research in Music and Acoustics (CCRMA) is a multidisciplinary facility where composers and researchers work together using computer-based technology both as an artistic medium and as a research tool. Areas of ongoing interest at CCRMA include: composition, applications hardware, applications software, synthesis techniques and algorithms, physical modeling, real-time controllers, signal processing, digital recording and editing, psychoacoustics and musical acoustics, music manuscripting by computer, and real-time applications.

The CCRMA community consists of administrative and technical staff, faculty, research associates, graduate research assistants, graduate and undergraduate students, visiting scholars, visiting researchers and composers, and industrial affiliates. Center activities include academic courses, seminars, small interest-group meetings, summer workshops, and colloquia. Concerts of computer music are presented several times each year with an annual outdoor computer-music festival in July.

CCRMA houses studios, computing facilities, and a networked system of software that includes programs and tools for editing, viewing, synthesizing, and analyzing sound. For a detailed and up-to-date description of facilities available, see the CCRMA home page at http://ccrma.stanford.edu/.

The Center for Computer-Assisted Research in the Humanities (CCARH), located in Braun Music Center, conducts research focused on constructing computer databases for music and on creating programs that allow student and staff researchers to access, analyze, print, and electronically perform the music. For more information, see the CCARH home page at http://www.ccarh.org/.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The undergraduate major in Music is built around a series of foundation courses in theory, musicianship, and music history, in addition to performance and the proficiency requirements outlined below. Because of the sequence of courses, it takes more than two years to complete the requirements for the major. Prospective majors are urged to consult the undergraduate student services officer in the department as early as possible in order to plan a program that allows sufficient time for major course work, practice, and University requirements outside the major. Early planning is especially important for students wishing to double-major, for those contemplating overseas study during their undergraduate years, for those wishing to do an in-depth concentration in the Music major, and for those with particular musical talents and interests. All required courses for the B.A. in Music and in the Music, Science, and Technology specialization must be taken for a letter grade. Electives may be taken credit/no credit, but any courses taken towards concentration requirements must also carry a letter grade.

1. Students are required to include the following foundation courses in their programs:
   a) theory: MUSIC 21, 22, 23
   b) history: MUSIC 40, 41, 42, and three from the series 140-148 Writing in the Major (WIM) courses (two of which must be taken as 4-unit WIM courses)
   c) analysis: MUSIC 121 and two from 122A, B, or C
2. Additionally, Music majors must fulfill the following two performance requirements:
   a) instruction in instrumental and/or vocal performance: minimum of five quarters, comprising a minimum of 15 units.
   b) ensemble: five quarters (5 units minimum) of work in one or more of the department's organizations or chamber groups. MUSIC 156, "sic": Improvisation Collective, and MUSIC 157, Mariachi Band, do not satisfy this requirement. MUSIC 181 may count for up to two of the ensemble-unit requirements for the Music major. To fulfill the ensemble requirement, Music majors need to participate at least three quarters in the department's traditional large ensembles (MUSIC 159–167), with the exception of students whose primary instrument is harp, keyboard, or guitar, who need to participate at least one quarter in the ensembles above, but who may fulfill the rest of the requirement with chamber music (171).
3. Majors are required to pass a Piano Proficiency examination as part of the music theory core (MUSIC 21, 22, 23). The examination is given in the first two weeks of MUSIC 21. Students who do not pass the Piano Proficiency examination are required to enroll in MUSIC 12 concurrently with the music theory core until they are able to pass. The examination consists of scales and arpeggios, performance of a simple tune to be set by the examiner, sight reading, and the performance of prepared pieces (consult the department undergraduate adviser for details).
4. Majors must also pass an Ear-Training Proficiency examination, which is one of the requirements to complete MUSIC 23. It may be taken by arrangement, demonstrating a student's ability to hear music accurately and to perform it at sight.

RECOMMENDED SCHEDULE FOR THE MUSIC MAJOR

The following sample schedule shows how a student may include substantial work on a major in Music while also fulfilling the University General Education Requirements during the freshman and sophomore years. The schedule also includes foreign language study, which is strongly recommended for all Music majors and especially for those expecting to continue into graduate work in any area of music.

	Quarter and Units		
FIRST YEAR	*A*	*W*	*S*
PWR as assigned	4		4
MUSIC 19 (if needed), 21, 22	(3)	4	4
Individual Instruction and/or Ensemble	1-4	1-4	1-4
Introduction to the Humanities	4-5	4-5	4-5
Choice of Foreign Language, General Education Requirement, or Stanford Introductory Seminar	3-5	3-5	3-5
SECOND YEAR			
MUSIC 23, 40, 41, 42	8	4	4
Individual Instruction and/or Ensemble	1-4	1-4	1-4
General Education Requirement, or Stanford Introductory Seminar	3-5	3-5	3-5
Elective	(3)	(3)	(3)
THIRD AND FOURTH YEARS			
MUSIC 121 and two from 122A, B, or C	4	4	4
Three from MUSIC 140-148	4	4	4
Elective	(4)	(4)	(4)
Senior Year: Concentration Project (if selected)	(4)		

MUSIC, SCIENCE, AND TECHNOLOGY

The specialization in Music, Science, and Technology is designed for those students with a strong interest in the musical ramifications of rapidly evolving computer technology and digital audio, and in the acoustic and psychoacoustic foundations of music. The program entails a research project under faculty guidance and makes use of the highly multidisciplinary environment at CCRMA. This program can serve as a complementary major to students in the sciences and engineering.

1. Students in the program are required to include the following courses in their studies:
   a) theory: 21, 22, 23, 121, 151 (WIM) (4 units each); 150 (3 units); 220A,B,C (4 units each); 250A (4 units)
   b) history: two from 40, 41, 42
   c) applied: individual studies in performance (6 units) or 192A,B; and Ensemble or 192C (5 units)
   d) research project: 220D (4 units)
2. Students in Music, Science, and Technology must also pass the Piano and Ear-Training Proficiency examinations required of Music majors.

MINORS

Minors in Music and in the Music, Science, and Technology specialization provide the student with a core of essential Music courses in the disciplines that establish both a foundation for informed appreciation of music and a basis for more advanced study, should the student wish to pursue it. Students minoring in Music or in the Music, Science, and Technology specialization must also pass the Piano and Ear-Training Proficiency examinations required of Music majors.

MUSIC	*Units*
MUSIC 21, 22, 23. Elements of Music	12
MUSIC 40, 41, 42. Music-History Survey	12
Choice of one (WIM):	
MUSIC 140-148; 151. Studies in Music History; Psychophysics	4
Two quarters:	
MUSIC 159-171. Ensemble	2
MUSIC 172-177. Individual Instruction	6
Total	36

MUSIC, SCIENCE, AND TECHNOLOGY	
MUSIC 21, 22, 23. Elements of Music	12
MUSIC 150. Musical Acoustics	3
MUSIC 151. Psychophysics and Cognitive Psychology for Musicians (WIM)	4
MUSIC 220A,B. Fundamentals of Computer-Generated Sound	8
MUSIC 192A,B. Theory and Practice of Audio Recording	6
MUSIC 192C. Session Recording (two quarters, 1 or 2 units/qtr.)	3
Total	36

CONCENTRATIONS

Concentrations are offered in performance, conducting, composition, or history and theory. In each concentration, 6 additional course units in the area of concentration beyond the basic requirements for the major are required. In addition, each concentrator registers for an independent project (198, 4 units) in the senior year under faculty supervision, leading to a senior recital, a composition, a conducting project, or a senior research paper. Students wishing to pursue the concentration in performance must demonstrate private-lesson-level proficiency on their instrument. Specific guidelines and information on the concentration tracks are available from the Department of Music office and students are urged to select this option no later than the middle of their junior year in order to complete all of the requirements in a timely manner.

HONORS PROGRAM

Honors in Music is awarded by the faculty to concentrators who have produced an independent project of exceptional quality and meet certain departmental standards in musicianship, scholarship, and academic standing. The conferral of honors is done solely through faculty consultation. Students do not petition for honors.

OVERSEAS STUDIES

Courses in Music are often available at Stanford overseas programs, especially in Berlin, Paris, and Oxford. See the Overseas Studies Program section of this bulletin for this year's listings. Music majors and minors should talk to the Department of Music undergraduate administrator prior to going overseas.

GRADUATE PROGRAMS

University requirements for the M.A., D.M.A., and Ph.D. degrees are described in the "Graduate Degrees" section of this bulletin.

The following statements apply to all the graduate degrees described below, unless otherwise indicated.

Admission—Applicants are required to submit evidence of accomplishment (scores, recordings, and/or research papers, according to the proposed field of concentration) when they complete the application form. Applicants should arrange to take the Graduate Record Examination (GRE) well in advance of the December 11 application deadline. All components of the application are due by December 11. International students whose first language is not English are also required to take the TOEFL exam (with certain exceptions: see http://gradadmissions.stanford.edu/).

Department Examinations—All entering graduate students except those in the M.A./MST program are required to take: (1) a diagnostic examination testing the student in theory (counterpoint, harmony, and analysis) and (for musicologists only) the history of Western art music, and (2) a proficiency examination in sight-singing and piano sight-reading. These exams are given at the beginning of study in the department (usually the week before school begins). Teaching assistant assignments and the funding associated with this portion of a graduate student's financial aid package are determined based upon completion of these exams.

None of Stanford's required undergraduate courses may be credited toward an advanced degree unless specifically required for both degrees. Only work that receives a grade of 'A,' 'B,' or 'Satisfactory' (a passing grade in an instructor-mandated credit/no credit course) in music courses numbered 100 or higher taken as a graduate student is recognized as fulfilling the advanced-degree requirements. Students may need to devote more than the minimum time in residence if preparation for graduate study is inadequate.

MASTER OF ARTS

Residence—A minimum of 45 academic units is required for the master's degree in Music.

MUSIC

Students in the doctoral programs who enter directly from the bachelor's level may, upon completing 45 units and advancing to candidacy, be recommended for the M.A. degree. The Department of Music does not accept students for study only towards the M.A. degree except in the Music, Science, and Technology program, described below.

MUSIC, SCIENCE, AND TECHNOLOGY

This is a one-year program of 45 units focusing on the integration of music perception, music-related signal processing and controllers, and synthesis. The program is designed for students having an undergraduate engineering or science degree, or a degree that includes course work in engineering mathematics. Modifications to the required course work listed below may be proposed on a student's behalf by the student's program adviser.

Required are:

	Units
MUSIC 151. Psychophysics and Cognitive Psychology for Musicians	4
MUSIC 154. Composition and Performance of Instrumental Music with Electronics	3
MUSIC 192A. Foundations of Sound-Recording Technology	3
MUSIC 192B. Advanced Sound-Recording Technology	3
MUSIC 220A. Fundamentals of Computer-Generated Sound	4
MUSIC 220B. Compositional Algorithms, Psychoacoustics, and Spatial Processing	4
MUSIC 220C. Research Seminar in Computer-Generated Music	4
MUSIC 250A. HCI Theory and Practice	4
MUSIC 320. Introduction to Digital Audio Signal Processing	4
MUSIC 420. Signal Processing Models in Musical Acoustics	3
MUSIC 421. Audio Applications of the Fast Fourier Transform	3
Elective	6
Total	45

DOCTORAL PROGRAMS

Residence—The candidate must complete a minimum of 135 academic units (see Residency under the "Graduate Degrees" section of this bulletin). Doctoral candidates working on Ph.D. dissertations or Doctor of Musical Arts (D.M.A.) final projects that require consultation with faculty members continue enrollment in the University under Terminal Graduate Registration (TGR), after they have reached the required 135 academic units and have completed their Special Area examinations.

Foreign Language Requirement—At the time of advancement to candidacy, all D.M.A. students, and Ph.D. students in the Computer-Based Theory and Acoustics program, are required to have demonstrated a reading knowledge of one language other than English and the ability to translate into idiomatic English. Ph.D. students in Musicology are required to demonstrate proficiency in German and a similar competence in a second language, chosen from French, Italian, or Latin (or, on a case-by-case basis, another language, if it has significant bearing on the candidate's field of study).

Qualifying Examination—A written and oral examination for admission to candidacy is given just prior to the fourth quarter of residence for D.M.A. students and Ph.D. students in the Computer-Based Music Theory and Acoustics programs; for Ph.D. students in Musicology, the exams are given just prior to the eighth quarter of residence. This exam tests knowledge of history, theory, repertory, and analysis.

Teaching—All students in the Ph.D. or D.M.A. degree programs, regardless of sources of financial support, are required to complete six quarters of supervised teaching at half time. Music 280 (given in Spring Quarter and taken at the end of the first year) is a required course for Teaching Assistants. Additional quarters of teaching may be required by the department.

Basic Requirements—Doctoral programs in the Department of Music do not require a master's degree as a prerequisite. All students entering directly from the bachelor's degree level are required to take the following course (which is, however, required of all students in musicology, regardless of entering degree level):

	Units
200. Graduate Proseminar	4

All doctoral candidates must take:

301A,B,C. Music Analysis: Modal, Tonal, and Post-Tonal	12

DOCTOR OF MUSICAL ARTS IN COMPOSITION

The Doctor of Musical Arts (D.M.A.) degree in Composition is given breadth through collateral studies in other branches of music and in relevant studies outside music as seems desirable.

Examinations—A written Special Area examination in the candidate's field of concentration, including a final project proposal, is required to be completed during the fourth year of study, no later than the last day of classes in Autumn Quarter of that year. A public lecture/demonstration is also required during the last quarter of residence. It should be one hour in length, treating aspects of the final project.

Requirements—Besides those requirements listed above, candidates are expected to produce a number of works demonstrating their ability to compose in a variety of forms and for the common media: vocal, instrumental, and electronic music. If possible, the works submitted are presented in public performance prepared by the composer. Annual progress is reviewed by the composition faculty. The final project in composition is an extended work for instruments, voices, electronic media, or a combination of these. MUSIC 323, Doctoral Seminar in Composition (16 units), is a required course.

DOCTOR OF PHILOSOPHY

The Ph.D. in Music can be pursued in two concentrations: Musicology or Computer-Based Music Theory and Acoustics.

Examinations—

1. *Special Areas:* a written and oral examination testing the student's knowledge of music and research in the student's field of concentration is completed during the fourth year of study, no later than the last day of classes in Autumn Quarter of that year. This includes an oral defense of the dissertation proposal. The examining committee comprises prospective readers of the dissertation.
2. *Ph.D. Orals:* the University oral examination, taken once the dissertation is substantially underway, is an oral presentation and defense of dissertation research methods and results.

Requirements—Besides those requirements listed above, other requirements by concentration are:

MUSICOLOGY	*Units*
221. Topics in the History of Theory	3-5
300A,B. Seminar in Notation	8
310. Research Seminars in Musicology*	24-40
312A,B. Aesthetics and Criticism of Music	8

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* The requirement is for eight seminars of 3-5 units each. Students may petition to take up to two graduate seminars in other departments, in consultation with their adviser.

COMPUTER-BASED MUSIC THEORY AND ACOUSTICS	
220A,B,C. Computer-Generated Music Seminars	12
220D. Research in Computer Music	12
320. Introduction to Digital Audio Signal Processing	4

JOINT PH.D. IN MUSIC AND HUMANITIES

The department participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in Music and Humanities. For a description of the program, see the "Interdisciplinary Studies in Humanities" section of this bulletin.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University Activity Unit limitations (8 units maximum).

Many Music courses have web pages linked to the Music home page. Courses with web sites at press time are noted in their entries below.

GENERAL

MUSIC 2C. Men, Women, and Opera—An introduction to opera through the lenses of gender and sexuality. The doomed heroines of Italian tragic operas by Verdi and Puccini; the battle of the sexes in Mozart's comedies *The Marriage of Figaro* and *Don Giovanni;* and ambiguous representations of masculinity in serious opera from Handel to Rossini, where heroes were played by high-voiced men and crossdressing women. Literary and historical background; feminist and queer critiques of opera's misogynist plots and stereotypes. Students attend an opera performance. GER:DB-Hum, EC-Gender

3 units, not given this year

MUSIC 3G. Music and Culture in Fin de Siècle Vienna, 1880-1914—Music, literature, art, and cultural politics. The relationship between Viennese modernism and its political background including the slow disintegration of the state, the rise of anti-Semitism, and the idea of degeneration. Sources include musicians such as Mahler, Schoenberg, and Strauss, and their contemporaries such as Freud, Klimt, Kokoschka, and Hofmannsthal.

3 units, Aut (Kennaway, J)

MUSIC 8A. Rock, Sex, and Rebellion—Development of critical listening skills and musical parameters through genres in the history of rock music. Focus is on competing aesthetic tendencies and subcultural forces that shaped the music. Rock's significance in American culture, and the minority communities that have enriched rock's legacy as an expressively diverse form. Lectures, readings, listening, and video screenings. GER:DB-Hum, EC-AmerCul

3 units, not given this year

MUSIC 9A. Tchaikovsky, Stravinsky, Shostakovich, and Beyond: A History of Russian Music—Introduction to Russian culture through classical music and folklore, including sacred, secular, oral, and written music. The variety of Russian sung folklore in its traditional context, and how it is reflected in the music of Russian composers including Glinka, Mussorgsky, Rimsky-Korsakov, Tchaikovsky, Skryabin, Stravinsky, Prokofiev, and Shostakovich. Listening assignments include fieldwork data and video recordings. GER:DB-Hum, EC-GlobalCom

3 units, Win (Zemtsovsky, I)

MUSIC 11N-34N. Stanford Introductory Seminars

MUSIC 11N. A View from the Podium: The Art of Conducting—Stanford Introductory Seminar. Preference to freshmen. How a conductor interprets music, realizes a personal vision through the rehearsal process, and communicates with orchestra and audience. Conducting as based on human communication skills. How to apply these lessons to other fields of endeavor. GER:DB-Hum

3 units, Aut (Cai, J)

MUSIC 11Q. The Allure of Chamber Music—Stanford Introductory Seminar. Preference to sophomores. Why is it that an intimate setting for a small group of independent instruments has engendered some of the most expressive works in the history of music? Class attends chamber music concerts, seeking to comprehend the setting in projecting that meaning. Preparation for each concert includes reading, listening, and discussion of the music to be performed; performer interviews when possible. Written reports on the concerts attended. GER:DB-Hum

3 units, Win (Cohen, A)

MUSIC 13Q. Classical Music and Politics: Western Music in Modern China—Stanford Introductory Seminar. Preference to sophomores. Social history, cultural studies, China studies, international relations, and music. From the Italian Jesuit, Matteo Ricci who presented a clavichord to the Chinese emperor to the emergence of a modern generation of Chinese musicians. GER:DB-Hum, EC-GlobalCom

3 units, Spr (Cai, J)

MUSIC 14N. Women Making Music—Stanford Introductory Seminar. Preference to freshmen. How queer female performers and fans negotiate issues of personal identity, subjectivity, visibility, and politics through composition, musical style, subcultures, and performance spaces. GER:DB-Hum, EC-Gender

3 units, Spr (Hadlock, H)

MUSIC 15N. The Role of Technology in the Arts—Stanford Introductory Seminar. Preference to freshmen. The aesthetic, sociological, and historical aspects of technology as it relates to the arts. Focus is on cinema, the history of recording, and electronic and computer music. Field trips to galleries, shows, museums. Students develop and complete a project on an aspect of art technology. Examples of past projects include historical, technical, and sociological aspects of hip-hop, rave, interactive art installations, computer games, and performance art. GER:DB-Hum

3 units, Spr (Berger, J)

MUSIC 16N. Music, Myth, and Modernity: Wagner's Ring Cycle and Tolkien's *Lord of the Rings*—Stanford Introductory Seminar. Preference to freshmen. Roots of Wagner's operatic cycle and Tolkien's epic trilogy in a common core of Norse, Germanic, and Anglo-Saxon mythology. The role of musical motive and characterization in Wagner's music dramas and the film version of Tolkien's trilogy. Music as a key element in the psychological, political, and cultural revision of ancient myth in modern opera and film. GER:DB-Hum, EC-GlobalCom

3 units, Spr (Grey, T)

MUSIC 17N. The Operas of Mozart—Stanford Introductory Seminar. Preference to freshmen. Four of Mozart's mature operas, the earliest works in the operatic repertoire never to go out of fashion. What accounts for this extraordinary staying power? Focus on the history of their composition, performance, and reception, and their changing significance from Mozart's time to the present. GER:DB-Hum

3 units, Win (Berger, K)

MUSIC 17Q. Perspectives in North American Taiko—Stanford Introductory Seminar. Preference to sophomores. Taiko, or Japanese drum, is a newcomer to the American music scene. Emergence of the first N. American taiko groups coincided with increased Japanese American activism, and to some it is symbolic of Japanese American identity. N. American taiko is associated with Japanese American Buddhism. Musical, cultural, historical, and political perspectives of taiko. Hands-on drumming. Japanese music and Japanese American history, and relations among performance, cultural expression, community, and identity. GER:DB-Hum, EC-AmerCul

4 units, Spr (Sano, S)

MUSIC 34N. The Work of Art as Noun and Verb—Stanford Introductory Seminar. Preference to freshmen. The nature of aesthetic experience for audience and artist across varied media. Luminous art works of the past (the work of art as noun) underscore major paradigm shifts within the history of each medium. Students create original works of art (the work of art as verb) through exercises including musical composition, choreography, poetry, visual art, and photography. Readings, guest lectures, field trips, class dinner, and student presentations. GER:DB-Hum

4 units, Spr (Applebaum, M)

MUSIC 18A. Jazz History: Ragtime to Bebop, 1900-1940—From the beginning of jazz to the war years. GER:DB-Hum, EC-AmerCul

3 units, Win (Berry, F)

MUSIC 18B. Jazz History: Bebop to Present, 1940-Present—Modern jazz styles from Bebop to the current scene. Emphasis is on the significant artists of each style. GER:DB-Hum, EC-AmerCul

3 units, Spr (Berry, F)

MUSIC 20A. Jazz Theory—Introduces the language and sounds of jazz through listening, analysis, and compositional exercises. Students apply the fundamentals of music theory to the study of jazz. Prerequisite: 19 or consent of instructor. GER:DB-Hum

3 units, Aut (Nadel, J)

MUSIC 20B. Advanced Jazz Theory—Approaches to improvisation through listening and transcribing, and developing familiarity with important contributors to this music. Topics: scale theory, altered dominants, and substitute harmony. Prerequisite: 20A or consent of instructor. GER:DB-Hum

3 units, alternate years, not given this year

MUSIC 20C. Jazz Arranging and Composition—Jazz arranging and composition for small ensembles. Foundation for writing for big band. Prerequisite: 20A or consent of instructor.

3 units, Win (Nadel, J)

MUSIC 127. Instrumentation and Orchestration—Individual instruments, instrumental groups within the orchestra, and combinations of groups. Arrangements from piano to orchestral music. Score analysis with respect to orchestration. Practical exercises using chamber ensembles and school orchestra. Prerequisite: 23. GER:DB-Hum

3 units, Aut (Aquilanti, G)

FOUNDATION FOR B.A. MAJOR

Students with training in theory should take the placement exam given at the beginning of each quarter for admission to more advanced courses. Students must not assume that they may begin study with MUSIC 21.

MUSIC 19. Introduction to Music Theory—For non-music majors and Music majors or minors unable to pass the proficiency test for entry to MUSIC 21. The fundamentals of music theory and notation, basic sight reading, sight singing, ear training, keyboard harmony; melodic, rhythmic, and harmonic dictation. Skill oriented, using piano and voice as basic tools to develop listening and reading skills. GER:DB-Hum

3 units, Aut, Spr (Berger, T)

MUSIC 21,22,23. Elements of Music—Melody, harmony, counterpoint, and rhythm are studied through analysis, composition, and exercises in practical musicianship. Emphasis is on tonal theory with components in melody, counterpoint, and harmony. Analytical and practical musicianship skills are taught, with analysis and compositional projects in historical styles. Students with previous training in theory should take the placement exam given at the beginning of each quarter for admission to more advanced courses. Students must not assume that they may begin study with MUSIC 21.

MUSIC 21. Elements of Music I—Preference to majors. Introduction to tonal theory. Practice and analysis. Diatonic harmony focusing on melodic and harmonic organization, functional relationships, voice-leading, and tonal structures. Ear-training and keyboard-harmony skills; analytical methods and listening strategies. Concurrent enrollment in MUSIC 12 (Piano) or demonstration of keyboard skills sufficient to pass the Piano Proficiency Exam within the first two weeks of the term is required. Enrollment limited to 40. Prerequisite: pass a basic musical skills proficiency examination on first day of class; students who do not pass may take MUSIC 19. GER:DB-Hum

4 units, Aut (Aquilanti, G), Win (Berger, T)

MUSIC 22. Elements of Music II—Preference to majors. Introduction to chromatic harmony focusing on secondary functions, modulations, harmonic sequences, mode mixture, and the Neapolitan, and augmented sixth chords. Analysis of musical forms and harmonizations complemented by harmonic and melodic dictation, sight singing, and other practical skills. Prerequisites: 21 or consent of instructor; demonstration of keyboard skills sufficient to pass the Piano Proficiency Exam within the first two weeks of the term is required, or concurrent enrollment in MUSIC 12. GER:DB-Hum

4 units, Win (Aquilanti, G), Spr (Berger, T)

MUSIC 23. Elements of Music III—Preference to majors. Continuation of chromatic harmony, complex forms, and introduction to early 20th-century techniques. Satisfactory passage of ear-training proficiency exam, part of the course's final, is a requirement for course completion and for continuation in the major sequence. Prerequisites: 22 or consent of instructor; demonstration of keyboard skills sufficient to pass the Piano Proficiency Exam within the first two weeks of the term is required, or concurrent enrollment in MUSIC 12. GER:DB-Hum

4 units, Aut (Ulman, E), Spr (Jones, C)

MUSIC 40, 41, 42. Music History—The history of Western art music from Gregorian chant to the present, stressing major styles and genres in their intellectual and institutional settings. Pre- or corequisite: 23. GER:DB-Hum

MUSIC 40. Music History to 1600
4 units, Aut (Markham, M)

MUSIC 41. Music History 1600-1830
4 units, Win (Hadlock, H)

MUSIC 42. Music History Since 1830
4 units, Spr (Grey, T)

MUSIC 121. Analysis of Tonal Music—Complete movements, or entire shorter works of the 18th and 19th centuries, are analyzed in a variety of theoretical approaches. Prerequisites: 23 or consent of instructor; and pass the ear-training and piano-proficiency examinations. GER:DB-Hum
4 units, Win (Barth, G)

MUSIC 122A. Eighteenth-Century Counterpoint—Analysis and composition of two- and three-part inventions and three- and four-voice fugues. Use of keyboard, ear training, and sight singing. Prerequisites: 23 or consent of instructor; and pass the ear-training and piano-proficiency examinations. GER:DB-Hum
4 units, Win (Rodin, J)

MUSIC 122B. Harmonic Materials of 19th Century—Analysis of 19th-century music, with compositional exercises based on 19th-century models. Prerequisites: 23 or consent of instructor; and pass the ear-training and piano-proficiency examinations. GER:DB-Hum
4 units, Spr (Jones, C)

MUSIC 122C. Introduction to 20th-Century Composition—Contemporary works, with emphasis on music since 1945. Projects in free composition based on 20th-century models. Prerequisites: 23 or consent of instructor; and pass the ear-training and piano-proficiency examinations. GER:DB-Hum
4 units, Aut (Applebaum, M)

COMPOSITION

MUSIC 123. Undergraduate Seminar in Composition—Current trends in composition. May be repeated for credit. Prerequisites: Music major; 23 or consent of instructor.
3 units, Win (Applebaum, M)

MUSIC 125. Individual Undergraduate Projects in Composition—May be repeated for credit. Prerequisites: music major, and one quarter of 123.
1-3 units, Aut, Win, Spr (Staff)

MUSIC 323. Doctoral Seminar in Composition—Illustrated discussions of compositional issues and techniques. Students present their own work to the class, and individually to the instructor.
4 units, Aut (Applebaum, M), Win (Ulman, E)

MUSIC 325. Individual Graduate Projects in Composition—May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

HISTORY AND LITERATURE

MUSIC 140-145. Seminars in Music History—Specialized topics in music history are each offered at least once within any two-year period. Topics vary each year. May be repeated for credit. Music majors may repeat the same seminar in music history only once for credit towards the major and must turn in different papers the second time. Pre- or corequisite: 23. GER:DB-Hum, WIM

MUSIC 140/240. Studies in Medieval Music
3-4 units, alternate years, not given this year

MUSIC 141/241. Studies in Renaissance Music
3-4 units, Spr (Rodin, J)

MUSIC 142/242. Studies in Baroque Music
3-4 units, alternate years, not given this year

MUSIC 143/243. Studies in Classic Music
3-4 units, alternate years, not given this year

MUSIC 144/244. Studies in Romantic Music
3-4 units, Win (Berger, K)

MUSIC 145/245. Studies in Modern Music
3-4 units, Aut (Barth, G), not given next year

MUSIC 221. Topics in the History of Theory—The intersection of music theory and compositional practice in different eras of Western music history. Primary sources in music theory and issues such as notation, rhythm, mode, dissonance treatment, counterpoint, tonality, form, rhetoric, affect and imitation, expression, linear analysis, 12-tone and set theory, in light of relevant repertoire and modern scholarship.
3-5 units, Win (Markham, M)

MUSIC 310. Research Seminar in Musicology—For graduate students. Topics vary each quarter. May be repeated for credit.
3-5 units, Aut (Rodin, J), Win (Hadlock, H), Spr (Berger, K)

MUSIC 312A,B. Aesthetics and Criticism of Music, Ancients and Moderns: Plato to Nietzsche—For graduate students. Primary texts focusing on the nature, purposes, and uses of music and other arts.
4 units, alternate years, not given this year

MUSIC 324H. Enlightenment Seminar—(Same as HUMNTIES 324.) How 18-century opera and literature reflect changing conceptions of the self, reason, and emotion; the proper basis of social and political authority; natural and supernatural justice; women's nature and status. Texts include: Gluck's *Iphigenia in Tauris;* Mozart's *The Marriage of Figaro* and *Don Giovanni; Manon Lescaut;* and *Les liaisons dangereuses*.
3-5 units, Aut (Hadlock, H)

COMPUTER MUSIC AND APPLICATIONS

MUSIC 120. Auditory Remapping of Bioinformatics—Representation of data related to bioinformatics and medical imaging. Physiological and perceptual perspectives. Representations of complexity in sound and types of auditory display applied to representation of data sets. Term project involving developing tools for sonification and/or applying these tools to a representation problem. Recommended: basic knowledge and interest in music, computer programming, or one of the biological sciences.
1-3 units, not given this year

MUSIC 150. Musical Acoustics—The physics of vibrating systems, waves, and wave motion. Time- and frequency-domain analysis of sound. Room acoustics, reverberation, and spatialization. The acoustics of musical instruments: voice, strings, and winds. Emphasis is on the practical aspects of acoustics in making music. Hands-on and computer-based lab. See http://ccrma.stanford.edu/courses/150/. Prerequisites: music performance/composition experience, basic algebra, calculus, and physics. GER:DB-EngrAppSci
3 units, Win (Rossing, T)

MUSIC 151. Psychophysics and Cognitive Psychology for Musicians—Concepts and experiments relevant to the use of sound, especially synthesized, in music. Listening to sound examples. Emphasis is on salience and the importance of various auditory phenomena in music. See http://ccrma.stanford.edu/. Prerequisite: basic knowledge of music. GER:DB-Hum, WIM
4 units, Spr (Berger, J)

MUSIC 154. Composition and Performance of Instrumental Music with Electronics—Aesthetic and analytical issues of mixed instrumental and electronic works. Focus is on one or a few works leading to a public performance at the end of the quarter. Prerequisite: experience in analysis of contemporary music and in electronic music.
1-3 units, Spr (Wang, G)

MUSIC 192. Theory and Practice of Audio Recording

MUSIC 192A. Foundations of Sound-Recording Technology—For upper division undergraduates and graduate students; preference given to Music majors with MST specialization. Topics: elementary electronics; the physics of sound transduction and microphone operation, selection, and placement; mixing consoles; connectors and device interconnection; grounding and shielding; principles of analog magnetic recording; operation maintenance of recording equipment; and principles of recording engineering. Enrollment limited. Prerequisites: 151; algebra, physics basics, and consent of instructor. GER:DB-EngrAppSci

3 units, Aut (Kadis, J)

MUSIC 192B. Advanced Sound Recording Technology—Topics: noise reduction techniques; dynamics and time-delay audio effects; the principles of digital audio; disk- and tape-based digital recorders; digital audio workstations and editing; advanced multitrack techniques; SMPTE and MIDI time code and device synchronization; MIDI sequencing and synchronization. See http://ccrma.stanford.edu/courses/. Prerequisite: 192A. GER:DB-EngrAppSci

3 units, Win (Kadis, J)

MUSIC 192C. Session Recording—Independent engineering of recording sessions. May be repeated for credit. Prerequisites: 192A,B.

1-2 units, Aut, Win, Spr (Kadis, J)

MUSIC 220A. Fundamentals of Computer-Generated Sound—Techniques for digital sound synthesis, effects, and reverberation. Topics: summary of digital synthesis techniques (additive, subtractive, nonlinear, wavetable, spectral-modeling, and physical-modeling); digital effects algorithms (phasing, flanging, chorus, pitch-shifting, and vocoding); and techniques for digital reverberation. Majors (undergraduate or graduate) must take for 4 units. See http://ccrma.stanford.edu/.

2-4 units, Aut (Chafe, C; Wang, G)

MUSIC 220B. Compositional Algorithms, Psychoacoustics, and Spatial Processing—The use of high-level programming language as a compositional aid in creating musical structures. Advanced study of sound synthesis techniques. Simulation of a reverberant space and control of the position of sound within the space. See http://ccrma.stanford.edu/. Prerequisite: 220A.

2-4 units, Win (Wang, G)

MUSIC 220C. Research Seminar in Computer-Generated Music—Individual projects in composition, psychoacoustics, or signal processing. See http://ccrma.stanford.edu. May be repeated for credit. Prerequisite: 220B.

2-4 units, Spr (Chafe, C)

MUSIC 220D. Research in Computer-Generated Music—Independent research projects in composition, psychoacoustics, or signal processing. See http://ccrma.stanford.edu/. May be repeated for credit. Prerequisite: 220C.

1-10 units, Aut, Win, Spr, Sum (Staff)

MUSIC 250A. HCI Theory and Practice—HCI issues as they relate to music applications in composition and performance. Project-oriented, examining issues from the technical and theoretical perspectives of computer science, haptics, and music theory. See http://ccrma.stanford.edu/.

3-4 units, Aut (Gurevich, M), Win (Staff)

MUSIC 253. Musical Information: An Introduction—The kinds of musical information used in sound, graphical, and analytical applications. Emphasis is on independent concepts and principles in music representation and research objectives (repertory analysis, performance analysis, theoretical models, similarity, and stylistic simulation). Examples from Western art music. Prerequisites: one year of music theory or equivalent; methods courses in fields such as musical analysis, symbolic systems, information processing, sound engineering, or intellectual property issues.

1-4 units, Win (Selfridge-Field, E)

MUSIC 254. Applications of Musical Information: Query, Analysis, and Style Simulation—Participants explore the issues introduced in 253 in greater depth and take initiative for research projects related to a theoretical or methodological issue, a software project, or a significant analytical result. Prerequisite: 253 or consent of instructor.

1-4 units, Spr (Selfridge-Field, E)

MUSIC 318. Advanced Acoustics—Current topics. May be repeated for credit.

1-5 units, Win (Rossing, T)

MUSIC 319. Research Seminar on Computational Models of Sound Perception—All aspects of auditory perception, often with emphasis on computational models. Topics: music perception, signal processing, auditory models, pitch perception, speech, binaural hearing, auditory scene analysis, basic psychoacoustics, and neurophysiology. See http://ccrma.stanford.edu/courses/.

1-3 units, Aut, Win, Spr (Slaney, M)

MUSIC 320. Introduction to Digital Audio Signal Processing—Digital signal processing for music and audio research. Topics: complex numbers, sinusoids, spectrum representation, sampling and aliasing, digital filters, frequency response, z transforms, transfer-function analysis, and associated Matlab software. See http://ccrma.stanford.edu/courses/320/.

3-4 units, Aut (Abel, J; Berners, D)

MUSIC 420. Signal Processing Models in Musical Acoustics—Computational methods in musical sound synthesis and digital audio effects based on acoustic physical models. Topics: acoustic simulation with delay lines, digital filters, and nonlinear elements; comb filters; allpass filters; artificial reverberation; delay-line interpolation and sampling-rate conversion; phasing, flanging, and chorus effects; efficient computational models of strings, woodwinds, brasses, and other musical instruments. See http://ccrma.stanford.edu/courses/420/. Prerequisites: 320 or equivalent; PHYSICS 21 or equivalent course applying Newton's laws of motion; and CS 106B or equivalent programming in C and C++.

3-4 units, Win (Smith, J)

MUSIC 421. Audio Applications of the Fast Fourier Transform (FFT)—Spectrum analysis and signal processing using the FFT with emphasis on audio applications. Topics: Fourier theorems; FFT windows; spectrum analysis; spectrograms; sinusoidal modeling; spectral modeling synthesis; FFT convolution; FIR filter design and system identification; overlap-add and filter-bank-summation methods for short-time Fourier analysis, modification, and resynthesis. See http://ccrma.stanford.edu/courses/421/. Prerequisites: 420 or consent of instructor.

3-4 units, Spr (Smith, J)

MUSIC 422. Perceptual Audio Coding—History and basic principles: development of psychoacoustics-based data-compression techniques; perceptual-audio-coder applications (radio, television, film, multimedia/internet audio, DVD, EMD). In-class demonstrations: state-of-the-art audio coder implementations (such as AC-3, MPEG) at varying data rates; programming simple coders. Topics: audio signals representation; quantization; time to frequency mapping; introduction to psychoacoustics; bit allocation and basic building blocks of an audio codec; perceptual audio codecs evaluation; overview of MPEG-1, 2, 4 audio coding and other coding standards (such as AC-3). Prerequisites: knowledge of digital audio principles, familiarity with C programming. Recommended: 320, EE 261. See http://ccrma.stanford.edu/.

3 units, Win (Bosi-Goldberg, M)

MUSIC 423. Signal Processing Research—Graduate research seminar. Problems in music and/or audio signal processing. Presentation of research-in-progress by graduate students, visiting scholars, and CCRMA faculty. See http://ccrma.stanford.edu/courses/423/.

1-4 units, Win, Spr (Smith, J)

MUSIC 424. Signal Processing Techniques for Digital Audio Effects—Techniques for dynamic range compression, reverberation, equalization and filtering, panning and spatialization, digital emulation of analog processors, and implementation of time-varying effects. Single-band and multiband compressors, limiters, noise gates, de-essers, convolutional reverberators, parametric and linear-phase equalizers, wah-wah and envelope-following filters, and the Leslie. Students develop effects algorithms of their own design in labs. Prerequisites: digital signal processing, sampling theorem, digital filtering, and the Fourier transform at the level of 320 or EE 261; Matlab and modest C programming experience. Recommended: 420 or EE 264; audio effects in mixing and mastering at the level of 192.

3-4 units, Spr (Berners, D; Abel, J)

PERFORMANCE

GROUP INSTRUCTION

Note—Special fee of $100 per quarter for 5G, 12A, B, C (non-majors); 65A, B; 72, 73, 74, 75, 76, 77.

MUSIC 5G. Introduction to Guzheng—Introduction to Chinese music through learning how to play guzheng, a 21-stringed traditional Chinese instrument. The cultural, social, and historical significance of guzheng. 15 guzheng techniques, how to read Chinese music and guzheng notation, and two simple classic guzheng pieces. (AU)
1 unit, Aut, Win, Spr (You, H)

MUSIC 12A,B,C. Introductory Piano Class—(A=level 1; B=level 2; C=level 3)
1 unit, Aut, Win, Spr, Sum (Zerlang, T)

MUSIC 65A,B. Voice Class I,II—Group (7 students to a section) beginning voice for the non-major (A=level 1; B=level 2). May be repeated for credit.
1 unit, Aut, Win, Spr (Giovannetti, C), Sum (Linduska, M)

MUSIC 65C. Voice Class (Majors and Ensemble Members)—For Music majors and non-majors who are members of departmental choral ensembles. May be repeated for credit.
1 unit, Aut, Win, Spr (Wait, G)

MUSIC 72-77. Small-Group, Intermediate-Level Instruction—Minimum enrollment required. May be repeated for credit.

MUSIC 72A. Intermediate Piano Class—For intermediate students. Prerequisites: 12C or equivalent, audition.
1 unit, Aut, Win, Spr, Sum (Zerlang, T)

MUSIC 72B. Organ Class—For beginning organ students who have keyboard skills.
1 unit, Aut, Win, Spr (Morgan, R)

MUSIC 72C. Harpsichord Class—For beginning harpsichord students who have keyboard skills.
1 unit, Aut, Win, Spr (Thornburgh, E)

MUSIC 72D. Jazz Piano Class—By invitation only; priority to majors and jazz-ensemble participants.
1 unit, Aut, Win, Spr (Low, M)

MUSIC 73. Intermediate Voice Class—For intermediate students. Admission by audition.
1 unit, Aut, Win, Spr (Giovannetti, C)

MUSIC 74C. Classical Guitar Class
1 unit, Aut, Win, Spr (Ferguson, C)

MUSIC 74D. Harp Class
1 unit, Aut, Win, Spr (Chauvel, M)

MUSIC 75B. Renaissance Wind Instruments Class—May be repeated for credit.
1 unit, Aut, Win, Spr (Myers, H)

MUSIC 76. Brass Instruments Class
1 unit, Aut, Win, Spr (Kenley, M)

MUSIC 77. Percussion Class
1 unit, Aut, Win, Spr (Veregge, M)

INDIVIDUAL INSTRUCTION

MUSIC 172/272-177/277. Individual Vocal and Instrumental Instruction—270-level courses are for advanced students. Weekly lessons throughout the academic quarter. Special fee of $200 per quarter for majors and $400 for non-majors (fees remain the same for 1, 2, or 3 units). Prospective students must demonstrate, by audition with the appropriate teacher, a minimum proficiency on instrument. Minimum proficiency requirements for each instrument are posted on the bulletin board outside Braun 102 and at http://music.stanford.edu/Academics/Auditions.html. May be repeated for credit.

MUSIC 172/272. Keyboard Instruments

MUSIC 172A/272A. Piano—Private lessons and group master class weekly.
1-3 units, Aut, Win, Spr (Barth, G; Dahl, L; Schultz, T; Weldy, F; Arul, K)

MUSIC 172B/272B. Organ
1-3 units, Aut, Win, Spr (Morgan, R)

MUSIC 172C/272C. Harpsichord
1-3 units, Aut, Win, Spr (Thornburgh, E)

MUSIC 172D/272D. Jazz Piano—By invitation only; priority to majors and jazz-ensemble participants.
1-3 units, Aut, Win, Spr (Low, M)

MUSIC 172E/272E. Fortepiano
1-3 units, Aut, Win, Spr (Barth, G)

MUSIC 172F/272F. Carillon—May be repeated for credit.
1-3 units, Aut, Win, Spr (Zerlang, T)

MUSIC 173/273. Voice
1-3 units, Aut, Win, Spr (Giovannetti, C; Wait, G; Schneider, A)

MUSIC 174/274. Stringed Instruments

MUSIC 174A/274A. Violin
1-3 units, Aut, Win, Spr (Jennings, G; Harms, D; Nuttall, G; St. John, S; Fong, D; Sohn, L; Doheny, A)

MUSIC 174B/274B. Viola
1-3 units, Aut, Win, Spr (Daniels, N; Robertson, L; Harms, D)

MUSIC 174C/274C. Violoncello
1-3 units, Aut, Win, Spr (Harrison, S; Costanza, C)

MUSIC 174D/274D. Contrabass
1-3 units, Aut, Win, Spr (Moyer, B)

MUSIC 174E/274E. Viola Da Gamba
1-3 units, Aut, Win, Spr (Dornenburg, J)

MUSIC 174F/274F. Classical Guitar
1-3 units, Aut, Win, Spr (Ferguson, C)

MUSIC 174G/274G. Harp
1-3 units, Aut, Win, Spr (Chauvel, M)

MUSIC 174H/274H. Baroque Violin
1-3 units, Aut, Win, Spr (Martin, A)

MUSIC 174I/274I. Early Plucked Strings
1-3 units, Aut, Win, Spr (Staff)

MUSIC 175/275. Woodwind Instruments

MUSIC 175A/275A. Flute
1-3 units, Aut, Win, Spr (Blaisdell, F; Hawley, A; Holmes-Schaefle, M; Maestre, J)

MUSIC 175B/275B. Oboe
1-3 units, Aut (Hubbard, R), Win, Spr (Matheson, J)

MUSIC 175C/275C. Clarinet
1-3 units, Aut, Win, Spr (Brandenburg, M; Simas, J)

MUSIC 175D/275D. Bassoon
1-3 units, Aut, Win, Spr (Olivier, R)

MUSIC 175E/275E. Recorder/Renaissance Wind Instruments
1-3 units, Aut, Win, Spr (Myers, H)

MUSIC 175F/275F. Saxophone
1-3 units, Aut, Win, Spr (Stein, H; Henderson, D)

MUSIC 175G/275G. Baroque Flute
1-3 units, Aut, Win, Spr (Staff)

MUSIC 176/276. Brass Instruments

MUSIC 176A/276A. French Horn
1-3 units, Aut, Win, Spr (Ragent, L)

MUSIC 176B/276B. Trumpet
1-3 units, Aut, Win, Spr (Johnson-Hamilton, J)

MUSIC 176C/276C. Trombone
1-3 units, Aut, Win, Spr (Kenley, M)

MUSIC 176D/276D. Tuba
1-3 units, Aut, Win, Spr (Clements, A)

MUSIC 177/277. Percussion
1-3 units, Aut, Win, Spr (Veregge, M)

PERFORMANCE PRACTICES

MUSIC 126. Introduction to Thoroughbass—The development of continuo techniques and skills for figured-bass realization. Performance and analysis of selected repertoire, using thoroughbass principles and exercises based on historical theoretical treatises. Prerequisite: 21.
1-3 units, Win (Berger, T)

MUSIC 130. Elementary Conducting

MUSIC 130A. Introduction to Conducting—Baton techniques and rehearsal procedures. The development of coordination of the members of the body involved in conducting; fluency in beat patterns and meters; dynamics, tempi, cueing, and use of the left hand in conducting. Prerequisites: 121 and diagnostic musicianship exam given first day of class; preference to students who have completed 122B.
3 units, alternate years, not given this year

MUSIC 130B. Elementary Orchestral Conducting—Prerequisites: 127 or previous orchestral performance experience, 130A.
3 units, alternate years, not given this year

MUSIC 130C. Elementary Choral Conducting—Techniques specific to the conducting of choral ensembles: warm-ups, breathing, balance, blend, choral tone, isolation principles, recitative conducting, preparation, and conducting of choral/orchestral works. Prerequisite: 130A.
3 units, alternate years, not given this year

MUSIC 169A/269A. Seminar in Performance Practices—Performance techniques, theoretical principles, aesthetics, and musical resources of various historical periods.
1-4 units, alternate years, not given this year

MUSIC 181. Advanced Voice Performance—Performance class in a workshop setting. Skills including style, diction, interpretation, and expression in art song, oratorio, and opera literature. Repertoire varies and spans more than one quarter. May be repeated for credit. Prerequisite: private-lesson proficiency in voice or consent of instructor.
1 unit, Aut, Win, Spr (Schneider, A)

MUSIC 182. Diction for Singers—The international phonetic alphabet and its application to German, French, and Italian vocal literature. Open also to pianists interested in vocal coaching and choral conducting.
1 unit, Win (Dahl, L)

MUSIC 183. Art Song Interpretation—For advanced singers and pianists as partners. Performance class in a workshop setting. Prerequisite: consent of instructor. Recommended: 170 for pianists or 182 for singers.

MUSIC 183A. German Art Song Interpretation—Including composers from Beethoven and Schubert to Wolf and Strauss.
1 unit, alternate years, not given this year

MUSIC 183B. French Art Song Interpretation—Composers include Fauré, Debussy, Ravel, and Poulenc.
1 unit, Spr (Dahl, L), alternate years, not given next year

MUSIC 230. Advanced Orchestral Conducting—May be repeated for credit. Prerequisite: 130B.
2-4 units, Aut, Win, Spr (Cai, J)

MUSIC 231. Advanced Choral Conducting—May be repeated for credit. Prerequisite: 130C.
2-4 units, Aut, Win, Spr (Sano, S)

ENSEMBLE

An audition is required for admission to any University musical ensemble; audition schedules are posted during the registration period in Autumn Quarter. Audition is by appointment in Winter and Spring quarters: contact the ensemble director. Membership is open to all students including those who do not register for credit, although these courses may be repeated for credit. Many Department of Music ensembles tour on a regular basis, usually after Commencement in June.

MUSIC 156. "sic": Improvisation Collective—Small ensemble devoted to learning trans-idiomatic improvisation techniques and composing indeterminate pieces in a workshop setting. One major concert. Prerequisite: access to an instrument. Improvisational experience and conventional instrumental virtuosity not required.
1 unit, Win (Applebaum, M)

MUSIC 157. Introduction to Mariachi Ensemble—Introduction to the practice of mariachi music, tradition, and history. Focus is on learning traditional sones, rancheras, huapangos, and boleros. Requirements: ability to play and access to instruments (violin, trumpet, guitar, vihuela, and guitarron). May be repeated for credit.
1 unit, Aut, Win, Spr (Rodriguez, R)

MUSIC 158. Soundwire Ensemble—Stanford's Internet2-based Soundwire Ensemble rehearses with the East Coast Tintinnabulate Ensemble directed by Pauline Oliveros, Rensselaer Polytechnic Institute. Concerts, composition, and improvisation projects using resources available when connecting with remote musicians. State-of-the-art audio and video technology developed by ensemble participants. May be repeated for credit.
2-3 units, Aut (Chafe, C; Wang, G)

MUSIC 159. Early Music Singers—Small choir specializing in Medieval, Renaissance, and early Baroque vocal music. One major concert per quarter.
1 unit, Aut (Mahrt, W), Win (Sargent, J), Spr (Mahrt, W)

MUSIC 160. Stanford Symphony Orchestra—70- to 100-member ensemble performing major orchestral works; minimum one concert per quarter.
1 unit, Aut, Win, Spr (Cai, J)

MUSIC 160A. Stanford Philharmonia Orchestra—Prerequisite: audition, one year of 160, or consent of instructor. May be repeated for credit.
1 unit, Aut, Win, Spr (Cai, J)

MUSIC 161. University Bands

MUSIC 161A. Stanford Wind Ensemble—40- to 50-member ensemble performing transcriptions of symphonic music, brass band music, and repertoire composed specifically for symphonic band. One concert per quarter.
1 unit, Aut, Win, Spr (Aquilanti, G)

MUSIC 161B. Jazz Orchestra—Big band format. Repertoire drawn primarily from the contemporary jazz-ensemble literature. One formal concert per quarter.
1 unit, Aut, Win, Spr (Berry, F)

MUSIC 161C. Red Vest Band—A small ensemble of the Leland Stanford Junior University Marching Band open to members of the LSJUMB by audition and consent of instructor. Members perform at all men's and women's home basketball games and travel to some away and post-season games. Twice-weekly rehearsals focus on introduction of new student arrangements and the LSJUMB's repertoire of rock, funk, and traditional styles. May be repeated for credit.
1 unit, Win (Aquilanti, G)

MUSIC 162. Symphonic Chorus—100- to 150-voice ensemble, performing major choral masterworks with orchestra. One concert per quarter.
1 unit, Aut, Win, Spr (Sano, S)

MUSIC 163. Memorial Church Choir—Official choir of Memorial Church, furnishing music for Sunday services and special occasions in the church calendar.
2 units, Aut, Win, Spr (Wait, G)

MUSIC 165. Chamber Chorale—24-voice chamber ensemble, specializing in virtuoso choral repertoire from all periods of Western art music.
1 unit, Aut, Win, Spr (Sano, S)

MUSIC 167. University Singers—Mixed-repertory chorus, performing choral repertoire from all periods of Western art music and other world cultures.
1 unit, Aut, Win, Spr (Morgan, R)

MUSIC 169. Stanford Taiko—Select North American taiko ensemble, performing traditional and contemporary repertoire for Japanese drums. Multiple performances in Winter and Spring quarters, also touring; instrument construction and maintenance. Admission by audition in Autumn Quarter only.

1 unit, Aut, Win, Spr (Sano, S; Uyechi, L)

MUSIC 170. Collaborative Piano—Performance class in a workshop setting. Techniques of collaboration with vocalists and instrumentalists in repertoire ranging from songs and arias to sonatas and concertos. Prerequisite: private-lesson proficiency level in piano, or consent of instructor.

1 unit, Aut (Dahl, L)

MUSIC 171. Chamber Music—Small combinations for strings, winds, and keyboard instruments. Open to students at the private-lesson-proficiency level to hone ensemble skills, preferably while taking private lessons. Selected string instrument participants are invited to participate in a chamber orchestra, led by members of the St. Lawrence String Quartet, without conductor. Winter Quarter: chamber orchestra in conjunction with chamber chorale performing choral sacred music of the Baroque period, led by members of the St. Lawrence. All new and returning students are required to audition. May be repeated for credit.

1 unit, Aut, Win, Spr (Staff)

UNDERGRADUATE DIRECTED READING AND RESEARCH

MUSIC 197. Undergraduate Teaching Apprenticeship—Work in an apprentice-like relationship with faculty teaching a student-initiated course. Prerequisite: consent of instructor.

1-2 units, Aut, Win, Spr (Staff)

MUSIC 198. Concentrations Project—For concentration program participants only. Must be taken in senior year.

4 units, Aut, Win, Spr (Staff)

MUSIC 199. Independent Study—For advanced undergraduates and graduate students who wish to do work outside the regular curriculum. Before registering, student must present specific project and enlist a faculty sponsor. May be repeated for credit.

1-5 units, Aut, Win, Spr, Sum (Staff)

GRADUATE RESEARCH AND SPECIAL STUDIES

MUSIC 200. Graduate Proseminar—Required of first-year graduate students in music. Introduction to research in music, bibliographical materials, major issues in the field, philosophy, and methods in music history. Guest lecturers and individual research topics.

4 units, Aut (Berger, K; McBride, J)

MUSIC 269B. Research in Performance Practices—Directed reading and research.

1-5 units, Aut, Win, Spr, Sum (Staff)

MUSIC 280. TA Training Course—Required for doctoral students serving as teaching assistants. Orientation to resources at Stanford, guest presentations on the principles of common teaching activities, supervised teaching experience. Students who entered in the Autumn should take 280 in the Spring prior to the Autumn they begin teaching.

1 unit, Spr (Losness, E; Ruviaro, B)

MUSIC 300. Seminar in Notation—Western notation of the Middle Ages and Renaissance: principles, purposes, and transcription.

MUSIC 300A. Medieval Notation

4 units, Spr (Mahrt, W)

MUSIC 300B. Renaissance Notation

4 units, alternate years, not given this year

MUSIC 301. Analysis of Music—Current trends, issues, and methods.

MUSIC 301A. Analysis of Music: Modal

4 units, Aut (Mahrt, W)

MUSIC 301B. Analysis of Music: Tonal

4 units, Win (Grey, T)

MUSIC 301C. Analysis of Music: Post-Tonal—Current analytical trends, issues, and methods.

4 units, Spr (Ulman, E)

MUSIC 302. Research in Musicology—Directed reading and research.

1-5 units, Aut, Win, Spr, Sum (Staff)

MUSIC 321. Readings in Music Theory—Directed reading and research.

1-5 units, Aut, Win, Spr, Sum (Staff)

MUSIC 322. Directed Readings in German Language—Students create reading lists relevant to their studies in Music in conjunction with instructor. May be repeated for credit.

1 unit, Win (Staff)

MUSIC 341. Ph.D Dissertation—May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

MUSIC 399. D.M.A. Final Project—May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

HUMNTIES 321. Classical Seminar—(Same as CLASSGEN 321.)

3-5 units, Aut (Nightingale, A)

HUMNTIES 322. Medieval Seminar—(Same as ENGLISH 370A.)

3-5 units, Win (Steidle, E)

HUMNTIES 323. Renaissance/Early Modern Seminar

3-5 units, Spr (Brooks, H)

PHILOSOPHY

Emeriti (Professors): Fred Dretske, Solomon Feferman, Georg Kreisel, Julius Moravcsik, David S. Nivison, Patrick Suppes, James O. Urmson; *(Courtesy Professor):* Denis Phillips
Chair: Kenneth Taylor
Director of Graduate Study: Helen Longino
Director of Undergraduate Study: Chris Bobonich
Professors: Chris Bobonich, Michael Bratman (on leave), Joshua Cohen, John Etchemendy, Dagfinn Føllesdal (Winter), Michael Friedman, Helen Longino, Grigori Mints, John Perry (on leave Autumn), Debra Satz, Brian Skyrms (Spring), Kenneth Taylor, Johan van Benthem (Spring), Thomas Wasow, Allen Wood
Associate Professors: Lanier Anderson, Mark Crimmins (on leave Winter, Spring), Graciela De Pierris (on leave), Krista Lawlor
Assistant Professors: Alexis Burgess, Nadeem Hussain, Agnieszka Jaworska, Marc Pauly, Tamar Schapiro
Professor (Research): Rega Wood (on leave Autumn)
Courtesy Professors: Reviel Netz, Josiah Ober
Lecturers: Katherine Dunlop, Thomas Ryckman
Acting Assistant Professor: David Hills

Department Offices: Building 90
Mail Code: 94305-2155
Department Phone: (650)723-2547
Email: philosophy@csli.stanford.edu
Web Site: http://www-philosophy.stanford.edu

Courses given in Philosophy have the subject code PHIL. For a complete list of subject codes, see Appendix.

Philosophy concerns itself with fundamental problems. Some are abstract and deal with the nature of truth, justice, value, and knowledge; others are more concrete, and their study may help guide conduct or enhance understanding of other subjects. Philosophy also examines the efforts of past thinkers to understand the world and people's experience of it.

Although it may appear to be an assortment of different disciplines, there are features common to all philosophical enquiry. These include an emphasis on methods of reasoning and the way in which judgments are formed, on criticizing and organizing beliefs, and on the nature and role of fundamental concepts.

Students of almost any discipline can find something in philosophy which is relevant to their own specialties. In the sciences, it provides a framework within which the foundations and scope of a scientific theory can be studied, and it may even suggest directions for future development. Since philosophical ideas have had an important influence on human endeavors of all kinds, including artistic, political, and economic, students of the humanities should find their understanding deepened by acquaintance with philosophy.

Philosophy is an excellent major for those planning a career in law, medicine, or business. It provides analytical skills and a breadth of perspective helpful to those called upon to make decisions about their own conduct and the welfare of others. Philosophy majors who have carefully planned their undergraduate program have an excellent record of admission to professional and graduate schools.

The Special Program in the History and Philosophy of Science enables students to combine interests in science, history, and philosophy. Students interested in this program should see the special adviser.

The joint major in Philosophy and Religious Studies combines courses from both departments into a coherent theoretical pattern.

The Tanner Memorial Library of Philosophy contains an excellent working library and ideal conditions for study.

Graduate students and undergraduate majors in philosophy have formed associations for discussion of philosophical issues and the reading of papers by students, faculty, and visitors. These associations elect student representatives to department meetings.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

There are two ways of majoring in philosophy: the General Program and the Special Program in the History and Philosophy of Science. A student completing either of these receives a B.A. degree in Philosophy. There is also a major program offered jointly with the Department of Religious Studies. To declare a major, a student should consult with the Director of Undergraduate Study and see the undergraduate student services administrator to be assigned an adviser and work out a coherent plan. The department strongly urges proficiency in at least one foreign language.

GENERAL PROGRAM

1. Course requirements, minimum 55 units:
   a) preparation for the major: an introductory course (under 100) and 80. (PHIL 80 should normally be taken no later than the first quarter after declaring the major.) Students taking both quarters of the Winter/Spring Philosophy Introduction to the Humanities (IHUM) track can count 5 units toward the introductory Philosophy requirement.
   b) the core, 24 additional Philosophy units, as follows:
      1) Logic: one from 50 (formerly 57), 150 (formerly 159), 151 (formerly 160A), 154 (formerly 169)
      2) Philosophy of science: any course from 60, 61, 156, 163-168
      3) Moral and political philosophy: one from 170-173
      4) Metaphysics and epistemology: one from 180-189
      5) History of philosophy: 100 and 102 are required of each major
   c) one undergraduate philosophy seminar from the 194 series.
   d) electives: courses numbered 10 or above, at least 13 units of which must be in courses numbered above 99.
2. Units for Tutorial, Directed Reading (PHIL 196, 197, 198), *The Dualist* (PHIL 198), Honors Seminar (PHIL 199), or affiliated courses may not be counted in the 55-unit requirement. No more than 10 units completed with grades of 'satisfactory' and/or 'credit' may be counted in the 55-unit requirement.
3. A maximum of 10 transfer units or two courses can be used for the departmental major. In general, transfer courses cannot be used to satisfy the five area requirements or the undergraduate seminar requirement. Students may not substitute transfer units for the PHIL 80 requirement.

SPECIAL PROGRAM IN HISTORY AND PHILOSOPHY OF SCIENCE

Undergraduates may major in Philosophy with a field of study in History and Philosophy of Science. This field of study is declared on Axess. Each participating student is assigned an adviser who approves the course of study. A total of 61 units are required for the sub-major, to be taken according to requirements 1 through 5 below. Substitutions for the listed courses are allowed only by written consent of the undergraduate adviser for History and Philosophy of Science. Students are encouraged to consider doing honors work with an emphasis on the history and philosophy of science. Interested students should see the description of the honors thesis in Philosophy and consult their advisers for further information.

1. Three science courses (for example, biology, chemistry, physics) for 12 units.
2. The following Philosophy (PHIL) core courses must be completed with a letter grade by the end of the junior year:
   a) one from 50 (formerly 57), 150 (formerly 159), 151 (formerly 160A), 154 (formerly 169)
   b) 60 or 61
   c) 80
3. Three history of science courses.
4. Three philosophy of science courses, of which one must be PHIL 164.
5. Three additional courses related to the major, in philosophy or history, to be agreed on by the adviser.
6. At least six courses in the major must be completed at Stanford with a letter grade. Units for Tutorial, Directed Reading, or *The Dualist* (196, 197, 198) may not be counted in the requirement. No more than

10 units completed with grades of 'satisfactory' and/or 'credit' may be counted in the requirement.

7. Transfer units must be approved in writing by the Director of Undergraduate Study at the time of declaring a major. Transfer courses are strictly limited when used to satisfy major requirements.

SPECIAL OPTION IN PHILOSOPHICAL AND LITERARY THOUGHT

Undergraduates may major in Philosophy with a special option in philosophy and literature. This option is declared to the department; it is not declared on Axess, and it does not appear on the transcript or the diploma. Students in this option take courses alongside students from other major departments which also have a specialized option associated with the program for the study of philosophical and literary thought, with administrative staff in the DLCL. Each student in this option is assigned an adviser in Philosophy, and students' schedules and overall course of study must be approved in writing by the adviser, and the Directors of Undergraduate Studies of Philosophy and of the program.

A total of 65 units must be completed for this option, including the following requirements.

1. Core requirements for the major in Philosophy, including
   a) an introductory course
   b) PHIL 80
   c) the core distribution requirements listed in section 1b of the general program above
2. Gateway course in philosophy and literature (PHIL 81). This course should be taken as early as possible in the student's career, normally in the sophomore year.
3. Three courses in a single national literature, chosen by the student in consultation with the adviser and the program director of undergraduate studies. This normally involves meeting the language proficiency requirements of the relevant literature department.
4. Electives within Philosophy beyond the core requirements totaling at least 5 units, and drawn from courses numbered 100 or higher.
5. Two upper division courses of special relevance to the study of philosophy and literature, as identified by the committee in charge of the program. A list of approved courses is available from the program director of undergraduate studies.
6. Capstone seminar in the PHIL 194 series.
7. Capstone seminar of relevance to the study of philosophy and literature, as approved by the program committee. In some cases, with approval of the Philosophy Director of Undergraduate Study and the program director of undergraduate studies, the same course may be used to meet requirements 6 and 7 simultaneously. In any case, the student's choice of a capstone seminar must be approved in writing by the Philosophy Director of Undergraduate Study and the program director of undergraduate studies.

Students are encouraged to consider doing honors work in a topic related to philosophy and literature, either through the Philosophy honors program, or through Interdisciplinary Studies in the Humanities.

The following rules also apply to the special option:

1. Units for Honors Tutorial, Directed Reading (PHIL 196, 197, 198), *The Dualist* (PHIL 198), Honors Seminar (PHIL 199) may not be counted toward the 65-unit requirement. No more than 10 units with a grade of 'satisfactory' or 'credit' may be counted toward the unit requirement.
2. A maximum of 15 transfer units may be counted toward the major, at most 10 of which may substitute for courses within Philosophy. Transfer credits may not substitute for PHIL 80 or 81, and are approved as substitutes for the five area requirements or PHIL 194 only in exceptional cases.
3. Courses offered in other departments may be counted toward requirements 3, 5. and 7, but such courses, including affiliated courses, do not generally count toward the other requirements. In particular, such courses may not satisfy requirement 4.
4. Units devoted to meeting the language requirement are not counted toward the 65-unit requirement.

MINOR

A minor in Philosophy consists of at least 30 units of Philosophy courses satisfying the following conditions:

1. IHUM 23A and B (The Fate of Reason) may be counted for a maximum of 5 units.
2. At least 10 units must be from courses numbered 100 or above.
3. The 30 units must include one of:
   a) a history of philosophy course numbered 100 or above
   b) two quarters of Area 1 (only 5 of the 10 units can count towards 30-unit requirement)
4. One course from any two of the following three areas (PHIL):
   a) Philosophy of science and logic: 60, 61, 156, 163-168; 50 (formerly 57), 150 (formerly 159), 151 (formerly 160A), 154 (formerly 169)
   b) Moral and political philosophy: 20, 30, 170-172
   c) Metaphysics and epistemology: 10, 80, 180-189
5. Units for tutorials, directed reading, and affiliated courses may not be counted.
6. Transfer units must be approved in writing by the Director of Undergraduate Study at the time of declaring. The number of transfer units is generally limited to a maximum of 10.
7. No more than 6 units completed with grades of 'satisfactory' or 'credit' count towards the 30-unit requirement.

Students must declare their intention to minor in Philosophy in a meeting with the Director of Undergraduate Study. This formal declaration must be made no later than the last day of the quarter two quarters before degree conferral. The Permission to Declare a Philosophy Minor (signed by the Director of Undergraduate Study) lists courses taken and to be taken to fulfill minor requirements. This permission is on file in the department office. Before graduation, a student's record is checked to see that requirements have been fulfilled, and the results are reported to the University Registrar.

HONORS PROGRAM

Students who wish to undertake a more intensive and extensive program of study, including seminars and independent work, are invited to apply for the honors program during Winter Quarter of the junior year. Admission is selective on the basis of demonstrated ability in philosophy, including an average grade of at least 'A-' in a substantial number of philosophy courses and progress towards satisfying the requirements of the major.

With their application, candidates should submit an intended plan of study for the remainder of the junior and the senior years. It should include at least 5 units of Senior Tutorial (196) during Autumn and/or Winter Quarter(s) of the senior year. Students who are applying to Honors College may use the same application for philosophy honors. In the quarter preceding the tutorial, students should submit an essay proposal to the Philosophy undergraduate director and determine an adviser.

Students applying for honors should enroll in Junior Honors Seminar (199) during the Spring Quarter of the junior year.

The length of this essay may vary considerably depending on the problem and the approach; usually it falls somewhere between 7,500 and 12,500 words. The honors essay may use work in previous seminars and courses as a starting point, but it cannot be the same essay that has been used, or is being used, in some other class or seminar. It must be a substantially new and different piece of work reflecting work in the tutorials.

A completed draft of the essay is submitted to the adviser at the end of the Winter Quarter of the senior year. Any further revisions must be finished by the fifth full week of the Spring Quarter, when three copies of the essay are to be given to the undergraduate secretary. The honors essay is graded by the adviser together with a second reader, chosen by the adviser in consultation with the student. The student also provides an oral defense of the thesis at a meeting with the adviser and second reader. The essay must receive a grade of 'A-' or better for the student to receive honors.

Honors tutorials represent units in addition to the 55-unit requirement.

The Department of Philosophy cooperates with the honors component of the "Interdisciplinary Studies in Humanities" as described in that section of this bulletin.

JOINT MAJOR IN PHILOSOPHY AND RELIGIOUS STUDIES

The joint major in Philosophy and Religious Studies consists of 60 units of course work with approximately one third each in the philosophy core, the religious studies core, and either the general major or the special concentration. Affiliated courses cannot be used to satisfy this requirement.

No courses in either the philosophy or religious studies core may be taken satisfactory/no credit or credit/no credit.

In general, transfer units cannot be used to satisfy the core requirements. Transfer units and substitutions must be approved by the director of undergraduate studies in the appropriate department.

CORE REQUIREMENTS

1. Philosophy (PHIL) courses:
   a) 80
   b) 16 units, including at least one Philosophy course from each of the following areas:
      1) Logic and philosophy of science: 50 (formerly 57), 60, 61, 150 (formerly 159), 151 (formerly 160A), 154 (formerly 169), 156, 162-168
      2) Ethics and value theory: 170-173
      3) Epistemology, metaphysics, and philosophy of language: 180-189
      4) History of philosophy: 100-103
2. Religious Studies courses: 20 units, including at least two courses in diverse religious traditions (for example, an Eastern and a Western or a literate and a preliterate tradition) and including at least one seminar.

General Major Requirements—Five additional courses (approximately 20 units) divided between the two departments. No more than 5 of these units may come from courses numbered under 99 in either department. Each student must also take at least one undergraduate seminar in religious studies and one undergraduate seminar in philosophy.

Special Concentration—With the aid of an adviser, students pursue a specialized form of inquiry in which the combined departments have strength; for example, American philosophy and religious thought, philosophical and religious theories of human nature and action, philosophy of religion. Courses for this concentration must be approved in writing by the adviser.

Directed Reading and Satisfactory/No Credit Units—Units of directed reading for fulfilling requirements of the joint major are allowed only with special permission. No more than 10 units of work with a grade of 'satisfactory' count toward the joint major.

HONORS PROGRAM

Students pursuing a joint major in Philosophy and Religious Studies may also apply for honors by following the procedure for honors in either of the departments.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

It is possible to earn an M.A. in Philosophy while earning a B.A. or B.S. This can usually be done by the end of the fifth undergraduate year, although a student whose degree is not in philosophy may require an additional year. Standards for admission to, and completion of, this program are the same as for M.A. applicants who already have the bachelor's degree when matriculating. Applicants for the coterminal program are not, however, required to take the Graduate Record Exam. Information about applying is available from Graduate Admissions in the Registrar's Office. The application deadline for Philosophy is January 10.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

The department is prepared to direct and supervise individual study and research to supplement instruction offered in the courses listed below. In addition, advanced seminars not listed in the catalog are frequently organized in response to student interest. Candidates for advanced degrees are urged to discuss their entire program of study with their department advisers as early as possible.

Prospective graduate students should see http://gradadmissions.stanford.edu for information and application materials. Applicants should take the Graduate Record Examination by October of the year the application is submitted.

MASTER OF ARTS

University requirements for the M.A. are discussed in the "Graduate Degrees" section of this bulletin.

Four programs lead to the M.A. in Philosophy. One is a general program providing a grounding in all branches of the subject. The others provide special training in one branch.

Admissions—All prospective master's students, including those currently enrolled in other Stanford programs, must apply for admission to the program. The application deadline is March 28 of the academic year preceding entry into the program. In exceptional circumstances, consideration may be given to applications received after the March 28 deadline but before April 30. No fellowships are available. Entering students must meet with the director of the master's program and have their advisers' approval, in writing, of program proposals. The master's program should not be considered a stepping stone to the doctoral program; these two programs are separate and distinct.

Unit Requirements—Each program requires a minimum of 45 units in philosophy. Students in a special program may be allowed or required to replace up to 9 units of philosophy by 9 units in the field of specialization. Although the requirements for the M.A. are designed so that a student with the equivalent of a strong undergraduate philosophy major at Stanford might complete them in one year, most students need longer. Students should also keep in mind that although 45 units is the minimum required by the University, quite often more units are necessary to complete department requirements. Up to 6 units of directed reading in philosophy may be allowed. There is no thesis requirement, but an optional master's thesis or project, upon faculty approval, may count as the equivalent of up to 8 units. A special program may require knowledge of a foreign language. At least 45 units in courses numbered 100 or above must be completed with a grade of 'B-' or better at Stanford. Students are reminded of the University requirements for advanced degrees, and particularly of the fact that for the M.A., students must complete three full quarters as measured by tuition payment.

GENERAL PROGRAM

The General Program requires a minimum of 45 units in Philosophy courses numbered above 99. These courses must be taken for a letter grade and the student must receive at least a 'B-' in the course. Courses taken to satisfy the undergraduate core or affiliated courses may not be counted in the 45 units. The requirement has three parts:

1. *Undergraduate Core:* students must have when they enter, or complete early in their program, the following undergraduate courses (students entering from other institutions should establish equivalent requirements with a master's adviser upon arrival or earlier):
   a) Logic: 50 (formerly 57), 150 (formerly 159), or 151 (formerly 160A)
   b) Philosophy of science: any course from 60, 61, 163-167
   c) Moral and political philosophy: one from 170-173
   d) Metaphysics and epistemology: one from 80, 180-189
   e) History of philosophy: two history of philosophy courses numbered 100 or above
2. *Graduate Core:* students must take at least one course numbered over 105 from three of the following five areas (courses used to satisfy the undergraduate core cannot also be counted toward satisfaction of the graduate core). Crosslisted and other courses taught outside the Department of Philosophy do not count towards satisfaction of the core.

   a) Logic and semantics
   b) Philosophy of science and history of science
   c) Ethics, value theory, and moral and political philosophy
   d) Metaphysics, epistemology, and philosophy of language
   e) History of philosophy

   Each master's candidate must take at least two courses numbered above 200 (these cannot be graduate sections of undergraduate courses). One may be a graduate core seminar (360, 370, 380, 381), but no student is admitted to a core seminar before completing undergraduate requirements in the area of the seminar and securing the approval of the instructor.

3. Specialization: students must take at least three courses numbered over 105 in one of the five areas.

SPECIAL PROGRAM IN SYMBOLIC SYSTEMS

Students should have the equivalent of the Stanford undergraduate major in Symbolic Systems. Students who have a strong major in one of the basic SSP disciplines (philosophy, psychology, linguistics, computer science) may be admitted, but are required to do a substantial part of the undergraduate SSP core in each of the other basic SSP fields. This must include the following three philosophy courses or their equivalents: 80; 151 (formerly 160A); and one from 181, 183, 184, 186. This work does not count towards the 45-unit requirement.

COURSE REQUIREMENTS

1. Four courses in philosophy at the graduate level (numbered 200 or above), including courses from three of the following five areas:
   a) Philosophy of language
   b) Logic
   c) Philosophy of mind
   d) Metaphysics and epistemology
   e) Philosophy of science

   At most two of the four courses may be graduate sections of undergraduate courses numbered 100 or higher.
2. Three courses numbered 100 or higher from outside Philosophy, chosen in consultation with an adviser. These courses should be from two of the following four areas:
   a) Psychology
   b) Linguistics
   c) Computer Science
   d) Education

Remaining courses are chosen in consultation with and approved by an adviser.

SPECIAL PROGRAM IN THE PHILOSOPHY OF LANGUAGE

Admission is limited to students with substantial preparation in philosophy or linguistics. Those whose primary preparation has been in linguistics may be required to satisfy all or part of the undergraduate core requirements as described in the "General Program" subsection above. Those whose preparation is primarily in philosophy may be required to take additional courses in linguistics.

COURSE REQUIREMENTS

1. Philosophy of language: two approved courses in the philosophy of language numbered 180 or higher.
2. Syntactic theory and generative grammar: 384 and LINGUIST 231.
3. Logic: at least two approved courses numbered 151 (formerly 160A) or higher.
4. An approved graduate-level course in mathematical linguistics or automata theory.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree (residence, dissertation, examination, and so on) are discussed in the "Graduate Degrees" section of this bulletin. The requirements detailed here are department requirements.

All courses used to satisfy proficiency requirements must be passed with a letter grade of 'B-' or better (no satisfactory/no credit).

At the end of each year, the department reviews the progress of each student to determine whether the student is making satisfactory progress, and on that basis to make decisions about probationary status and termination from the program where appropriate.

Any student in one of the Ph.D. programs may apply for the M.A. when all University and department requirements have been met.

PROFICIENCY REQUIREMENTS

1. *Course requirements*, to be completed during the first two years:
   a) four core graduate courses and seminars in philosophy of language (381); philosophy of mind, metaphysics, and epistemology (380); value theory (370); and philosophy of science (360)
   b) three of the four items listed below:
      1) three history courses, each consisting of an approved graduate-level course in the history of philosophy. Courses satisfying this seven-out-of-eight requirement must include at least one history course in ancient philosophy, one in modern.
      2) PHIL 151 (formerly 160A)
   c) PHIL 150 (formerly 159) or the equivalent
   d) A total of at least 49 units of course work in the Department of Philosophy numbered above 110, but not including Teaching Methods (PHIL 239) or affiliated courses. Units of Individual Directed Reading (PHIL 240) may be included only with the approval of the Director of Graduate Study.
2. *Teaching Assistance:* a minimum of five quarters of teaching assistance, usually during the second and third years. As part of the training for being a teaching assistant, Ph.D. students are required to take PHIL 239 during Spring Quarter of their first and second years.
3. *Candidacy:* to continue in the Ph.D. program, each student must be approved for candidacy during the sixth academic quarter (normally the Spring Quarter of the student's second year). Students may be approved for candidacy on a conditional basis if they have only one or two outstanding deficiencies, but are not officially advanced to candidacy until these deficiencies have been removed. Approval for candidacy indicates that, in the department's judgment, the student can complete the Ph.D. In reaching this judgment, the department considers the overall quality of the student's work during the first six quarters and the student's success in fulfilling course requirements.
4. During the third year of graduate study, and after advancement to candidacy, a Ph.D. student should complete at least three graduate-level courses/seminars, at least two of which must be in philosophy. Courses required for candidacy are not counted toward satisfaction of this requirement. Choice of courses/seminars outside philosophy is determined in consultation with a student's adviser.
5. During the summer of their second year, students are required to attend a dissertation development seminar given by the department.
6. Dissertation work and defense: the third and fourth (and sometimes fifth) years are devoted to dissertation work.
   a) *Dissertation Proposal:* by Spring Quarter of the third year, students select a dissertation topic, a reading committee, and some possible thesis relative to that topic. The topic and thesis should be sketched in a proposal of three to five pages, plus a detailed, annotated bibliography indicating familiarity with the relevant literature. The proposal should be approved by the reading committee before the meeting on graduate student progress late in Spring Quarter.
   b) *Departmental Oral:* during Autumn Quarter of the fourth year, students take an oral examination, called the "Departmental Oral," based on at least 30 pages of written work, in addition to the proposal. The aim of the exam is to help the student arrive at an acceptable plan for the dissertation and to make sure that the student, thesis, topic, and adviser make a reasonable fit. In cases where such an exam is

deemed inappropriate by the reading committee, the student may be exempted by filing a petition with the Director of Graduate Study, signed by the student and the members of the reading committee.
   c) *Fourth-Year Colloquium:* no later than the Spring Quarter of the fourth year, students present a research paper in a seminar open to the entire department. This paper should be on an aspect of the student's dissertation research.
   d) *University Oral Exam:* Ph.D. students must submit a completed draft of the dissertation to the three-person reading committee at least one month before the student expects to defend the thesis in the University oral exam. If the student is given permission to go forward, the University orals take place approximately two weeks later. A portion of the exam consists of a student presentation based on the dissertation and is open to the public. A closed question period follows. If the draft is ready by Autumn Quarter of the fourth year, the student can request that the University oral count as the department oral.

SPECIAL GRADUATE PROGRAMS

The department recognizes that some students may need to spend a large amount of time preparing themselves in some other discipline related to their philosophical goals, or in advanced preparation in some area within philosophy. In such circumstances, the department may be willing to waive some of the Ph.D. requirements. Such an exemption is not automatic; a program must be worked out with an adviser and submitted to the department some time in the student's first year. This proposal must be in writing and must include:

1. The areas to be exempted (see below).
2. A program of additional courses and seminars in the special area (usually at least 12 units).
3. A justification of the program that considers both intellectual coherence and the student's goals.

The department believes there is plenty of room for normal specialization within the program as it stands, and that all students specialize to some extent. Thus, the intent is not to exempt courses on a one-to-one basis, but only to grant exemptions when a student plans an extensive and intensive study of some relevant area.

Special program students may be exempted from the following:

1. One additional item from the items listed above in requirement 1(a)
2. PHIL 150 (formerly 159); but in this case, a student must take PHIL 50 (formerly 57)

If a student's special program involves substantial course work outside of philosophy, the student may, with the approval of the adviser, petition the department to reduce requirement l(d), the Philosophy unit requirement for the first two years. Normally this requirement is not reduced below 32 units.

PH.D. MINOR

To obtain a Ph.D. minor in Philosophy, students must follow these procedures:

1. Consult with the Director of Graduate Study to establish eligibility, and select a suitable adviser.
2. Give to the department academic assistant a signed copy of the program of study (designed with the adviser) which offers:
   a) 30 units of courses in the Department of Philosophy with a letter grade of 'B-' or better in each course. No more than 3 units of directed reading may be counted in the 30-unit requirement.
   b) At least one course or seminar numbered over 99 to be taken in each of these five areas:
      1) Logic
      2) Philosophy of science
      3) Ethics, value, theory, and moral and political philosophy
      4) Metaphysics, epistemology, and philosophy of language
      5) History of philosophy
   c) Two additional courses numbered over 199 to be taken in one of those (b) five areas.
3. A faculty member from the Department of Philosophy (usually the student's adviser) serves on the student's doctoral oral examination committee and may request that up to one third of this examination be devoted to the minor subject.
4. Paperwork for the minor must be submitted to the department office before beginning the program.

INTERDEPARTMENTAL PROGRAMS

GRADUATE PROGRAM IN HUMANITIES

The Department of Philosophy also participates in the Graduate Program in Humanities leading to the joint Ph.D. degree in Philosophy and Humanities. It is described in the "Interdisciplinary Studies in Humanities" section of this bulletin.

GRADUATE PROGRAM IN COGNITIVE SCIENCE

Philosophy participates with the departments of Computer Science, Linguistics, and Psychology in an interdisciplinary program in Cognitive Science. It is intended to provide an interdisciplinary education, as well as a deeper concentration in philosophy, and is open to doctoral students. Students who complete the requirements within Philosophy and the Cognitive Science requirements receive a special designation in Cognitive Science along with the Ph.D. in Philosophy. To receive this field designation, students must complete 30 units of approved courses, 18 of which must be taken in two disciplines outside of philosophy. The list of approved courses can be obtained from the Cognitive Science program located in the Department of Psychology.

SPECIAL TRACK IN PHILOSOPHY AND SYMBOLIC SYSTEMS

Students interested in interdisciplinary work relating philosophy to artificial intelligence, cognitive science, computer science, linguistics, or logic may pursue a degree in this program.

Prerequisites—Admitted students should have covered the equivalent of the core of the undergraduate Symbolic Systems Program requirements as described in that section of this bulletin, including courses in artificial intelligence (AI), cognitive science, linguistics, logic, and philosophy. The graduate program is designed with this background in mind. Students missing part of this background may need additional course work. Aside from the required course work below, the Ph.D. requirements are the same as for the regular program.

Courses of Study—The program consists of two years of courses and two years of dissertation work. Students are required to take the following courses in the first two years:

1. Six philosophy courses:
   a) two of the following: 360, 370, 380, 381
   b) one course in the history of modern philosophy
   c) two quarters of graduate logic courses from among 350A, 351A, 352A, 353A
   d) at least one additional seminar in the general area of symbolic systems: such as, 354, 358
2. Five cognitive science and computer science courses:
   a) at least two courses in cognitive psychology
   b) two or three graduate courses in computer science, at least one in AI and one in theory
3. Three linguistics and computational linguistics courses:
   a) graduate courses on natural language that focus on two of the following areas: phonetics and phonology, syntax, semantics, or pragmatics
   b) one graduate course in computational linguistics, typically LINGUIST 239
4. At least two additional graduate seminars at a more advanced level, in the general area of the program, independent of department. These would typically be in the area of the student's proposed dissertation project.

The requirements for the third year are the same as for other third-year graduate students in philosophy: a dissertation proposal, creation of a dissertation committee, and at least three approved graduate courses and seminars. The dissertation committee must include at least one member of the Department of Philosophy and one member of the Program in Symbolic Systems outside the Department of Philosophy.

The requirement for the fourth year is the same as for the other graduate students in philosophy: a department oral on an initial draft of part of the dissertation, a fourth year colloquium, and a University oral exam when the dissertation is essentially complete.

JOINT PROGRAM IN ANCIENT PHILOSOPHY

This program is jointly administered by the Departments of Classics and Philosophy and is overseen by a joint committee composed of members of both departments. It provides students with the training, specialist skills, and knowledge needed for research and teaching in ancient philosophy while producing scholars who are fully trained as either philosophers (with a strong specialization in ancient languages and philology) or classicists (with a concentration in philosophy).

Students are admitted to the program by either department. Graduate students admitted by the Philosophy department receive their Ph.D. from the Philosophy department; those admitted by the Classics department receive their Ph.D. from the Classics department. For Philosophy graduate students, this program provides training in classical languages, literature, culture, and history. For Classics graduate students, this program provides training in the history of philosophy and in contemporary philosophy.

Each student in the program is advised by a committee consisting of one professor in each department.

Requirements for Philosophy Graduate Students—These are the same as the proficiency requirements for the Ph.D. in Philosophy with the following exception: if the student has already taken two courses in modern philosophy, there is no need to take a course in modern philosophy to satisfy proficiency requirement 1.a.2.

One year of Greek is a requirement for admission to the program. If students have had a year of Latin, they are required to take 3 courses in second- or third-year Greek or Latin, at least one of which must be in Latin. If they have not had a year of Latin, they are then required to complete a year of Latin, and take two courses in second- or third-year Greek or Latin.

Students are also required to take at least three courses in ancient philosophy at the 200 level or above, one of which must be in the Classics department and two of which must be in the Philosophy department.

GRADUATE DEGREES IN HISTORY AND PHILOSOPHY OF SCIENCE AND TECHNOLOGY

See the description in the "History and Philosophy of Science and Technology" section of this bulletin.

GRADUATE FELLOWSHIPS AND ASSISTANTSHIPS

A limited amount of fellowship support is available for Ph.D. students in philosophy. Students request aid by checking the appropriate box on the application form. Details of this program may be obtained from the department. Note that a condition of financial aid may be teaching assistance that goes beyond the Ph.D. requirement.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. See the quarterly *Time Schedule* for revised listings.

INTRODUCTION TO THE HUMANITIES (IHUM)

The following Introduction to the Humanities courses are taught by Philosophy department faculty members. IHUM courses are typically available only to freshmen seeking to fulfill IHUM requirements; see the "Introduction to the Humanities" section of this bulletin for further information. Prospective majors in Philosophy are advised to consider satisfying their IHUM-2,3 requirements by registering for the following IHUM courses.

IHUM 23A,B. The Fate of Reason—Two quarter sequence. The historical fate of Socrates' proposal that only reason can provide answers to questions of what to believe and how to act. The fate of reason in cultural contexts including medieval Christian, Islamic, and Jewish. Themes include free will, personal identity, the authority of morality, and the tension between reason as power for improving life and as insufficient means for reaching important truths. GER:IHUM-2,3

IHUM 23A: *4 units, Win (Hussain, N)*
IHUM 23B: *4 units, Spr (Longino, H)*

INTRODUCTORY

These courses acquaint the student with some of the most important problems, positions, and methods in Philosophy. Some are designed to give general preparation for further work in Philosophy. Some apply the philosopher's approach to particular problems and subjects encountered in other areas of study.

PHIL 10. God, Self, and World: An Introduction to Philosophy—Traditional philosophical problems including the existence of God, how and what one can know about the world, how to understand the nature of the mind and its relation to the body, and whether people have free will. Paradoxes. Readings include classical and contemporary texts. GER:DB-Hum

5 units, Win (Perry, J)

PHIL 12N. Mortal Questions—Stanford Introductory Seminar. Preference to freshmen. Should people fear death? Why does life sometimes seem meaningless? Can people be good or bad by accident? What makes a sexual act perverse? When is warfare immoral? Focus is on Thomas Nagel's *Mortal Questions* as an introduction to contemporary analytic philosophy. GER:DB-Hum

3 units, Aut (Burgess, A)

PHIL 14N. Belief—Stanford Introductory Seminar. Preference to freshmen. Is there anything wrong with believing something without evidence? Is it possible? The nature and ethics of belief, and belief's relation to evidence and truth. How much control do believers have over their belief? GER:DB-Hum

3 units, Win (Lawlor, K)

PHIL 16N. Values and Objectivity—Stanford Introductory Seminar. Preference to freshmen. What is meant by the objectivity of beliefs and attitudes? Can the commitment of science to truthfulness be free of particular perspectives and subjective influence? Is objectivity a matter of degree relative to the kind of inquiry undertaken? Readings from philosophy of science, moral philosophy, and philosophy of mind. GER:DB-Hum

3 units, Aut (Ryckman, T)

PHIL 17N. The Logic of Social Justice—Stanford Introductory Seminar. Preference to freshmen. Social choice theory studies the aggregation of individual preferences into a group preference, including voting procedures, auctions, and fair division procedures. Normative properties such as fairness, non-manipulability, and optimality. Central impossibility results. Student projects analyze real-life social mechanisms such as the Stanford housing draw, or voting systems of different countries. Recommended: AP mathematics or equivalent. GER:DB-SocSci

3 units, Win (Pauly, M)

PHIL 18N. Well-Being—Stanford Introductory Seminar. What makes a life good for the person who lives it? Does well-being depend solely on the quality of the person's experiences? Are things good because people desire them or do people desire them because they are good? Are there objective criteria for assessing the goodness of a life? Readings from historical and contemporary sources. GER:DB-Hum

3 units, Spr (Jaworska, A)

PHIL 20. Introduction to Moral Philosophy—(Same as ETHICSOC 20.) What is the basis of moral judgment? What makes right actions right and wrong actions wrong? What makes a state of affairs good or worth promoting? What is it to have a good or virtuous character? Answers to classic questions in ethics through the works of traditional and contemporary authors. GER:DB-Hum, EC-EthicReas

5 units, Spr (Schapiro, T)

PHIL 30. Introduction to Political Philosophy—(Same as ETHICSOC 30, POLISCI 3.) State authority, justice, liberty, and equality through major works in political philosophy. Topics include human nature and citizenship, the obligation to obey the law, democracy and economic inequality, equality of opportunity and affirmative action, religion, and politics. GER:DB-Hum, EC-EthicReas

5 units, Aut (Hussain, N)

PHIL 50. Introductory Logic—Propositional and predicate logic; emphasis is on translating English sentences into logical symbols and constructing derivations of valid arguments.

4 units, Aut (Morton Galdos, J), Spr (Potochnik, A)

PHIL 60. Introduction to Philosophy of Science—(Same as HPS 60.) 20th-century views on the nature of scientific knowledge. Logical positivism and Popper; the problem of induction; Kuhn, Feyerbend, and radical philosophies of science; subsequent attempts to rebuild moderate empiricist and realist positions. GER:DB-Hum

5 units, Aut (Longino, H)

PHIL 61. Science, Religion, and the Birth of Modern Philosophy—(Same as HPS 61.) Galileo's defense of the Copernican world-system that initiated the scientific revolution of the 17th century, led to conflict between science and religion, and influenced the development of modern philosophy. Readings focus on Galileo and Descartes. GER:DB-Hum

5 units, Win (Friedman, M)

PHIL 77. Methodology in Ethics: Translating Theory into Practice—(Same as ETHICSOC 77.) Ideally, social policies are informed by ethical thought and reflection, but doing good in the world requires the active translation of moral theory and political philosophy into action. What kinds of empirical data are relevant to social decision making, and how should they be collected, evaluated, and integrated into normative analysis? What assumptions about human nature are in play? How should diverse cultural values be addressed? Case studies from biomedical science, business, and government.

4 units, Spr (Staff)

PHIL 78. Medical Ethics—(Same as ETHICSOC 78.) Introduction to moral reasoning and its application to problems in medicine: informed consent, the requirements and limits of respect for patients' autonomy, surrogate decision making, euthanasia and physician-assisted suicide, and abortion. GER:DB-Hum, EC-EthicReas

4 units, Win (Jaworska, A)

PHIL 80. Mind, Matter, and Meaning—Central topics in philosophy emphasizing development of analytical writing skills. What are human beings? Are human beings free? How do human minds and bodies interact? What does it all mean? Prerequisite: introductory philosophy course. GER:DB-Hum, WIM

5 units, Win (Lawlor, K), Spr (Burgess, A)

PHIL 81. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum

4 units, Win (Anderson, L; Landy, J)

HISTORY OF PHILOSOPHY

100-103 are surveys of important figures and movements in Western philosophy. Other courses cover particular periods, movements, and figures in the history of philosophy. Prospective Philosophy majors should take as many as possible during the sophomore year.

PHIL 100. Greek Philosophy—Greek philosophical thought, covering Socrates, Plato, Aristotle, and the Hellenistic schools (the Epicureans, the Stoics, and the Skeptics). Topics: the nature of the soul, virtue and happiness, knowledge, and reality. GER:DB-Hum

4 units, Aut (Bobonich, C)

PHIL 101. Medieval Religious Philosophy—(Same as RELIGST 167.) Focus is on God, world, and words. A pervasive assumption about the structure of the world, that it reflected the categories of God's mind and emerged from an act of divine speech, gave impetus to the interest in the nature of language and its relation to the world. Scripture served as one kind of divine communication to human beings, and *The Book of the World* as another. The problem of universals, the question of how words relate to God, epistemology, theories of reference, and semiotics. Readings from Augustine, Anselm, Aquinas, Scotus, and Ockham. GER:DB-Hum

4 units, not given this year

PHIL 102. Modern Philosophy, Descartes to Kant—Major figures in early modern philosophy in epistemology, metaphysics, and philosophy of mind. Writings by Descartes, Locke, Leibniz, Berkeley, Hume, and Kant. GER:DB-Hum

4 units, Aut (Dunlop, K)

PHIL 103. 19th-Century Philosophy—Focus is on ethics and the philosophy of history. Works include Mill's *Utilitarianism*, Hegel's *The Philosophy of World History*, Marx's *Economic and Philosophic Manuscripts*, Kierkegaard's *The Sickness Unto Death*, and Nietzsche's *On the Genealogy of Morals*. GER:DB-Hum

4 units, Spr (Staff)

PHIL 113/213. Hellenistic Philosophy—(Graduate students register for 213.) Epicureans, skeptics, and stoics on epistemology, ethics, metaphysics, and psychology.

4 units, Aut (Bobonich, C)

PHIL 115/215. Foundations of Medieval Psychology—(Graduate students register for 215.) Western medieval faculty psychology. Focus on Albert the Great and changes in his views on sensation and understanding and the faculties of sense, imagination, and intellect. Other texts by Albert's student Thomas Aquinas and his predecessors, Richard Rufus and Roger Bacon. Changes in the comparative influence exerted by Avicenna and Averroes on the Western tradition of Aristotelian psychology. May be repeated for credit. See http://rrp.stanford.edu/Albert/news. GER:DB-Hum

3-5 units, Spr (Wood, R)

PHIL 117/217. Descartes—(Graduate students register for 217; formerly 121/221.) Descartes's philosophical writings on rules for the direction of the mind, method, innate ideas and ideas of the senses, mind, God, eternal truths, and the material world. GER:DB-Hum

4 units, not given this year

PHIL 118/218. British Empiricism, 1660s-1730s—(Graduate students register for 218.) GER:DB-Hum

4 units, not given this year

PHIL 119/219. Rationalists—(Graduate students register for 219; formerly 143/243.) Developments in 17th-century continental philosophy. Descartes's views on mind, necessity, and knowledge. Spinoza and Leibniz emphazing their own doctrines and their criticism of their predecessors. Prerequisite: 102. GER:DB-Hum

4 units, not given this year

PHIL 122/222. Hume—(Graduate students register for 222; formerly 120/220.) Hume's theoretical philosophy, in particular, skepticism and naturalism, the theory of ideas and belief, space and time, causation and necessity, induction and laws of nature, miracles, a priori reasoning, the external world, and the identity of the self. GER:DB-Hum

4 units, not given this year

PHIL 125/225. Kant's First Critique—(Graduate students register for 225.) The founding work of Kant's critical philosophy emphasizing his contributions to metaphysics and epistemology. His attempts to limit metaphysics to the objects of experience. Prerequisite: course dealing with systematic issues in metaphysics or epistemology, or with the history of modern philosophy. GER:DB-Hum

4 units, Aut (Anderson, L)

PHIL 126B/226B. Kant's Ethical Theory—(Graduate students register for 226B.) Kant's moral philosophy based primarily on the *Groundwork of Metaphysics of Morals*, *Critique of Practical Reason*, and *The Metaphysics of Morals*. GER:DB-Hum

4 units, not given this year

PHIL 127A/227A. Kant's Ethical Theory—(Graduate students register for 227A.) Readings include *Groundwork for the Metaphysics of Morals* and *The Metaphysics of Morals*. GER:DB-Hum

4 units, not given this year

PHIL 127B/227B. Kant's Anthropology and Philosophy of History—(Graduate students register for 227B.) Kant's conception of anthropology or human nature, based on his philosophy of history, which influenced and anticipated 18th- and 19th-century philosophers of history such as Herder, Fichte, Hegel, and Marx. Texts include *Idea for a Universal History*, *Conjectural Beginning of Human History*, and *Anthropology from a Pragmatic Point of View*. Topics include: Kant's pragmatic approach to the study of human nature; the difficulty of human self knowledge; the role of regulative and teleological principles in studying human history; and Kant's theory of race. GER:DB-Hum

4 units, Spr (Wood, A)

PHIL 128/228. Fichte's Ethics—(Graduate students register for 228.) The founder of the German Idealist movement who adopted but revised Kant's project of transcendental philosophy basing it on the principle of awareness of free self-activity. The awareness of other selves and of ethical relations to them as a necessary condition for self-awareness. His writings from 1793-98 emphasizing the place of intersubjectivity in his theory of experience. GER:DB-Hum

4 units, not given this year (Wood, A)

PHIL 130/230. Hegel's Elements of Philosophy of Right—(Graduate students register for 230; formerly 122/222.) Introduction to Hegel's philosophy, emphasizing his moral and political philosophy, through study of his last major work (1821). May be repeated for credit. Prerequisite: course in the history of modern philosophy. GER:DB-Hum

4 units, Aut (Wood, A)

PHIL 134/234. Phenomenology and Intersubjectivity—(Graduate students register for 234.) Readings from Husserl, Stein, Heidegger, Sartre, and Merleau-Ponty on subjects related to awareness of others. Topics include solipsism, collective experience, empathy, and objectification of the other. GER:DB-Hum

4 units, not given this year

PHIL 135/235. Existentialism—(Graduate students register for 235; formerly 132/232.) Focus is on the existentialist preoccupation with human freedom. What constitutes authentic individuality? What is one's relation to the divine? How can one live a meaningful life? What is the significance of death? A rethinking of the traditional problem of freedom and determinism in readings from Rousseau, Kierkegaard, and Nietzsche, and the extension of these ideas by Sartre, Beauvoir, and Camus, including their social and political consequences in light of 20th-century fascism and feminism. GER:DB-Hum

4 units, Spr (Anderson, L)

PHIL 136/236. History of Analytic Philosophy—(Graduate students register for 236; formerly 147/247.) Theories of knowledge in Frege, Carnap, and Quine. Emphasis is on conceptions of analyticity and treatment of logic and mathematics. Prerequisite: 50 and one course numbered 150-165 or 181-90. GER:DB-Hum

4 units, not given this year

PHIL 137/237. Wittgenstein—(Graduate students register for 237.) The main themes and claims in Wittgenstein's later work concentrating on his views about meaning, mind, knowledge, the nature of philosophical perplexity, and the nature of philosophical progress in his *Philosophical Investigations*. Emphasis is on the relationship between the novel arguments of the *Investigations* and its ways of writing up the results of philosophical questioning. GER:DB-Hum

4 units, not given this year

PHIL 143/243. Quine—(Graduate students register for 243; formerly 183/283.) The philosophy of Quine: meaning and communication; analyticity, modality, reference, and ontology; theory and evidence; naturalism; mind and the mental. GER:DB-Hum

4 units, not given this year

LOGIC AND PHILOSOPHY OF SCIENCE

PHIL 150/250. Basic Concepts in Mathematical Logic—(Graduate students register for 250; formerly 159.) The concepts and techniques used in mathematical logic, primarily through the study of the language of first order logic. Topics: formalization, proof, propositional logic, quantifiers, sets, mathematical induction, and enumerability. GER:DB-Math

4 units, Aut (Wasow, T)

PHIL 150X. Basic Concepts in Mathematical Logic—Equivalent to the second half of 150. Students attend the first meeting of 150 and rejoin the class on October 30. Prerequisite: CS 103A or X, or PHIL 50.

2 units, Aut (Wasow, T)

PHIL 151/251. First-Order Logic—(Graduate students register for 251; formerly 160A.) The syntax and semantics of sentential and first-order logic. Concepts of model theory. Gödel's completeness theorem and its consequences: the Löwenheim-Skolem theorem and the compactness theorem. Prerequisite: 150 or consent of instructor. GER:DB-Math

4 units, Win (Pauly, M)

PHIL 152/252. Computability and Logic—(Graduate students register for 252.) Approaches to effective computation: recursive functions, register machines, and programming styles. Proof of their equivalence, discussion of Church's thesis. Elementary recursion theory. These techniques used to prove Gödel's incompleteness theorem for arithmetic, whose technical and philosophical repercussions are surveyed. Prerequisite: 151. GER:DB-Math

4 units, Spr (Pauly, M)

PHIL 153. Feminist Theories and Methods Across the Disciplines—(Same as FEMST 103/203.) The interdisciplinary foundations of feminist thought, and the nature of disciplines and of interdisciplinary work. The challenges of feminism for scholarship and research, taught by a Feminist Studies resource faculty member from one of the disciplines in question. GER:EC-Gender

4-5 units, Win (Longino, H)

PHIL 154/254. Modal Logic—(Graduate students register for 254.) Syntax and semantics of modal logic, and technical results like completeness and correspondence theory. Applications to philosophy and computer science. Prerequisite: 150 or preferably 151. GER:DB-Math

4 units, Aut (Mints, G)

PHIL 155. General Interest Topics in Mathematical Logic—Propositional calculus, Sudoku puzzles, problem P=NP. Possible worlds, modal logic. Incompleteness, provability logic. Logic of knowledge and belief. May be repeated for credit.
4 units, Spr (Mints, G)

PHIL 156. Popper, Kuhn, and Lakatos—(Same as EDUC 214.) These 20th-century philosophers of science raise fundamental issues dealing with the nature of scientific progress: the rationality of change of scientific belief, science versus non-science, role of induction in science, truth or verisimilitude as regulative ideals. Their impact in the social sciences and applied areas such as educational research. (SSPEP) GER:DB-Hum
3 units, not given this year

PHIL 157/257. Topics in Philosophy of Logic—(Graduate students register for 257.) Disputed foundational issues in logic; the question of what the subject matter and boundaries of logic are, such as whether what is called second-order logic should be counted as logic. What is the proper notion of logical consequence? May be repeated for credit. Pre- or corequisite: 151, or consent of instructor.
3 units, not given this year

PHIL 162/262. Philosophy of Mathematics—(Graduate students register for 262; same as MATH 161.) 20th-century approaches to the foundations and philosophy of mathematics. The background in mathematics, set theory, and logic. Schools and programs of logicism, predicativism, platonism, formalism, and constructivism. Readings from leading thinkers. Prerequisite: 151 or consent of instructor.
4 units, Spr (Feferman, S)

PHIL 163/263. Significant Figures in Philosophy of Science—(Graduate students register for 263.) Directed study of two or more thinkers, past or present, who have made a lasting impact on contemporary philosophy of science. Subjects last year were Henri Poincaré, Pierre Duhem, and Gaston Bachelard. GER:DB-Hum
4 units, not given this year

PHIL 164/264. Central Topics in the Philosophy of Science: Theory and Evidence—(Graduate students register for 264.) The relation of theory to evidence and prediction, problems of induction, empirical underdetermination of theory by evidence, and theory choice. Hypothetico-deductive, Bayesian, pragmatic, and inference to the best explanation models of explanation. The semantic approach to theories. GER:DB-Hum
4 units, Aut (Ryckman, T)

PHIL 165/265. Philosophy of Physics—(Graduate students register for 265.) Central topic alternates annually between space-time theories and philosophical issues in quantum mechanics. Topics last year: absolute and relational theories of space, time, and motion. Newton's critique of Descartes and debate with Leibniz. The principle of relativity and space-time formulations of Aristotelian, Galilean, and relativity physics. Mach's principle and the theory of general relativity. Einstein's struggles with the principle of general covariance. Space-time substantivalism, and the meaning of background independence. May be repeated for credit if content is different. GER:DB-Hum
4 units, Spr (Ryckman, T)

PHIL 166/266. Probability—(Graduate students register for 266.)
4 units, Spr (Skyrms, B; Diaconis, P)

PHIL 167A/267A. Philosophy of Biology—(Graduate students register for 267A.) Philosophical questions raised by evolutionary biology. The concepts of fitness and adaptation. How are hypotheses about adaptation to be tested? How should organisms be classified? How can the history of the phylogenetic branching process be inferred? Are there laws in evolutionary biology? Are theories in biology reducible to theories in physics? What does evolutionary biology contribute to the understanding of human mind and culture? GER:DB-Hum
4 units, not given this year

PHIL 167B/267B. Philosophy, Biology, and Behavior—(Graduate students register for 267B.) Continuation of 167A/267A. Further philosophical study of key theoretical ideas in biology, focusing on problems involving explanation of behavior. Topics: evolutionary versus proximate causal explanations of behavior; genetic and other determinisms; and classification and measurement of behavior. Prerequisites: 167A; or one PHIL course and either one BIOSCI course or Human Biology core; or equivalent with consent of instructor.
4 units, Win (Longino, H)

PHIL 168/268. Theories of Truth—(Graduate students register for 268.) The correspondence, coherence, pragmatist and deflationary theories of truth. Tarski's semantic conception of truth and hierarchical truth definitions. The problems posed by the liar paradox for non-hierarchical theories. Formal theories of truth proposed since the 70s to deal with these problems.
4 units, not given this year

ETHICS, AESTHETICS, AND SOCIAL AND POLITICAL PHILOSOPHY

PHIL 170/270. Ethical Theory—(Graduate students register for 270; same as ETHICSOC 170.) Major strands in contemporary ethical theory. Readings include Bentham, Mill, Kant, and contemporary authors. GER:DB-Hum, EC-EthicReas
4 units, Aut (Jaworska, A)

PHIL 171. Justice—(Same as ETHICSOC 171, IPS 208, PHIL 271, POLISCI 136S, PUBLPOL 207.) Focus is on the ideal of a just society, and the place of liberty and equality in it, in light of contemporary theories of justice and political controversies. Topics include protecting religious liberty, financing schools and elections, regulating markets, assuring access to health care, and providing affirmative action and group rights. Issues of global justice including human rights and global inequality. GER:DB-Hum, EC-EthicReas
5 units, Aut (Cohen, J)

PHIL 172/272. History of Modern Ethics—(Graduate students register for 272.) Major strands in the history of modern, pre-Kantian moral philosophy. Emphasis is on the dialogue between empiricists and rationalists on the subject of the relationship between the natural and the normative. Authors include Frances Hutcheson, David Hume, Adam Smith, Samuel Clarke, and Richard Price.
4 units, Win (Schapiro, T)

PHIL 173A. Aesthetics: Metaphor across the Arts—What if a metaphor is an instructively compact work of art, or if finding a metaphor apt is an instructively simple case of finding something aesthetically valuable? What does this reveal about the nature of art and language? Introduction to the philosophical study of art and aesthetic value, organized around metaphor. Contemporary accounts of metaphor as a verbal device. Arguments for the existence of nonverbal metaphor in nonliterary arts. The power and appeal of metaphors drawn from art, art criticism, theoretical inquiry, and everyday life. GER:DB-Hum
4 units, Spr (Hills, D)

PHIL 173B/273B. Metaethics—(Graduate students register for 273B.) Can moral and ethical values be justified or is it just a matter of opinion? Is there a difference between facts and values? Are there any moral truths? Does it matter if there are not? Focus is not on which things or actions are valuable or morally right, but what is value or rightness itself. Contemporary metaethics. Prerequisites: 80, 181, and an ethics course. GER:DB-Hum
4 units, Spr (Hussain, N)

PHIL 174/274. Freedom and the Practical Standpoint—(Graduate students register for 274.) Confronted with the question of how to act, people think of themselves as freely determining their own conduct. Natural science poses a challenge to this by explaining all events, including human actions, in terms of causal processes. Are people justified in thinking of themselves as free? Major philosophical approaches to this question: incompatibilism, compatibilism, and the two-standpoint view. GER:DB-Hum
4 units, not given this year

PHIL 175/275. Philosophy of Law—(Graduate students register for 275.) Philosophical foundations of law and the legal system. The justifiability of patterns of assigning legal responsibility within criminal law. Prerequisite: four courses in Philosophy including 80. GER:DB-Hum
4 units, not given this year

PHIL 176/276. Political Philosophy: The Social Contract Tradition—(Graduate students register for 276.) Why and under what conditions do human beings need political institutions? What makes them legitimate or illegitimate? What is the nature, source, and extent of the obligation to obey the legitimate ones, and how should people alter or overthrow the others? Answers by political theorists of the early modern period: Hobbes, Locke, Rousseau, and Kant. GER:DB-Hum
4 units, not given this year

PHIL 177. Philosophical Issues Concerning Race and Racism—(Same as POLISCI 136.) Concepts of race, race consciousness, and racism, and their connections. What is race and what is its role in racism? How should ethnic and racial identities be viewed to secure the conditions in which humanity can be seen as a single moral community whose members have equal respect? What laws, values, and institutions best embody the balance among competing goals of group loyalty, opposition to racism, and common humanity? Philosophical writings on freedom and equality, human rights, pluralism, and affirmative action. Historical accounts of group exclusion. GER:DB-Hum, EC-AmerCul
4 units, Win (Satz, D)

PHIL 178. Ethics in Society Honors Seminar—(Same as ETHICSOC 190.) For students planning honors in Ethics in Society. Methods of research. Students present issues of public and personal morality; topics chosen with advice of instructor.
3 units, Win (Reich, R)

PHIL 179/279. Semantics: Theories of Meaning—(Graduate students register for 279.) What makes ambiguity, polysemy, and context sensitivity needed in natural languages; why this is not the case with formal languages. How to develop semantics for context-sensitive structures.
4 units, not given this year

PHIL 179S/279S. Moral Psychology, Reasons for Action, and Moral Theory—(Graduate students register for 279S.) What sorts of considerations does an ethical agent take to be good reasons for action? Work in moral psychology to illuminate the theory of practical reasons, and the theory of practical reasons to test the prospects for systematic moral theory. Can any systematic moral theory be reconciled with the moral psychology of ordinary, morally respectable agents? Reading include Bernard Williams, Rosalind Hursthouse, Peter Railton, T.M. Scanlon, and Barbara Herman.
4 units, not given this year

EPISTEMOLOGY, METAPHYSICS, PHILOSOPHY OF MIND, AND PHILOSOPHY OF LANGUAGE

PHIL 180/280. Metaphysics—Traditional philosophical riddles involving the notion of existence including: the ontological argument for the existence of God; the problem of intuitively true, negative existential statements; the sorites paradox; and the question of why there is anything at all. Conceptual tools philosophers use to address these questions, from nonexistent objects to possible worlds. Meta-metaphysics.
4 units, Aut (Burgess, A)

PHIL 181/281. Philosophy of Language—(Graduate students register for 281.) The study of conceptual questions about language as a focus of contemporary philosophy for its inherent interest and because philosophers see questions about language as behind perennial questions in other areas of philosophy including epistemology, philosophy of science, metaphysics, and ethics. Key concepts and debates about the notions of meaning, truth, reference, and language use, with relations to psycholinguistics and formal semantics. Readings from philosophers such as Frege, Russell, Wittgenstein, Grice, and Kripke. Prerequisites: 80 and background in logic.
4 units, Win (Føllesdal, D)

PHIL 182. Truth—Philosophical debates about the place in human lives and the value to human beings of truth and its pursuit. The nature and significance of truth-involving virtues such as accuracy, sincerity, and candor.
4 units, Aut (Hills, D)

PHIL 184/284. Theory of Knowledge—(Graduate students register for 284.) Competing theories of epistemic justification (foundationalism, coherentism, and externalism) against the background of radical scepticism. Readings from contemporary sources. Prerequisite: 80 or consent of instructor. GER:DB-Hum
4 units, Spr (Lawlor, K)

PHIL 184F/284F. Feminist Theories of Knowledge—(Graduate students register for 284F; same as FEMST 166.) Feminist critique of traditional approaches in epistemology and alternative feminist approaches to such topics as reason and rationality, objectivity, experience, truth, the knowing subject, knowledge and values, knowledge and power. GER:DB-Hum, EC-Gender
4 units, not given this year

PHIL 185. Memory—Structure, content, functional role, and epistemic authority of human memories. Sources include philosophical and psychological literature from different schools and historical periods.
4 units, Win (Hills, D)

PHIL 186/286. Philosophy of Mind—(Graduate students register for 286.) Debates concerning the nature of mental states, their relation to physical states of the human body, how they acquire their content, how people come to know about them in themselves and others, and the roles they play in the explanation of human conduct.
4 units, Win (Perry, J)

PHIL 187/287. Philosophy of Action—(Graduate students register for 287.) What is it to be an agent? Is there a philosophically defensible contrast between being an agent and being a locus of causal forces to which one is subject? What is it to act purposively? What is intention? What is it to act intentionally? What is it to act for a reason? Are the reasons for which one acts causes of one's action? What is it to act autonomously? Readings include Davidson and Frankfurt. Prerequisite: 80. GER:DB-Hum
4 units, not given this year

PHIL 188. Personal Identity—People seem to remain the same despite the changes they undergo during their lives. Why? The answer can influence one's beliefs about whether people are essentially bodies or minds, and whether one's own survival matters. Readings include John Locke, Thomas Reid, David Hume, Bernard Williams, and Derek Parfit. GER:DB-Hum
4 units, not given this year

PHIL 190. Introduction to Cognitive Science—(Same as LINGUIST 144, PSYCH 130, SYMBSYS 100.) The history, foundations, and accomplishments of the cognitive sciences, including presentations by leading Stanford researchers in artificial intelligence, linguistics, philosophy, and psychology. Overview of the issues addressed in the Symbolic Systems major. GER:DB-SocSci
4 units, Spr (Davies, T)

PHIL 193W. Nietzsche, Doestoevsky, and Sartre—(Same as HUMNTIES 193W.) Literary works in which philosophical ideas and issues are put forward, such as prose poems, novels, and plays. Ideas and issues and the dramatic or narrative structures through which they are presented. Texts include: Nietzsche, *Thus Spoke Zarathustra*; Dostoevsky, *The Brothers Karamazov*; and Sartre, *Nausea* and *No Exit*.
4 units, Aut (Wood, A)

PHIL 194A. Empiricism and the Philosophy of Mind—Priority to majors. 20th-century analytic and early modern philosophy of mind and epistemology. Main text is Wilfrid Sellars's *Empiricism and the Philosophy of Mind*; source materials and commentary. Enrollment limited to 12.
4 units, Aut (Dunlop, K)

PHIL 194B. The Ethics of Belief—Priority to majors. Are beliefs subject to moral evaluation? Can it be right or wrong to believe or disbelieve something? Are people morally required to believe only that for which there is sufficient evidence; or can the good consequences of believing something justify the belief, irrespective of the evidence? Contemporary and historical sources. Enrollment limited to 12.
4 units, Win (Wood, A)

PHIL 194E. Undergraduate Seminar: Ethical Antitheory—May be repeated for credit.
4 units, Win (Hills, D)

PHIL 195A. Unity of Science—Primarily for seniors.
4 units, Spr (Potochnik, A)

PHIL 195B. Donor Seminar: Practical Reasoning—Primarily for seniors. Relationships among action, deliberation, reasons, and rationality. On what basis do people decide what to do? What norms or rules structure reasoning? What constitutes rationality?
4 units, Aut (Morton Galdos, J)

PHIL 196. Tutorial, Senior Year
5 units, Aut, Win, Spr, Sum (Staff)

PHIL 197. Individual Work, Undergraduate—May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

PHIL 198. *The Dualist*—Weekly meeting of the editorial board of *The Dualist*, a national journal of undergraduate work in philosophy. Open to all undergraduates. May be taken 1-3 quarters. (AU)
1 unit, Aut, Win, Spr (Angelides, A)

PHIL 199. Seminar for Prospective Honors Students—Open to juniors intending to do honors in philosophy. Methods of research in philosophy. Topics and strategies for honors project. May be repeated for credit.
2 units, Spr (Staff)

PRIMARILY FOR GRADUATE STUDENTS

PHIL 224. Kant's Philosophy of Physical Science—Kant's *Metaphysical Foundations of Natural Science* (1786), published between the first (1781) and second (1787) editions of the *Critique of Pure Reason*, in the scientific and philosophical context provided by Newtonian natural philosophy and the Leibnizean tradition. The place of this work in the development of Kant's thought. Prerequisite: acquaintance with either Kant's theoretical philosophy or the contemporaneous scientific context, principally Newton, Leibniz, and Euler.
4 units, Win (Friedman, M)

PHIL 233. Husserl—Husserl's phenomenology. Main themes in his philosophy and their interconnections, including consciousness, perception, intersubjectivity, lifeworld, ethics, mathematics and the sciences, and time and space. Works in English translation.
4 units, not given this year

PHIL 239. Teaching Methods in Philosophy—For Ph.D. students in their first or second year who are or are about to be teaching assistants for the department. May be repeated for credit.
1-4 units, Aut (Potochnik, A)

PHIL 240. Individual Work for Graduate Students—May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

PHIL 241. Dissertation Development Seminar—Required of second-year Philosophy Ph.D. students; restricted to Stanford Philosophy Ph.D. students. Prerequisite: consent of instructor.
2-3 units, Sum (Staff)

PHIL 242. The Philosophical and Educational Thought of John Dewey—(Same as EDUC 304.) Dewey's pragmatic philosophy and educational thought; his debt to Darwin, Hegel, Peirce, and James; his educational writings including *Democracy and Education*; and his call for a revolution in philosophy in *Reconstruction in Philosophy*. (SSPEP)
4 units, not given this year

PHIL 248. Medieval Latin Paleography—The history of medieval scripts and medieval abbreviation. Dating and placing Latin European medieval manuscripts. Editing medieval texts in philosophy, psychology, physics, and theology. Class project: an anonymous commentary on Aristotle's *Ethics* preserved in a Florentine manuscript.
3-5 units, not given this year

PHIL 258. Minds and Machines—Readings on arguments concerning mechanical models of the mind including Turing machine models to which Gödel's incompleteness theorems are relevant, and connectionist (neural net) models. Prerequisites: 151 (formerly 160A), 152, or equivalents. Recommended: 389.
4 units, not given this year

PHIL 312. Aristotle's Psychology—*De Anima* and parts of *Parva Naturalia*.
4 units, Win (Bobonich, C)

PHIL 318. Aristotle's *Ethics*—Topics in Aristotle's ethical theory and related parts of his psychology.
4 units, not given this year

PHIL 322. Hume—Hume's theoretical philosophy emphasizing skepticism and naturalism, the theory of ideas and belief, space and time, causation and necessity, induction and laws of nature, miracles, a priori reasoning, the external world, and the identity of the self.
4 units, not given this year

PHIL 323. Kant's Criticism of Metaphysics—Motivations and strategies of Kant's criticisms of traditional metaphysics in the *Critique of Pure Reason*. Leibnizian and Wolffian versions of the concept containment theory of truth and the Wolffian ideal of a conceptual system of metaphysical knowledge. Kant's analytic/synthetic distinction, focusing on its place in the rejection of metaphysics and in arguments about the ideas of reason in the transcendental dialectic. Prerequisite: course on the first *Critique*, or consent of instructor.
4 units, not given this year

PHIL 332. Nietzsche—Preference to doctoral students. Nietzsche's later works emphasizing *The Gay Science*, *Beyond Good and Evil*, and *On the Genealogy of Morals*. The shape of Nietzsche's philosophical and literary projects, and his core doctrines such as eternal recurrence, will to power, and perspectivism. Problems such as the proper regulation of belief, and the roles of science, morality, art, and illusion in life.
4 units, not given this year

PHIL 335. Topics in Aesthetics—May be repeated for credit.
4 units, not given this year

PHIL 350A. Model Theory—Language and models of the first order, predicate calculus, complete and decidable theories. Fraisse-Ehrenfeucht games. Preservation theorems. Prerequisites: 150,151, or equivalent.
3 units, not given this year

PHIL 350B. Finite Model Theory—(Same as MATH 290B.) Classical model theory deals with the relationship between formal languages and their interpretation in finite or infinite structures; its applications to mathematics using first-order languages. The recent development of the model theory of finite structures in connection with complexity classes as measures of computational difficulty; how these classes are defined within certain languages that go beyond first-order logic in expressiveness, such as fragments of higher order or infinitary languages, rather than in terms of models of computation.
3 units, not given this year

PHIL 351A. Recursion Theory—Theory of recursive functions and recursively enumerable sets. Register machines, Turing machines, and alternative approaches. Gödel's incompleteness theorems. Recursively unsolvable problems in mathematics and logic. Introduction to higher recursion theory. The theory of combinators and the lambda calculus. Prerequisites: 151, 152, and 161, or equivalents.
3 units, not given this year

PHIL 351B. Constructive Mathematics—Effective and non-effective proofs. Background from constructive logic and computability. Elementary constructive analysis, recursive analysis. Constructive models. Foundational issues. May be repeated for credit. Prerequisites: 151, 152, or equivalents, and a calculus class.
3 units, not given this year

PHIL 352A,B. Set Theory—(Same as MATH 292A,B) The basics of axiomatic set theory; the systems of Zermelo-Fraenkel and Bernays-Gödel. Topics: cardinal and ordinal numbers, the cumulative hierarchy and the role of the axiom of choice. Models of set theory, including the constructible sets and models constructed by the method of forcing. Consistency and independence results for the axiom of choice, the continuum hypothesis, and other unsettled mathematical and set-theoretical problems. Prerequisites: PHIL160A,B, and MATH 161, or equivalents.
3 units, **A:** *Aut,* **B:** *Win (Tupailo, S)*

PHIL 353A. Proof Theory—(Same as MATH 293A.) Gentzen's natural deduction and sequential calculi for first-order propositional and predicate logics. Normalization and cut-elimination procedures. Relationships with computational lambda calculi and automated deduction. Prerequisites: 151, 152, and 161, or equivalents.
3 units, Aut (Mints, G)

PHIL 353B. Higher-Order Logic—Second-order and general higher-order logic. Expressive power and failure of classical theorems such as axiomatizability, compactness, and Loewenheim-Skolem. Different systems of higher-order logic, including type theory. Proof theory and completeness over general models. History of type theory as an alternative foundation of mathematics. Applications in computer science and linguistics. Prerequisite: 151. Recommended: 152.
3 units, Aut (Pauly, M)

PHIL 354. Topics in Logic—Readings on uses of proof theory in analysis and number theory. Proof mining: extraction of bounds from non-effective proofs, uniformity results. May be repeated for credit. Prerequisites: 151, 152, or equivalents, and a 100-level MATH course.
3 units, Win (Mints, G)

PHIL 355. Logic and Social Choice—Topics in the intersection of social choice theory and formal logic. Voting paradoxes, impossibility theorems and strategic manipulation, logical modeling of voting procedures, preference versus judgment aggregation, role of language in social choice, and metatheory of social choice. May be repeated for credit. Prerequisite: 151 or consent of instructor.
4 units, not given this year

PHIL 356. Applications of Modal Logic—Applications of modal logic to knowledge and belief, and actions and norms. Models of belief revision to develop a dynamic doxastic logic. A workable modeling of events and actions to build a dynamic deontic logic on that foundation.
3 units, not given this year

PHIL 358. Rational Agency and Intelligent Interaction—(Same as CS 222.) For advanced undergraduates, and M.S. and beginning Ph.D. students. Logic-based methods for knowledge representation, information change, and games in artificial intelligence and philosophy. Topics: knowledge, certainty, and belief; time and action; belief dynamics; preference and social choice; games; and desire and intention. Prerequisite: propositional and first-order logic. Recommended: modal logic; game theory.
3 units, Spr (Shoham, Y; vanBenthem, J)

PHIL 359. Advanced Modal Logic—Mathematical analysis of modal systems, including bisimulation and expressive power, correspondence theory, algebraic duality, completeness and incompleteness, and extended modal logics, up to guarded fragments of first-order logic, fixed-point logics, and second-order logic. Prerequisite: 151, 154/254, or equivalent background.
4 units, Spr (vanBenthem, J)

PHIL 360. Core Seminar in Philosophy of Science—Limited to first- and second-year Philosophy Ph.D. students.
4 units, alternate years, not given this year

PHIL 365. Seminar in Philosophy of Science: Structural Realism—This recent version of scientific realism and its differences with standard realism and antirealism. Historical antecedents in Hertz, Poincaré, Russell, Eddington, and Weyl.
4 units, not given this year

PHIL 366. Evolution and Communication
4 units, Spr (Skyrms, B)

PHIL 370. Core Seminar in Ethics—Limited to first- and second-year students in the Philosophy Ph.D. program.
4 units, Spr (Schapiro, T)

PHIL 372. Problems in Kantian Ethics—May be repeated for credit.
4 units, not given this year

PHIL 372C. Graduate Seminar: Global Justice—(Same as POLISCI 432.) Applicability of the idea of justice to global politics; the foundations and substance of human rights; problems of accountability, democracy, and the rule of law in global governance; and issues of distributive justice.
5 units, not given this year

PHIL 372D. Graduate Seminar: John Rawls's Political Philosophy—(Same as POLISCI 332.) Leading ideas in *A Theory of Justice, Political Liberalism*, and *The Law of Peoples*.
5 units, Win (Cohen, J)

PHIL 373. Moral Psychology: The Concept of Inclination—The weight placed by Kantian and rationalist moral theories on the distinction between inclination and reason. The concept of inclination as that which inclines but does not determine how people act. How are inclinations related to the people who hold them? Are they expressions of values, or more like internal weather? What is their nature? What does it mean to act from inclination? Are actions on inclination unchosen or just badly chosen? Historical and contemporary sources.
4 units, Aut (Schapiro, T)

PHIL 374. Caring and Practical Reasoning—What is it to care about something; how is caring related to desiring, emotions, and having policies; what is the relationship between caring and the will; why do people care about things; can attention to caring help explain the phenomenon of silencing reasons? Readings from contemporary literature, including Frankfurt, Watson, Bratman, Scanlon, Williams, Helm, and Kolodny. May be repeated for credit.
4 units, Spr (Jaworska, A)

PHIL 374C. Democracy and the Constitution—(Same as POLISCI 434.) Connections between democratic theory and constitutional theory. Sources include literature from political philosophy, constitutional law, and jurisprudence, and arguments about freedom of expression, campaign finance, legislative apportionment, and privacy. Readings from Scalia, Breyer, Ely, Ackerman, Dahl, Habermas, Dworkin, Przeworski, Riker, and Schumpeter. Non-Law enrollment limited to 10 chosen by lottery.
5 units, not given this year

PHIL 376. Agency and Personal Identity—How philosophical theories of agency interact with philosophical accounts of personal identity. Readings include David Velleman and Harry Frankfurt.
4 units, not given this year

PHIL 377. Topics in Democratic Theory—(Same as POLISCI 333.) Modern approaches to democratic theory including liberal, communitarian, republican, and participatory theories beginning with the works of Locke, Rousseau, and Mill. Writers: John Rawls, Ronald Dworkin, Jeremy Waldron, Joshua Cohen, Habermas, Petit, Iris Marion Young, Ian Shapiro, and Amy Gutman.
3-5 units, not given this year

PHIL 378. Problems in Medical Ethics—Focus is on recent philosophical work concerning the moral status of non-paradigmatic human beings such as fetuses or Alzheimer's patients, and non-ideal conditions of decision making such as concretized emotions or exploitation. Prerequisite: 170 or equivalent.
4 units, not given this year

PHIL 379. Graduate Seminar in Metaethics—Theories about the meaning of ethical terms and the content of ethical judgements. Do these theories fit with best accounts of human agency and practical deliberation? Readings from recent literature. Prerequisites: 173B/273B, 181, 187/287 or equivalent.
4 units, Aut (Hussain, N)

PHIL 380. Core Seminar in Metaphysics and Epistemology—Limited to first- and second-year students in the Philosophy Ph.D. program.
4 units, Aut (Lawlor, K)

PHIL 381. Core Seminar in Philosophy of Language—Limited to first- and second-year students in the Philosophy Ph.D. program.
4 units, alternate years, not given this year

PHIL 382. Seminar on Reference—Philosophical issues concerning the relationship between linguistic expressions and the objects to which they refer. Is it possible to get one unified theory of reference for different kinds of referring expressions such as proper names, pronouns, demonstratives, and other kinds of indexicals? Unsolved problems and desiderata for a theory of reference?
4 units, Win (Føllesdal, D; Taylor, K)

PHIL 383. Philosophy of Mind Seminar—May be repeated for credit.
4 units, Win (Taylor, K)

PHIL 384. Seminar in Metaphysics and Epistemology—May be repeated for credit.
4 units, Spr (Perry, J)

PHIL 385. Philosophy of Language Seminar: Foundations of Non-factualism—How could a meaningful, declarative sentence fail to say anything true or false? Focus is on Huw Price's *Facts and the Function of Truth*.
4 units, Win (Burgess, A)

PHIL 386B. Subjectivity—Readings from Husserl and others in the phenomenological tradition, and recent work on intentionality and consciousness by philosophers and cognitive scientists.
4 units, not given this year

PHIL 386C. Subjectivity—Continuation of 386B.
4 units, not given this year

PHIL 387. Shared Agency—Contemporary work. May be repeated for credit.
4 units, not given this year

PHIL 387S. Practical Reasons and Practical Reasoning—Attempts to develop alternatives to Humean, instrumentalist conceptions of practical reasoning, and alternatives to Humean, non-cognitivist views of practical reasons. Readings include Aurel Kolnai, Bernard Williams, David Wiggins, Joseph Raz, Michael Bratman, Elijah Millgram, and T.M. Scanlon.
4 units, not given this year

PHIL 388. Normativity—May be repeated for credit.
4 units, not given this year

PHIL 391. Research Seminar in Logic and the Foundations of Mathematics—(Same as MATH 391.) Contemporary work. May be repeated a total of three times for credit.
1-3 units, Aut, Win, Spr (Mints, G; Feferman, S)

PHIL 450. Thesis
1-15 units, Aut, Win, Spr, Sum (Staff)

PHIL 470. Proseminar in Moral Psychology—Restricted to Philosophy doctoral students. May be repeated for credit.
4 units, not given this year

PHIL 500. Advanced Ph.D. Proseminar—Presentation of dissertation work in progress by seminar participants. May be repeated for credit.
1 unit, Aut, Win, Spr (Anderson, L; Taylor, K)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CLASSGEN 22N. Technologies of Civilization: Writing, Number, and Money
4-5 units, Spr (Netz, R)

CLASSGEN 94. Ethics of Pleasure
3-5 units, Spr (Peponi, A)

CLASSGEN 208B. Survey of Greek and Latin Literature: Classical Greek
4-5 units, Win (Nightingale, A)

CLASSGEN 237. Augustine on the Body—(Same as COMPLIT 337.)
4-5 units, Spr (Nightingale, A)

CLASSGRK 113/213. Advanced Greek: Palaeography
3-5 units, Spr (Netz, R)

CLASSHIS 101. The Greeks
4-5 units, Win (Ober, J; Krotscheck, U)

CLASSHIS 250A,B. Greek Political Economy I,II—(Same as POLISCI 332R.)
4-5 units, **A:** *Win,* **B:** *Spr (Manning, J; Ober, J)*

ETHICSOC 179M. Libertarianism and Its Critics
4 units, Spr (Staff)

HPS 154. What is Science? Explaining Nature from Pythagoras to Popper
3-5 units, Aut (McCaskey, J)

LAW 206. Core Legal Concepts: Thinking Like a Lawyer—(Same as GSBGEN 382.)
3 units, Aut (Kelman, M; Kramer, L)

MATH 161. Set Theory
3 units, Win (Feferman, S)

POLISCI 136R. Introduction to Global Justice—(Same as INTNLREL 136R.)
5 units, Spr (Staff)

POLISCI 331S. Politics and Collective Action—(Same as IPS 206A, PUBLPOL 204A.)
4 units, Win (Satz, D)

PHYSICS

Emeriti: (Professors) Alexander I. Fetter,* Stanley S. Hanna, William A. Little, David M. Ritson, H. Alan Schwettman,* Robert V. Wagoner,* Mason R. Yearian; *(Professors, Research)* Todd I. Smith,* John P. Turneaure; *(Professors, Courtesy)* Peter A. Sturrock (Applied Physics), Richard Taylor (SLAC)

Chair: Patricia Burchat

Director of Graduate Study: Sarah Church

Director of Undergraduate Study: Roger W. Romani

Professors: Roger Blandford, Phil Bucksbaum, Patricia Burchat, Blas Cabrera, Steven Chu (on leave), Savas G. Dimopoulos, Sebastian Doniach, Giorgio Gratta, Shamit Kachru, Steven Kahn, Renata E. Kallosh, Aharon Kapitulnik, Mark Kasevich, Steven A. Kivelson, Robert B. Laughlin, Andrei D. Linde, Peter F. Michelson, Douglas D. Osheroff, Vahé Petrosian, Roger W. Romani, Zhi-Xun Shen, Stephen Shenker, Eva Silverstein, Leonard Susskind, Stanley G. Wojcicki, Shoucheng Zhang

Associate Professors: Tom Abel, Sarah Church, Kathryn Moler

Assistant Professors: Steve Allen, Stefan Funk, David Goldhaber-Gordon, Hari Manoharan, Risa Wechsler

Professors (Research): John A. Lipa, Phillip H. Scherrer

Courtesy Professor: Richard N. Zare

Lecturer: Rick Pam

Consulting Professors: Ralph Devoe, Gerald Fisher, Alan Title

Visiting Professor: Douglas Gough

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* Recalled to active duty.

Department Offices: 382 Via Pueblo Mall
Mail Code: 94305-4060
Phone: (650) 723-4344
Web Site: http://www.stanford.edu/dept/physics

Courses in Physics have the subject code PHYSICS. For a complete list of subject codes, see Appendix.

The Russell H. Varian Laboratory of Physics, the new Physics and Astrophysics Building, the nearby W. W. Hansen Experimental Physics Laboratory (HEPL), the E. L. Ginzton Laboratory, and the Geballe Laboratory for Advanced Materials (GLAM) together house a range of physics activities from general courses through advanced research. Ginzton Lab houses research on optical systems, including quantum electronics, metrology, optical communication and development of advanced lasers. GLAM houses research on novel and nanopatterned materials, from high-temperature superconductors and magnets to organic semiconductors, sub-wavelength photon waveguides, and quantum dots. GLAM also supports the materials community on campus with a range of characterization tools: it is the site for the new Stanford Nanocharacterization Lab (SNL) and the NSF-sponsored Center for Probing the Nanoscale (CPN). The Stanford Linear Accelerator Center (SLAC) is just a few miles from the Varian Laboratory. SLAC is a high-energy physics lab with a two-mile-long linear accelerator that can accelerate electrons and positrons up to 50 GeV, and produce highly polarized electron beams. The PEP-II asymmetric-energy electron-positron storage ring is used to study CP violation in the B meson system. The Stanford Synchrotron Radiation Laboratory (SSRL) uses intense x-ray beams produced with another smaller storage ring on the SLAC site. Construction of the world's first x-ray free electron laser, called the Linac Coherent Light Source, is underway at SLAC. The facility is expected to be operational in 2009.

The Ginzton Laboratory, HEPL, GLAM, SLAC, and SSRL are listed in the "Academic Programs and Centers, Independent Research Laboratories, Centers, and Institutes" section of this bulletin. Students may also be interested in research and facilities at two other independent labs: the Center for Integrated Systems, focused on electronics and nanofabrication; and the Clark Center, a new interdisciplinary biological sciences, medicine, and bioengineering laboratory.

The Kavli Institute for Particle Astrophysics and Cosmology (KIPAC), formed jointly with the Stanford Linear Accelerator Center (SLAC), provides a focus for theoretical, observational, and instrumental research programs, including the Gamma Ray Large Area Space Telescope (GLAST) and the Large Synoptic Survey Telescope (LSST). Stanford is a member of the Hobby-Eberly Telescope Consortium, operating an innovative 9.2 meter-equivalent telescope at the McDonald Observatory in Texas. The CDMS (cryogenic dark matter search) experiment is operated in an underground laboratory on the Stanford campus and in the Soudan mine in Minnesota. Stanford is taking a lead role in the EXO-200 double-beta decay experiment that is expected to start taking data in 2008 at a deep underground site in southern New Mexico. These are research opportunities for students in this growing interdisciplinary field.

The Stanford Institute for Theoretical Physics is devoted to the investigation of the basic structure of matter (string theory, M-theory, quantum cosmology, condensed matter physics).

The Physics Library, a center for the reading and study of physics and astronomy at all levels, includes print and electronic access to current subscriptions and back sets of important journals together with textbooks, dissertations, scholarly monographs, and the collected works of the most eminent physicists.

Course work is designed to provide students with a sound foundation in both classical and modern physics. Students who wish to specialize in astronomy, astrophysics, or space science should also consult the "Astronomy Course Program" section of this bulletin.

Three introductory series of courses include labs in which undergraduates carry out individual experiments. The Intermediate Physics Laboratories offer facilities for increasingly complex individual work, including the conception, design, and fabrication of laboratory equipment. Undergraduates are also encouraged to participate in research; most can do this through the honors program and/or the summer research program.

Graduate students find opportunities for research in the fields of astrophysics, particle astrophysics, cosmology, experimental particle physics, theoretical particle physics, intermediate energy physics, low temperature physics, condensed matter physics, materials research, atomic physics, laser physics, quantum electronics, coherent optical radiation, novel imaging technologies, and biophysics. Faculty advisers are drawn from many departments, including Physics, Applied Physics, Materials Science and Engineering, Electrical Engineering, and Biological Sciences. Opportunities for research are also available with the faculty at SLAC in the areas of theoretical and experimental particle physics, particle astrophysics, cosmology accelerator design, and photon science.

The number of graduate students admitted to the Department of Physics is strictly limited. Students should submit applications by Tuesday, December 11 for the following Autumn Quarter. Graduate students may normally enter the department only at the beginning of Autumn Quarter.

UNDERGRADUATE PROGRAMS

The study of physics is undertaken by three principal groups of undergraduates: those including physics as part of a general education; those preparing for careers in professional fields that require a knowledge of physics, such as medicine or engineering; and those preparing for careers in physics or related fields, including teaching and research in colleges and universities, research in federally funded laboratories and industry, and jobs in technical areas. Physics courses numbered below 100 are intended to serve all three of these groups. The courses numbered above 100 meet the needs mainly of the third group, but also of some students majoring in other branches of science and in engineering.

ENTRY-LEVEL SEQUENCES

The Department of Physics offers three-year, entry-level physics sequences, the PHYSICS 20, 40, and 60 series. The first of these is non-calculus-based, and is intended primarily for those who are majoring in the biological sciences. Such students with AP Physics credit, particularly those who are considering research careers, may wish to consider taking the PHYSICS 20 or 40 series, rather than using AP placement. These introductory series provide a depth and emphasis on problem solving that is of significant value in biological research, which today involves considerable physics-based technology.

For those intending to major in engineering or the physical sciences, or simply wishing a stronger background in physics, the department offers the

PHYSICS 40 and 60 series. Either of these satisfies the entry-level physics requirements of any Stanford major. The 60 series is intended for those who have already taken a Physics course at the level of the 40 series, or at least have a strong background in mechanics, some background in electricity and magnetism, and a strong background in calculus. The PHYSICS 40 series begins with mechanics in Winter Quarter, electricity and magnetism in Spring Quarter, and light and heat in Autumn Quarter. While it is recommended that most students begin the sequence with mechanics (PHYSICS 41) in Winter Quarter, those who have had strong physics preparation in high school (such as a score of at least 4 on the Physics Advanced Placement C exam) may start the sequence with PHYSICS 45 in Autumn Quarter.

BACHELOR OF SCIENCE

A calculus-based entry-level series is required, either PHYSICS 61, 63, 64, 65, 67, or 41, 43, 44, 45, 46 (or preferably 67 rather than 44). Students who take the PHYSICS 40 series take PHYSICS 70, which covers the foundations of modern physics. This material is incorporated into the PHYSICS 60 series beginning in 2005-06. Students taking the PHYSICS 60 series in 2005-06 or after do not take PHYSICS 70; instead, they must take one advanced Physics elective (100-level or higher). In addition, the following more advanced courses are required: PHYSICS 105, 107 (WIM), 108, 110, 120, 121, 130, 131, 170, and 171; MATH 51, 52, 53, 131; one additional Mathematics course numbered 100 or higher, or PHYSICS 112. MATH 51H, 52H, and 53H may substitute for MATH 51, 52, and 53. It is strongly recommended that students intending to complete a Ph.D. in Physics also take PHYSICS 113, 134, and one or more of the following, depending upon their interests: PHYSICS 152, 153A,B, 160, 161, 172, 204 and EE 268. PHYSICS 113 is designed to be taken in parallel with 110. The department advises the study of some computer science such as CS 106. Mathematics and Physics courses taken to satisfy the department's major requirements cannot be taken on a credit/no credit basis. Prospective Physics majors are also advised to take PHYSICS 59, Current Research Topics, in their freshman or sophomore year.

To help in deciding which introductory sequence is most suitable, students considering a major in Physics may contact the undergraduate program coordinator (elva@stanford.edu) to arrange an advising appointment. Although it is possible to complete the Physics major in three years, students who contemplate starting the major during sophomore year should make an advising appointment to map out their schedule. Students with significant advanced preparation in physic beyond AP Physics C or A-levels should consult with Professor Romani before the start of classes to determine appropriate placement.

For advanced placement advice, see http://registrar.stanford.edu/students/academics/adv_place.htm.

Undergraduates are offered help with physics problems in the Physics Tutoring Center, which is staffed Monday through Friday.

REQUIRED COURSES FOR MAJORS

For sample schedules illustrating how to complete the Physics major, see http://physics.stanford.edu/academics/undergrad.html.

INTRODUCTORY SEQUENCE

Students must complete either the 40 or 60 series as follows:

40 Series:	*Qtr. and Units*	
PHYSICS 41. Mechanics	W	4
PHYSICS 43. Electricity and Magnetism	S	4
PHYSICS 44. Electricity and Magnetism Lab	S	1
PHYSICS 45. Light and Heat	A	4
PHYSICS 46. Light and Heat Lab	A	1
PHYSICS 67. Introduction to Laboratory Physics (recommended for prospective majors in place of 44)	S	2
PHYSICS 70. Foundations of Modern Physics	A	4
60 Series:		
PHYSICS 61. Mechanics and Special Relativity	A	4
PHYSICS 63. Electricity, Magnetism and Waves	W	4
PHYSICS 64. Electromagnetism Lab	W	1
PHYSICS 65. Thermodynamics and Foundations of Modern Physics	S	4
PHYSICS 67. Introduction to Laboratory Physics	S	2
and		
MATH 51, 52, 53. Linear Algebra, Multivariable Calculus, and Ordinary Differential Equations	A,W,S	15
PHYSICS 59. Current Research Topics (recommended)*	A	1

INTERMEDIATE SEQUENCE

PHYSICS 105. Intermediate Laboratory I: Analog Electronics	A	3
PHYSICS 107. Intermediate Laboratory II: Exp. Techniques (WIM)	W	4
PHYSICS 108. Intermediate Laboratory III: Project	W or S	3
PHYSICS 110. Intermediate Mechanics	S	4
PHYSICS 112. Math Methods of Physics (recommended)**	W	4
PHYSICS 113. Computational Physics (recommended)*	S	4
PHYSICS 120,121. Intermediate Electricity and Magnetism	W,S	8
and MATH 131. Partial Differential Equations	A,W	3

ADVANCED SEQUENCE

PHYSICS 130,131. Quantum Mechanics	A,W	8
PHYSICS 134. Advanced Topics in Quantum Mechanics*	S	4
PHYSICS 170,171. Statistical Mechanics	A,W	8
and one advanced Mathematics elective (100 level or higher) *or* PHYSICS 112		
One advanced Physics elective (100 level or higher): required only for students who are not required to take PHYSICS 70		

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* These courses are not required, but 113 and 134 are recommended for students who intend to complete a Ph.D. in Physics.

** Those wishing to do physics theory in graduate school may wish to take a collection of courses in the Department of Mathematics rather than or in addition to PHYSICS 112.

CONCENTRATIONS IN PHYSICS

The primary purpose of concentrations in the Physics major is to provide consistent and more formal advising to students who want to concentrate in a particular area of physics during their undergraduate education, or prepare for future graduate studies in a particular area of physics. Physics majors are not required to choose a concentration and a concentration does not add any formal requirements to the Physics major. Upon graduation, students receive a certificate of completion of a concentration.

Students seeking further advice on a given concentration should contact the professor whose name appears next to the respective title of each section below.

A. APPLIED PHYSICS (Hari Manoharan)

At least four, one quarter courses chosen from the following courses, or three courses plus an honors thesis:

Solid State:

PHYSICS 172. Solid State Physics
APPPHYS 218. Scattering Physics
APPPHYS 270. Magnetism and Long Range Order in Solids
MATSCI 195. Waves and Diffraction in Solids

Biophysics:

APPPHYS 192. Introductory Biophysics

Lasers:

EE 268. Introduction to Modern Optics
EE 231. Introduction to Lasers
EE 232. Laser Dynamics

Lab Methods:

APPPHYS 207, 208. Laboratory Electronics, Analog and Digital
APPPHYS 304. Lasers Laboratory
APPPHYS 305. Nonlinear Optics Laboratory

B. ASTROPHYSICS (Roger Romani, Sarah Church)

Requirements:

PHYSICS 100. Introduction to Observational and Laboratory Astronomy
PHYSICS 160. Introduction to Stellar and Galactic Astrophysics
PHYSICS 161. Introduction to Extragalactic Astrophysics and Cosmology

Plus one elective from below or an honors thesis:

PHYSICS 211. Continuum Mechanics
PHYSICS 260. Introduction to Astrophysics and Cosmology
PHYSICS 262. Introduction to Gravitation
PHYSICS 312. Basic Plasma Physics; prerequisites are PHYSICS 210 and 220)

C. BIOPHYSICS (David Goldhaber-Gordon)

At least four, one quarter courses chosen from the following courses, or three courses plus an honors thesis:

APPPHYS 192/292. Introductory Biophysics
BIOC 202. Metabolic Biochemistry
BIOPHYS 228. Computational Structure Biology
BIOSCI 141. Biostatistics
BIOSCI 132/232. Advanced Imaging Lab In Biophysics
BIOSCI 135/HUMBIO 182. Biological Clocks
BIOSCI 211. Biophysics of Sensory Transduction
BIOSCI 217. Neuronal Biophysics
CS 273.Algorithms for Structure and Motion In Biology

It is recommended that Physics majors interested in pursuing a career in biophysics consider a minor in Biological Sciences.

D. GEOPHYSICS (Simon Klemperer, Geophysics)

At least four, one quarter courses chosen from the following courses, or three courses plus an honors thesis:

GEOPHYS 102. Geosphere
GEOPHYS 112. Exploring Geosciences with MATLAB
GEOPHYS 140. Introduction to Remote Sensing
GEOPHYS 150. General Geophysics and Physics of the Earth
GEOPHYS 180. Geophysical Inverse Problems
GEOPHYS 182. Reflection Seismology
GEOPHYS 190. Near-Surface Geophysics
GEOPHYS 262. Rock Physics
GEOPHYS 288. Crustal Deformation

E. THEORETICAL PHYSICS (Andrei Linde)

At least four, one quarter courses chosen from the following courses, or three courses plus an honors thesis:

PHYSICS 153A,B. Introduction to String Theory
PHYSICS 204. Advanced Seminar in Theoretical Physics
PHYSICS 212. Statistical Mechanics
PHYSICS 232. Special Topics in Quantum Mechanics
PHYSICS 252. Introduction to High Energy Physics
PHYSICS 260. Introduction to Astrophysics and Cosmology
PHYSICS 262. Introduction to Gravitation
PHYSICS 330,331,332. Quantum Field Theory
PHYSICS 351,352. Elementary Particle Physics
PHYSICS 362. Advanced Extragalactic Astrophysics and Cosmology
PHYSICS 364. Advanced Gravitation

Notes to students taking this concentration:

1. No more than one of the courses should be taken for CR/NC.
2. Students should discuss the choice of courses with members of the Institute for Theoretical Physics and/or their major adviser.
3. Students may attend 330 after taking 130, 131. Prior study of special topics in quantum mechanics (134, 232) may be helpful.

INDIVIDUALLY DESIGNED MAJOR PROGRAM IN TEACHING PHYSICAL SCIENCE

This major, a joint effort of the Department of Physics and the Stanford Teacher Education Program (STEP), is designed for students to prepare themselves as high school teachers of physics and general science. Students complete 45-47 units of Physics and related Mathematics courses, 40-43 units of course work in other sciences such as the life sciences, chemistry, and geosciences, and in general issues of science, and 9-15 units of concentration and depth courses. Total program units: 94-105. Students interested in this program should consult Professor Patricia Burchat (burchat@stanford.edu, 725-5771), and Professor Rachel Lotan, director of the STEP Coterminal Teaching Program in the School of Education (rlotan@stanford.edu).

CORE PHYSICS COURSES:

Mechanics:	Units
PHYSICS 41. Mechanics	
or PHYSICS 61. Mechanics and Special Relativity	4
Heat:	
PHYSICS 45. Light and Heat	
PHYSICS 46. Light and Heat Lab	
or	
PHYSICS 65. Thermodynamics and Foundations of Modern Physics	
PHYSICS 67. Introduction to Laboratory Physics	5-6
Electricity and Magnetism:	
PHYSICS 43. Electricity and Magnetism	
PHYSICS 67. Introduction to Laboratory Physics	
or	
PHYSICS 63. Electricity, Magnetism, and Waves	
PHYSICS 64. Electricity and Magnetism Lab	
and	
PHYSICS 105. Analog Electronics (Lab)	8-9
Wave Motion:	
PHYSICS 107 Intermediate Physics Laboratory II: Experimental Techniques and Data Analysis (WIM)	4
Modern Physics (for students who take 40 series):	
PHYSICS 70. Foundations of Modern Physics	4
Applications:	
PHYSICS 59. Current Research Topics	1
Mathematics (Physics departmental requirement):	
MATH 51,52,53. Linear Algebra, Multivariable Calculus, and Ordinary Differential Equations	
and a course in Statistics (choose one):	
STATS 110. Statistical Methods in Engineering and the Physical Sciences	
STATS 116. Theory of Probability	
STATS 141. Biostatistics	
STATS 166. Computational Biology	
STATS 191. Introduction to Applied Statistics	20
Total	46-48

ADDITIONAL SCIENCE BREADTH COURSES

Life Sciences:	
BIOSCI 41. Genetics, Biochemistry, and Molecular Biology	
BIOSCI 42. Cell Biology and Animal Physiology	
BIOSCI 43. Plant Biology, Evolution and Ecology	
or	
HUMBIO 2A,B, 3A,B, 4A,B	15
Chemistry:	
CHEM 31A and B, or 31X. Chemical Principles	
CHEM 33. Structure and Reactivity	8
Geosciences:	
EARTHSYS 10. Introduction to Earth Systems	
PHYSICS 15. The Nature of the Universe	
or PHYSICS 16. Cosmic Horizon	
or PHYSICS 17. Black Holes	8
General Issues of Science:	
STS 101. Science, Technology, and Contemporary Society	
EDUC 180. Directed Reading in History of Science	
ENGR 103. Public Speaking and Presentation Development	9-12

CONCENTRATION AND DEPTH COURSES

3 courses (100 level or above) in a single area of concentration	9-15
Total units for general science	49-58
Total units for the Physical Science program	94-105

This individually designed major program in Physical Science includes all the elements of a Program of Subject Matter Preparation for Secondary Teachers of Physics and General Science that has been approved by the California Commission on Teacher Credentialing (CCTC). Students who complete the program are exempt from taking the CSET examination in Physics and General Science for admission to the Stanford Teacher Education Program (STEP) or any other accredited secondary teacher education program in California. Full details of the CCTC-approved program may be found at http://ed.stanford.edu/suse/programs-degrees/program-co-terminal-step.html. *Note:* the Stanford individually designed major program in Physical Science requires course work beyond the CCTC-approved program, specifically 9-15 units of depth courses in a field of concentration: Physics, Astrophysics, Biological Sciences, Chemistry, Earth Sciences, Human Biology, or Computational Mathematics. See the adviser in the Physics department or the School of Education for more details.

MINORS

A minor is offered in either Physics or Astronomy. Students who take the 20 or 40 series at Stanford in support of their major may count those units towards the minor. Those who have fulfilled Physics requirements at the 20 or 40 series level by enrollment at another accredited university, or through advanced placement credits, may count credits towards 21/22 and 23/24, or 41 and 43/44, respectively. 25/26, or 45/46 for a technical minor, must be taken at Stanford even if similar material has been covered elsewhere. With the 21/22/23/24 or 41/43/44 exception noted above, all courses for the minor must be taken at Stanford University for a letter grade, and a grade of 'C' or better must be received for all units applied toward the minor. The minor declaration deadline is three quarters before graduation, typically the beginning of Autumn Quarter if the student is graduating at the end of Spring Quarter.

MINOR IN PHYSICS

An undergraduate minor in Physics requires a minimum of 27 units with the following course work:

Non-Technical—For students whose majors do not require the PHYSICS 40 or 60 series:

	Units
PHYSICS 21, 22, 23, 24, 25, and 26	12
Any combination of Physics courses totaling 15 units or greater	15
Total	27

Technical—For students whose majors require the PHYSICS 40 or 60 series:

	Units
PHYSICS 41, 43/44, 45/46 and PHYSICS 70	18
or	
PHYSICS 61, 63/64, 65/67	15
at least three PHYSICS courses numbered 100 or above	9-12
Total	27-30

MINOR IN ASTRONOMY

Students wishing to pursue advanced work in astrophysical sciences should major in physics and concentrate in astrophysics. However, students outside of physics with a general interest in astronomy may organize their studies by completing one of the following minor programs.

An undergraduate minor in astronomy requires the following courses:

Non-Technical—For students whose majors do not require the PHYSICS 40 series:

	Units
PHYSICS 21, 23, 25/26	10
PHYSICS 50 or 100 (Observatory Lab)	3-4
Choose two courses from the following:	
PHYSICS 15, 16, 17	6
Total	19-20 (9-10 in addition to the 20 series)

Technical—For students whose majors require the PHYSICS 40 series:

	Units
PHYSICS 41, 43, 45/46	13
PHYSICS 70	4
PHYSICS 100 (Observatory Lab)	4
Choose two courses from the following:	
PHYSICS 160,* 161,* EE 106*	6
Total	27 (14 in addition to the 40 series)

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* With approval of the minor adviser and the chair of the Astronomy Course Program, 3 units of PHYSICS 169, Independent Study in Astrophysics, may be substituted for one course of astronomy (e.g., 160, 161, EE 106). This independent study can either be constituted as a directed reading program or participation in a research project. Students are also strongly encouraged to take the electricity and magnetism/optics lab of the appropriate Physics series (24, 44) for 1 additional unit.

To be accepted to the minor program, the student must obtain an adviser from the faculty in the Astronomy Course Program.

HONORS PROGRAM

The department offers a program leading to the degree of Bachelor of Science in Physics with honors as follows:

1. Students must submit an Honors Program Proposal form to the undergraduate program coordinator once they find a physics project, either theoretical or experimental, in consultation with individual faculty members. Proposal forms are available from the Physics undergraduate office and must be submitted by November 1 of the academic year in which the student plans to graduate.
2. Credit for the project is assigned by the adviser within the framework of PHYSICS 205. The work done in the honors program may not be used as a substitute for regular required courses.
3. A written report and a presentation of the work at its completion are required for honors. By mid-May, the honors candidate is required to present the project at the department's honors presentations. This event is publicized and open to the general public. The expectation is that the student's adviser, second reader, and all other honors candidates attend.
4. The decision as to whether a given independent study project does or does not merit award of honors is made jointly by the student's honors adviser and the second reader for the written thesis. This decision is based on the quality of the student's honors work and other work in physics.

GRADUATE PROGRAMS

MASTER OF SCIENCE

The department does not offer a coterminal degree program, or a separate program for the M.S. degree, but this degree may be awarded for a portion of the Ph.D. degree work.

University requirements for the master's degree, discussed in the "Graduate Degrees" section of this bulletin, include completion of 45 units of unduplicated course work after the bachelor's degree. Among the department requirements are a grade point average (GPA) of at least 3.0 (B) in courses 210 or 211, 212, 220, 221, 230, 231, or their equivalents. Up to 6 of these required units may be waived on petition if a thesis is submitted.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. are discussed in the "Graduate Degrees" section of this bulletin. The minimum department requirements for the Ph.D. degree in Physics consist of completing all courses listed below, plus 290 and 294 and at least one quarter from each of two subject areas (among biophysics, condensed matter, quantum optics and atomic physics, astrophysics and gravitation, and nuclear and particle physics) chosen from courses with numbers above 232, except 290 and 294. The requirements in the following list may be fulfilled by passing the course at Stanford or passing an equivalent course elsewhere: 210 or 211, 212, 220, 221, 230, 231, 290, 294. A grade point average (GPA) of at least 3.0 (B) is required in all the courses taken toward the degree.

All Ph.D. candidates must have math proficiency equivalent to the following Stanford math courses: 106, 113, 114, 116, 131, 132.

Prior to making an application for candidacy, each student is required to pass a comprehensive qualifying examination on undergraduate physics. This closed book exam is given in the month of January following the student's arrival at Stanford. This is a written examination held over two days, covering particle mechanics, electricity and magnetism, quantum mechanics, statistical mechanics, thermodynamics, special relativity, and general physics. A thesis proposal must be submitted during the third year. In order to assess the direction and progress toward a thesis, an oral report and evaluation are required during the fourth year. After completion of the dissertation, each student must take the University oral examination (defense of dissertation).

Three quarters of teaching (including a demonstrated ability to teach) are a requirement for obtaining the Ph.D. in Physics.

Students interested in applied physics and biophysics research should also take note of the Ph.D. granted independently by the Department of Applied Physics and by the Biophysics Program. Students interested in astronomy, astrophysics, or space science should also consult the "Astronomy Course Program" section of this bulletin.

PH.D. MINOR

Minors in Physics must take at least six courses numbered 210 to 232 among the 20 required units. All prospective minors must obtain approval of their Physics course program from the Physics Graduate Study Committee at least one year before award of the Ph.D.

FELLOWSHIPS AND ASSISTANTSHIPS

The Department of Physics makes an effort to support all its graduate students through fellowships, teaching assistantships, research assistantships, or a combination of sources. Information on application procedures is mailed with the admission information.

TEACHING CREDENTIALS

For information on teaching credentials, consult the "School of Education" section of this bulletin or address an inquiry to the Credential Administrator, Office of Academic Services, Cubberley Building, School of Education. Also see the earlier section on the Individually Designed Major program in Teaching Physical Science.

COURSES

There are four series of beginning courses. One course from the teen series (15, 16, 17, 19) is recommended for the humanities or social science student who wishes to become familiar with the methodology and content of modern physics. The 20 series (21, 22, 23, 24, 25, 26) is recommended for general students and for students preparing for medicine or biology. The 40 series (41, 43, 44, 45, 46) is for students of engineering, chemistry, geology, mathematics, or physics. The advanced freshman series (61, 63, 64, 65, 67) is for students who have had strong preparation in physics and calculus in high school. Students who have had appropriate background and wish to major in physics should take this introductory series.

The 20, 40, and 60 series consist of demonstration lectures on the fundamental principles of physics, problem work on application of these principles to actual cases, and lab experiments correlated with the lectures. Their objectives are not only to give information on particular subjects, but also to provide training in the use of the scientific method. The primary difference between the series of courses is that topics are discussed more thoroughly and treated with greater mathematical rigor in the 40 and 60 series.

Courses beyond 99 are numbered in accordance with a three-digit code. The first digit indicates the approximate level of the course:

100	undergraduate courses
200	first-year graduate courses
300	more advanced courses
400	research, special, or current topics

The second digit indicates the general subject matter:

00	laboratory
10,20,30	general courses
50	elementary particle physics
60	astrophysics, cosmology, gravitation
70	condensed matter physics
80	optics and atomic physics
90	miscellaneous courses

UNDERGRADUATE

WIM indicates that the course satisfies the Writing in the Major requirements.

PHYSICS 15. The Nature of the Universe—The structure, origin, and evolution of the major components of the Universe: planets, stars, and galaxies. Emphasis is on the formation of the Sun and planets, the evolution of stars, and the structure and content of the Milky Way galaxy. Topics: cosmic enigmas (dark matter, black holes, pulsars, x-ray sources), star birth and death, and the origins of and search for life in the solar system and beyond. GER:DB-NatSci

3 units Aut (Romani, R), Sum (Staff)

PHYSICS 16. Cosmic Horizons—The origin and evolution of the universe and its contents: stars, galaxies, quasars. The overall structure of the cosmos and the physical laws that govern matter, space, and time. Topics include the evolution of the cosmos from the origin of the elements and the formation of stars and galaxies, exotic astronomical objects (black holes, quasars, supernovae, and gamma ray bursts), dark matter, inflationary cosmology, and the fate of the cosmos. GER:DB-NatSci

3 units, Win (Linde, A)

PHYSICS 17. Black Holes—Newton's and Einstein's theories of gravitation and their relationship to the predicted properties of black holes. Their formation and detection, and role in galaxies and high-energy jets. Hawking radiation and aspects of quantum gravity. GER:DB-NatSci

3 units, Spr (Abel, T)

PHYSICS 18. Revolution in Concepts of the Cosmos—The evolution of concepts of the cosmos and its origin, from the Copernican heliocentric model to the current view based on Hubble's discovery of expansion of the Universe. Recent cosmological observations and the relevance of laboratory experiments in particle physics. One night of observations at the Stanford Observatory. Enrollment limited to 20.

1 unit, not given this year

PHYSICS 19. How Things Work: An Introduction to Physics—The principles of physics through familiar objects and phenomena, including airplanes, engines, refrigerators, lightning, radio, TV, microwave ovens, and fluorescent lights. Estimates of real quantities from simple calculations. Prerequisite: high school algebra and trigonometry. GER:DB-NatSci

3 units, Aut (Funk, S)

PHYSICS 21. Mechanics and Heat—For biology, social science, and premedical students. Introduction to Newtonian mechanics, fluid mechanics, theory of heat. Prerequisite: high school algebra and trigonometry; calculus not required. GER:DB-NatSci

3 units, Aut (Linde, A)

PHYSICS 21S. Mechanics and Heat with Laboratory—Equivalent to 21 and 22. GER:DB-NatSci

4 units, Sum (Fisher, G)

PHYSICS 22. Mechanics and Heat Laboratory—Pre- or corequisite: 21.

1 unit, Aut (Linde, A)

PHYSICS 23. Electricity and Optics—Electric charges and currents, magnetism, induced currents; wave motion, interference, diffraction, geometrical optics. Prerequisite: 21. GER:DB-NatSci

3 units, Win (Wojcicki, S)

PHYSICS 24. Electricity and Optics Laboratory—Focus is on electrodynamics circuits. Pre- or corequisite: 23.

1 unit, Win (Wojcicki, S)

PHYSICS 25. Modern Physics—Introduction to modern physics. Relativity, quantum mechanics, atomic theory, radioactivity, nuclear reactions, nuclear structure, high energy physics, elementary particles, astrophysics, stellar evolution, and the big bang. Prerequisite: 23 or consent of instructor. GER:DB-NatSci

3 units, Spr (Burchat, P)

PHYSICS 25S. Modern Physics with Laboratory—Equivalent to 25 and 26. GER:DB-NatSci

4 units, Sum (Fisher, G)

PHYSICS 26. Modern Physics Laboratory—Pre- or corequisite: 25.

1 unit, Spr (Burchat, P)

PHYSICS 28. Mechanics, Heat, and Electricity—For biology, social science, and premedical students. The sequence 28 and 29 fulfills, in ten weeks, the one-year college physics requirement with lab of most medical schools. Topics: Newtonian mechanics, fluid mechanics, theory of heat, electric charges, and currents. Calculus is used as a language and developed as needed. Prerequisite: high school algebra and trigonometry. GER:DB-NatSci

6 units, Sum (Fisher, G)

PHYSICS 29. Electricity and Magnetism, Optics, Modern Physics—Magnetism, induced currents; wave motion, optics; relativity, quantum mechanics, atomic theory, radioactivity, nuclear structure and reactions, elementary particles, astrophysics, and cosmology. Prerequisite: 28. GER:DB-NatSci

6 units, Sum (Fisher, G)

PHYSICS 41. Mechanics—Vectors, particle kinematics and dynamics, work, energy, momentum, angular momentum; conservation laws; rigid bodies; mechanical oscillations and waves. Discussions based on use of calculus. Corequisite: MATH 19 or 41, or consent of instructor. GER:DB-NatSci

4 units, Win (Susskind, L)

PHYSICS 41N. Mechanics: Insights, Applications, and Advances—Stanford Introductory Seminar. Preference to freshman. Additional topics for students in PHYSICS 41 such as tidal forces, gyroscopic effects, fractal dimensions, and chaos. Corequisite: 41, or advanced placement.

1 unit, Win (Abel, T)

PHYSICS 43. Electricity and Magnetism—Electrostatics, Coulomb's law, electric fields and fluxes, electric potential, properties of conductors, Gauss's law, capacitors and resistors, DC circuits; magnetic forces and fields, Biot-Savart law, Faraday's law, Ampere's law, inductors, transformers, AC circuits, motors and generators, electric power, Galilean transformation of electric and magnetic fields, Maxwell's equations; limited coverage of electromagnetic fields and special relativity. Prerequisites: 41 or equivialent, and MATH 19 or 41. Corequisite: MATH 20 or 42, or consent of instructor. GER:DB-NatSci
4 units, Spr (Osheroff, D)

PHYSICS 43N. Understanding Electromagnetic Phenomena—Stanford Introductory Seminar. Preference to freshmen. Expands on the material presented in 43; applications of concepts in electricity and magnetism to everyday phenomena and to topics in current physics research. Corequisite: 43 or advanced placement.
1 unit, Spr (Drell, P)

PHYSICS 44. Electricity and Magnetism Lab—Pre- or corequisite: 43.
1 unit, Spr (Osheroff, D)

PHYSICS 45. Light and Heat—Reflection and refraction, lenses and lens systems; polarization, interference, and diffraction; temperature, properties of matter and thermodynamics, introduction to kinetic theory of matter. Prerequisites: 41 or equivalent, and MATH 19 or 41, or consent of instructor. GER:DB-NatSci
4 units, Aut (Gratta, G), Sum (Staff)

PHYSICS 46. Light and Heat Laboratory—Pre- or corequisite: 45.
1 unit, Aut (Gratta, G), Sum (Staff)

PHYSICS 50. Astronomy Laboratory and Observational Astronomy—Introduction to observational astronomy emphasizing the use of optical telescopes. Observations of stars, nebulae, and galaxies in laboratory sessions with 16- and 24-inch telescopes at the Stanford Observatory. No previous physics required. Limited enrollment. Lab. GER:DB-NatSci
3 units, Aut (Church, S), Sum (Staff)

PHYSICS 59. Current Research Topics—Recommended for prospective Physics majors. Presentations of current research topics by faculty with research interests related to physics, often including tours of experimental laboratories where the research is conducted.
1 unit, Aut (Wechsler, R)

PHYSICS 61,63,65. Advanced Freshman Physics—For students with a strong high school mathematics and physics background contemplating a major in Physics or interested in a rigorous treatment of physics. The fundamental structure of classical physics including Newtonian mechanics, electricity and magnetism, waves, optics, thermodynamics. Foundations of modern physics including special relativity, atomic structure, quantization of light, matter waves and the Schrödinger equation. Prerequisites: high school physics and familiarity with calculus (differentiation and integration in one variable); pre- or corequisite; for: 61: MATH 51; for 63: MATH 52; for 65: MATH 53. GER:DB-NatSci

PHYSICS 61. Mechanics and Special Relativity
4 units, Aut (Blandford, R)

PHYSICS 63. Electricity, Magnetism and Wave
4 units, Win (Allen, S)

PHYSICS 65. Thermodynamics and Foundations of Modern Physics
4 units, Spr (Fetter, A)

PHYSICS 64. Advanced Electromagnetism Laboratory—Experimental work in mechanics, electricity and magnetism. Corequisite 63.
1 unit, Win (Allen, S)

PHYSICS 67. Introduction to Laboratory Physics—Methods of experimental design, data collection and analysis, statistics, and curve fitting in a laboratory setting. Experiments drawn from electronics, optics, heat, and particle physics. Intended as preparation for PHYSICS 105, 107, 108. Lecture plus laboratory format. Required for 60 series Physics majors; recommended for 40 series students who intend to major in Physics. Corequisite: 65 or 43.
2 units, Spr (Staff)

PHYSICS 70. Foundations of Modern Physics—Required for Physics majors who completed the 40 series, or the PHYSICS 60 series prior to 2005-06. Special relativity, the experimental basis of quantum theory, atomic structure, quantization of light, matter waves, Schrödinger equation. Prerequisites: 41, 43. Corequisite: 45. Recommended: prior or concurrent registration in MATH 53. GER:DB-NatSci
4 units, Aut (Kasevich, M)

PHYSICS 83N. Physics in the 21st Century—Stanford Introductory Seminar. Preference to freshmen. Current topics at the frontier of modern physics. Topics include subatomic particles and the standard model, symmetries in nature, extra dimensions of space, string theory, supersymmetry, the big bang theory of the origin of the universe, black holes, dark matter, and dark energy of the universe. Why the sun shines. Cosmology and inflation. GER:DB-NatSci
3 units, Win (Dimopoulos, S)

PHYSICS 84Q. The Rise of Machines—Stanford Introductory Seminar. Preference to sophomores majoring in the physical sciences and engineering. Key experiments in the history of particle physics and astrophysics. Evolution and innovation in detector and accelerator technologies that enabled these experiments. The fundamental structure and interactions of matter.
3 units, Spr (Schindler, R)

PHYSICS 87N. The Physics of One: Nanoscale Science and Technology—Stanford Introductory Seminar. Preference to freshmen. Contemporary interdisciplinary research in nanoscience and nanotechnology; the manipulation of nature's fundamental building blocks. Accomplishments and questions engendered by knowledge at the discrete limit of matter. Prerequisite: high-school physics. GER:DB-NatSci
3 units, Win (Manoharan, H)

PHYSICS 100. Introduction to Observational and Laboratory Astronomy—For physical science or engineering students. Emphasis is on the quantitative measurement of astronomical parameters such as distance, temperature, mass, composition of stars, galaxies, and quasars. Observation using the 0.4m and 0.6m telescopes at the Stanford Observatory. Limited enrollment. Prerequisites: one year of college physics; prior or concurrent registration in 25, 65, or 70; and consent of instructor. GER:DB-NatSci
4 units, Spr (Church, S)

PHYSICS 105. Intermediate Physics Laboratory I: Analog Electronics—Analog electronics including Ohm's law, passive circuits and transistor and op amp circuits, emphasizing practical circuit design skills to prepare undergraduates for laboratory research. Short design project. Minimal use of math and physics, no electronics experience assumed beyond introductory physics. Prerequisite: PHYSICS 43 or 63.
3 units, Aut (Pam, R)

PHYSICS 107. Intermediate Physics Laboratory II: Experimental Techniques and Data Analysis—Experiments on lasers, Gaussian optics, and atom-light interaction, with emphasis on data and error analysis techniques. Students describe a subset of experiments in scientific paper format. Prerequisites: completion of 40 or 60 series, and 70 and 105. Recommended: 130, prior or concurrent enrollment in 120. WIM
4 units, Win (Kasevich, M)

PHYSICS 108. Intermediate Physics Laboratory III: Project—Small student groups plan, design, build, and carry out a single experimental project in low-temperature physics. Prerequisites 105, 107.
3 units, Win (Osheroff, D), Spr (Kapitulnik, A)

PHYSICS 110. Intermediate Mechanics—Lagrangian and Hamiltonian mechanics. Principle of least action, Galilean relativity, Lagrangian mechanical systems, Euler-Lagrange equations. Central potential, Kepler's problem, planetary motion. Scattering problems, disintegration, Rutherford scattering cross section. Harmonic motion in the presence of rapidly oscillating field. Poisson's brackets, canonical transformations, Liouville's theorem, Hamilton-Jacoby equation. Prerequisites: 41 or 61, and MATH 53.
4 units, Spr (Kahn, S)

PHYSICS 112. Mathematical Methods of Physics—Theory of complex variables, complex functions, and complex analysis. Fourier series and Fourier transforms. Special functions such as Laguerre, Legendre, and Hermite polynomials, and Bessel functions. The uses of Green's functions. Covers material of MATH 106 and 132 most pertinent to Physics majors. Prerequisites: MATH 50 or 50H series, MATH 131.
4 units, Win (Gratta, G)

PHYSICS 113. Computational Physics—Numerical methods for solving problems in mechanics, electromagnetism, quantum mechanics, and statistical mechanics. Methods include numerical integration; solutions of ordinary and partial differential equations; solutions of the diffusion equation, Laplace's equation and Poisson's equation with relaxation methods; statistical methods including Monte Carlo techniques; matrix methods and eigenvalue problems. Short introduction to MatLab, used for class examples; class projects may be programmed in any language such as C. Prerequisites: MATH 53, prior or concurrent registration in 110, 121. Previous programming experience not required.
4 units, Spr (Cabrera, B)

PHYSICS 120. Intermediate Electricity and Magnetism—Vector analysis, electrostatic fields, including multipole expansion; dielectrics. Special relativity and transformation between electric and magnetic fields. Maxwell's equations. Static magnetic fields, magnetic materials. Electromagnetic radiation, plane wave problems (free space, conductors and dielectric materials, boundaries). Dipole and quadrupole radiation. Wave guides and cavities. Prerequisites: 43 or 63; concurrent or prior registration in MATH 52 and 53. Recommended: concurrent or prior registration in 112.
4 units, Win (Cabrera, B)

PHYSICS 121. Intermediate Electricity and Magnetism—Vector analysis, electrostatic fields, including multipole expansion. Dielectrics, static magnetic fields, magnetic materials. Maxwell's equation. Electromagnetic radiation. Special relativity and transformation between electric and magnetic fields. Plane wave problems (free space, conductors and dielectric materials, boundaries). Dipole and quadrupole radiation and their frequency and angular distributions. Scattering synchrotron and bremsstrahlung processes. Energy loss in water. Wave guides and cavities. Prerequisites: 120; concurrent or prior registration in MATH 131. Recommended: 112.
4 units, Spr (Petrosian, V)

PHYSICS 130,131. Quantum Mechanics—The origins of quantum mechanics, wave mechanics, and the Schrödinger equation. Heisenberg's matrix formulation of quantum mechanics, solutions to one-dimensional systems, separation of variables and the solution to three-dimensional systems, the central field problem and angular momentum eigenstates, spin and the coupling of angular momentum, Fermi and Bose statistics, time-independent perturbation theory. Prerequisites: 70, 110; pre- or corequisites: 120, 121, and MATH 131.
4 units, **130:** *Aut (Kivelson, S),* **131:** *Win (Wacker, J)*

PHYSICS 134. Advanced Topics in Quantum Mechanics—Variational principle, time-dependent perturbation theory, WKB approximation. Scattering theory: partial wave expansion, Born approximation. Nature of quantum measurement: EPR paradox, Bell's inequality, and Schrödinger's cat paradox. Additional topics may include an introduction to relativistic quantum mechanics or quantum information science. Prerequisites: 130, 131.
4 units, Spr (Moler, K)

PHYSICS 152. Introduction to High Energy Physics—(Graduate students register for 252.) Elementary particles and the fundamental forces. Conservation laws and symmetries. Interaction of elementary particles with matter and detection techniques. The quark model. Weak interactions of quarks and leptons. The standard model of particle physics. Colliders. Connections to cosmology. Prerequisite: 130.
3 units, Win (Roodman, A)

PHYSICS 153A. Introduction to String Theory I: Goals—Facts about physics in extra dimensions. Nonrelativistic strings. Relativistic particles and strings. Light-cone quantization of relativistic strings and the emergence of the critical dimension. Prerequisites: 130, 131.
4 units, not given this year

PHYSICS 153B. Introduction to String Theory II: Open Strings and D-branes—Emergence of gauge theory and connections to particle physics. String thermodynamics and black holes. T-duality, string compactification, and stringy modifications of geometry. Prerequisites: 130, 131, and 153A.
4 units, not given this year

PHYSICS 160. Introduction to Stellar and Galactic Astrophysics—Observed characteristics of stars and the Milky Way galaxy. Physical processes in stars and matter under extreme conditions. Structure and evolution of stars from birth to death. White dwarfs, planetary nebulae, supernovae, neutron stars, pulsars, binary stars, x-ray stars, and black holes. Galactic structure, interstellar medium, molecular clouds, HI and HII regions, star formation, and element abundances. Prerequisites: 40 or 60 series, and 70.
3 units, Win (Petrosian, V)

PHYSICS 161. Introduction to Extragalactic Astrophysics and Cosmology—Observations of the distances and compositions of objects on cosmic scales: galaxies, galaxy clusters, quasars, and diffuse matter at high red shift. Big bang cosmology, physical processes in the early universe, the origin of matter and the elements, inflation, and creation of structure in the Universe. Observational evidence for dark matter and dark energy. Future of the Universe. Prerequisites: calculus and college physics at the level of the 40 or 60 series, and 70.
3 units, Spr (Michelson, P)

PHYSICS 169A. Independent Study in Astrophysics and Honors Thesis: Selection of the Problem—Description of the problem, its background, work planned in the subsequent two quarters, and development of the theoretical apparatus or initial interpretation of the problem.
1-9 units, Aut (Staff)

PHYSICS 169B. Independent Study in Astrophysics and Honors Thesis: Continuation of Project—Substantial completion of the required computations or data analysis for the research project selected.
1-9 units, Win (Staff)

PHYSICS 169C. Independent Study in Astrophysics and Honors Thesis: Completion of Project—Completion of research and writing of a paper presenting methods used and results.
1-9 units, Spr (Staff)

PHYSICS 170,171. Thermodynamics, Kinetic Theory, and Statistical Mechanics—The derivation of laws of thermodynamics from basic postulates; the determination of the relationship between atomic substructure and macroscopic behavior of matter. Temperature; equations of state, heat, and internal energy; entropy; reversibility; applications to various properties of matter; and absolute zero and low-temperature phenomena. Distribution functions, transport phenomena, fluctuations, equilibrium between phases, phase changes, the partition function for classical and quantum systems, Bose-Einstein condensation, and the electron gas. Cooperative phenomena including ferromagnetism, the Ising model, and lattice gas. Irreversible processes. Prerequisites: 45 or 65, and MATH 53. Corequisite: 130,131 for 170,171 respectively.
4 units, **170:** *Aut,* **171:** *Win (Zhang, S)*

PHYSICS 172. Solid State Physics—Crystal structures and bonding in solids. X-ray diffraction. Lattice dynamics and thermal properties. Electronic structure of solids; transport properties of metals; quantum oscillations; charge density waves. Properties and applications of semiconductors. Phenomenology and microscopic theory of superconductivity. Prerequisites: 170, 171.
3 units, Spr (Manoharan, H)

PHYSICS 173B. Concepts in Condensed Matter Physics—Focus is on simple, archetypical examples. Topics include interaction and correlation, emergent order and symmetry breaking, new states of matter, pattern formation, and nonlinear dynamics in material systems. Prerequisite: introductory solid state or condensed matter physics.
1 unit, not given this year

PHYSICS 190. Independent Study—Undergraduate research in experimental or theoretical physics under the supervision of a faculty member. Prerequisites: superior work as an undergraduate Physics major, and consent of instructor.
1-9 units, Aut, Win, Spr, Sum (Staff)

PHYSICS 204A. Seminar in Theoretical Physics—Topics of recent interest may include cosmology, black hole physics, and strong-weak coupling duality transformations.
3 units, Aut (Silverstein, E)

PHYSICS 204B. Seminar in Theoretical Physics—Topics including quantum computing, Berry phase, and quantum Hall effect.
3 units, Win (Doniach, S)

PHYSICS 205. Undergraduate Honors Research—Experimental or theoretical project and thesis in Physics under supervision of a faculty member. Planning of the thesis project should begin no later than middle of the junior year. Successful completion of an honors thesis leads to graduation with departmental honors. Prerequisites: superior work in Physics as an undergraduate major and approval of the honors adviser.
1-12 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

PHYSICS 210. Advanced Particle Mechanics—The Lagrangian and Hamiltonian dynamics of particles. Beyond small oscillations. Phase portraits, Hamilton-Jacoby theory, action-angle variables, adiabatic invariance. Nonlinear dynamical systems, continuous and discrete. Behavior near the fixed points, stability of solutions, attractors, chaotic motion. Transition to continuum mechanics. Prerequisite: 110 or equivalent.
3 units, Aut (Laughlin, R)

PHYSICS 211. Continuum Mechanics—Elasticity, fluids, turbulence, waves, gas dynamics, shocks, and MHD plasmas. Examples from everyday phenomena, geophysics, and astrophysics.
3 units, Win (Peskin, M)

PHYSICS 212. Statistical Mechanics—Principles, ensembles, statistical equilibrium. Thermodynamic functions, ideal and near-ideal gases. Fluctuations. Mean-field description of phase-transitions and associated critical exponents. One-dimensional Ising model and other exact solutions. Renormalization and scaling relations. Prerequisites: 130, 131, 171, or equivalents.
3 units, Spr (Peskin, M)

PHYSICS 216. Back of the Envelope Physics—Techniques such as scaling and dimensional analysis, useful to make order-of-magnitude estimates of physical effects in different settings. Goals is to promote a synthesis of physics through solving problems, some not included in a standard curriculum. Applications include properties of materials, fluid mechanics, geophysics, astrophysics, and cosmology. Prerequisites: undergraduate mechanics, statistical mechanics, electricity and magnetism, and quantum mechanics.
3 units, Aut (Madejski, G)

PHYSICS 220. Classical Electrodynamics—Electrostatics and magnetostatics: conductors and dielectrics, magnetic media, electric and magnetic forces, and energy. Maxwell's equations: electromagnetic waves, Poynting's theorem, electromagnetic properties of matter, dispersion relations, wave guides and cavities, magnetohydrodynamics. Special relativity: Lorentz transformations, covariant, equations of electrodynamics and mechanics, Lagrangian formulation, Noether's theorem and conservation laws. Radiation: dipole and quadrupole radiation, electromagnetic scattering and diffraction, the optical theorem, Liénard-Wiechert potentials, relativistic Larmor's formula, frequency and angular distribution of radiation, synchrotron radiation. Energy losses in matter: Bohr's formula, Cherenkov radiation, bremsstrahlung and screening effects, transition radiation. Prerequisites: 121, 210, or equivalents; MATH 106 and 132.
3 units, Win (Silverstein, E)

PHYSICS 221. Classical Electrodynamics—Electrostatics and magnetostatics: conductors and dielectrics, magnetic media, electric and magnetic forces, and energy. Maxwell's equations: electromagnetic waves, Poynting's theorem, electromagnetic properties of matter, dispersion relations, wave guides and cavities, magnetohydrodynamics. Special relativity: Lorentz transformations, covariant, equations of electrodynamics and mechanics, Lagrangian formulation, Noether's theorem and conservation laws. Radiation: dipole and quadrupole radiation, electromagnetic scattering and diffraction, the optical theorem, Liénard-Wiechert potentials, relativistic Larmor's formula, frequency and angular distribution of radiation, synchrotron radiation. Energy losses in matter: Bohr's formula, Cherenkov radiation, bremsstrahlung and screening effects, transition radiation. Prerequisites: 121 or equivalent; MATH 106 and 132, or PHYSICS 210.
3 units, Spr (Tantawi, S)

PHYSICS 230. Quantum Mechanics—Fundamental concepts. Introduction to Hilbert spaces and Dirac's notation. Postulates applied to simple systems, including those with periodic structure. Symmetry operations and gauge transformation. The path integral formulation of quantum statistical mechanics. Problems related to measurement theory. The quantum theory of angular momenta and central potential problems. Prerequisite: 131 or equivalent.
3 units, Aut (Shenker, S)

PHYSICS 231. Quantum Mechanics—Basis for higher level courses on atomic solid state and particle physics. Wigner-Eckart theorem and addition of angular momenta. Approximation methods for time-independent and time-dependent perturbations. Semiclassical and quantum theory of radiation, second quantization of radiation and matter fields. Systems of identical particles and many electron atoms and molecules. Prerequisite: 230.
3 units, Win (Shenker, S)

PHYSICS 232. Quantum Mechanics—Special topics. Elementary excitations in solids (the free electron gas, electronic band structure, phonons). Elementary scattering theory (Born approximation, partial wave analyses, resonance scattering). Relativistic single-particle equations. Dirac equation applied to central potentials, relativistic corrections, and nonrelativistic limits.
3 units, Spr (Dimopoulos, S)

PHYSICS 252. Introduction to High Energy Physics—See 152.
3 units, Win (Roodman, A)

PHYSICS 260. Introduction to Astrophysics and Cosmology—The observed properties and theoretical models of stars, galaxies, and the universe. Physical processes for production of radiation from cosmic sources. Observations of cosmic microwave background radiation. Newtonian and general relativistic models of the universe. Physics of the early universe, nucleosynthesis, baryogenesis, nature of dark matter and dark energy and inflation. Prerequisites: 110, 121, and 171, or equivalents.
3 units, Aut (Petrosian, V)

PHYSICS 262. Introduction to Gravitation—Introduction to general relativity. Curvature, energy-momentum tensor, Einstein field equations. Weak field limit of general relativity. Black holes, relativistic stars, gravitational waves, cosmology. Prerequisite: 121 or equivalent including special relativity.
3 units, Win (Wagoner, R)

PHYSICS 275. Electrons in Nanostructures—The behavior of electrons in metals or semiconductors at length scales below 1 micron, smaller than familiar macroscopic objects but larger than atoms. Ballistic transport, Coulomb blockade, localization, quantum mechanical interference, and persistent currents. Topics may include quantum Hall systems, graphen, spin transport, spin-orbit coupling in nanostructures, magnetic tunnel junctions, Kondo systems, and 1-dimensional systems. Readings focus on the experimental research literature, and recent texts and reviews. Prerequisite: undergraduate quantum mechanics and solid state physics.

3 units, Win (Goldhaber-Gordon, D)

PHYSICS 290. Research Activities at Stanford—Required of first-year Physics graduate students; suggested for junior or senior Physics majors for 1 unit. Review of research activities in the department and elsewhere at Stanford at a level suitable for entering graduate students.

1-3 units, Aut (Michelson, P)

PHYSICS 291. Practical Training—Opportunity for practical training in industrial labs. Arranged by student with the research adviser's approval. A brief summary of activities is required, approved by the research adviser.

3 units, Sum (Staff)

PHYSICS 293. Literature of Physics—Study of the literature of any special topic. Preparation, presentation of reports. If taken under the supervision of a faculty member outside the department, approval of the Physics chair required. Prerequisites: 25 units of college physics, consent of instructor.

1-15 units, Aut, Win, Spr, Sum (Staff)

PHYSICS 294. Teaching of Physics Seminar—Required of teaching assistants in Physics in the year in which they first teach. Techniques of teaching physics by means of weekly seminars, simulated teaching situations, observation of other teachers, and evaluation of in-class teaching performance.

1 unit, Aut (Pam, R)

PHYSICS 301. Astrophysics Laboratory—Seminar/lab. Astronomical observational techniques and physical models of astronomical objects. Observational component uses the 24-inch telescope at the Stanford Observatory and ancillary photometric and spectroscopic instrumentation. Emphasis is on spectroscopic and photometric observation of main sequence, post-main sequence, and variable stars. Term project developing observational equipment or software. Limited enrollment. Prerequisite: consent of instructor.

3 units, alternate years, not given this year

PHYSICS 312. Basic Plasma Physics—For the nonspecialist who needs a working knowledge of plasma physics for space science, astrophysics, fusion, or laser applications. Topics: orbit theory, the Boltzmann equation, fluid equations, MHD waves and instabilities, EM waves, the Vlasov theory of ES waves and instabilities including Landau damping and quasilinear theory, the Fokker-Planck equation, and relaxation processes. Advanced topics in resistive instabilities and particle acceleration. Prerequisite: 210 and 220, or consent of instructor.

3 units, alternate years, not given this year

PHYSICS 321. Laser Spectroscopy—Theoretical concepts and experimental techniques. Absorption, dispersion, Kramers-Kronig relations, line-shapes. Classical and laser linear spectroscopy. Semiclassical theory of laser atom interaction: time-dependent perturbation theory, density matrix, optical Bloch equations, coherent pulse propagation, multiphoton transitions. High-resolution nonlinear laser spectroscopy: saturation spectroscopy, polarization spectroscopy, two-photon and multiphoton spectroscopy, optical Ramsey spectroscopy. Phase conjugation. Four-wave mixing, harmonic generation. Coherent Raman spectroscopy, quantum beats, ultra-sensitive detection. Prerequisite: 230. Recommended: 231.

3 units, alternate years, not given this year

PHYSICS 323. Laser Cooling and Trapping—Principles of laser cooling and atom trapping. Optical forces on atoms, forms of laser cooling, atom optics and atom interferometry, ultra-cold collisions, and introduction to Bose condensation of dilute gases. Emphasis is on the development of the general formalisms that treat these topics. Applications of the cooling and trapping techniques: atomic clocks, internal sensors, measurements that address high-energy physics questions, many-body effects, polymer science, and biology. Prerequisite: 231 or equivalent.

3 units, Spr (Kasevich, M)

PHYSICS 330. Quantum Field Theory—Quantization of scalar and Dirac fields. Introduction to supersymmetry. Feynman diagrams. Quantum electrodynamics. Elementary electrodynamic processes: Compton scattering; e+e- annihilation. Loop diagrams and electron (g-2). Prerequisites: 130, 131, or equivalents.

3 units, Aut (Kallosh, R)

PHYSICS 331. Quantum Field Theory—Functional integral methods. Local gauge invariance and Yang-Mills fields. Asymptotic freedom. Spontaneous symmetry breaking and the Higgs mechanism. Unified models of weak and electromagnetic interactions. Prerequisite: 330.

3 units, Win (Kallosh, R)

PHYSICS 332. Quantum Field Theory—Theory of renormalization. The renormalization group and applications to the theory of phase transitions. Renormalization of Yang-Mills theories. Applications of the renormalization group of quantum chromodynamics. Perturbation theory anomalies. Applications to particle phenomenology.

3 units, Spr (Dixon, L)

PHYSICS 351. Standard Model of Particle Physics and Beyond—Group theory, symmetries, the standard model of particle physics, gauge hierarchy and the cosmological constant problem as motivations for beyond the standard model, introduction to supersymmetry, technicolor, extra dimension, split SUSY. Corequisite: 230.

3 units, Aut (Dimopoulos, S)

PHYSICS 352. Neutrino Physics—Neutrino masses and mixing. Kinematics tests for neutrino masses. Neutrino interactions, the number of light neutrino species. Solar and atmospheric neutrino anomalies. Artificial neutrino sources: reactors and particle accelerators. Majorana and Dirac neutrinos. Double-beta decay. Neutrinos in supernovae. Relic neutrinos. Neutrino telescopes.

3 units, not given this year

PHYSICS 360. Physics of Astrophysics—Theoretical concepts and tools for modern astrophysics. Radiation transfer equations; emission, scattering, and absorption mechanisms: Compton, synchrotron and bremsstrahlung processes; photoionization and line emission. Equations of state of ideal, interacting, and degenerate gasses. Application to astrophysical sources such as HII regions, supernova remnants, cluster of galaxies, and compact sources such as accretion disks, X-ray, gamma-ray, and radio sources. Prerequisites: 121, 171 or equivalent.

3 units, Win (Romani, R)

PHYSICS 361. Stellar and Galactic Astrophysics—Astronomical data on stars, star clusters, interstellar medium, and the Milky Way galaxy. Theory of stellar structure; hydrostatic equilibrium, radiation balance, and energy production. Stellar formation, Jean's mass, and protostars. Evolution of stars to the main sequence and beyond to red giants, white dwarfs, neutron stars, and black holes. Supernovae and compact sources. Structure of the Milky Way: disk and spiral arms; dark matter and the halo mass; central bulge or bar; and black hole. Prerequisite: 221 or equivalent. Recommended: 260, 360.

3 units, alternate years, not given this year

PHYSICS 362. Advanced Extragalactic Astrophysics and Cosmology—Observational data on the content and activities of galaxies, the content of the Universe, cosmic microwave background radiation, gravitational lensing, and dark matter. Models of the origin, structure, and evolution of the Universe based on the theory of general relativity. Test of the models and the nature of dark matter and dark energy. Physics of the early Universe, inflation, baryosynthesis, nucleosynthesis, and galaxy formation. Prerequisites: 210, 211, 260 or 360.

3 units, Spr (Wechsler, R)

PHYSICS 363. Solar and Solar-Terrestrial Physics—Structure, mechanisms, and properties of the Sun's interior and atmosphere. Tools for solar observations; magnetic fields and polarimetry. Solar oscillations and helioseismology. Differential rotation and turbulent convection. Solar MHD, Alfven and magneto-acoustic waves. Solar cycle and dynamo. Magnetic energy release, reconnection, particle acceleration. Solar activity, sunspots, flares, coronal mass ejections; UV, X-ray, and high-energy particle emissions. The interaction of the solar wind with Earth's magnetosphere and its terrestrial effects; space weather. Prerequisite: 221 or equivalent.

3 units, Win (Kosovichev, A)

PHYSICS 364. Advanced Gravitation—Early universe cosmology. Topics at the interface between cosmology and gravity, particle theory, and speculative theories of physics at the Planck scale such as string theory. Inflationary cosmology and generation of density pertubations, models of baryogenesis, big bang nucleosynthesis, and speculations about the Universe at the Planck scale. Experiments in the near future that may extend or revise current notions.

3 units, alternate years, not given this year

PHYSICS 370. Theory of Many-Particle Systems—Application of quantum field theory to the nonrelativistic, many-body problem, including methods of temperature-dependent Green's functions and canonical transformations. Theory of finite-temperature, interacting Bose and Fermi systems with applications to superfluidity, superconductivity, and electron gas. Prerequisite: 232.

3 units, alternate years, not given this year

PHYSICS 372. Condensed Matter Theory I—(Formerly APPPHYS 372.) Fermi liquid theory, many-body perturbation theory, response function, functional integrals, interaction of electrons with impurities.

3 units, Win (Laughlin, R)

PHYSICS 373. Condensed Matter Theory II—(Formerly APPPHYS 373) Superfluidity and superconductivity. Quantum magnetism. Prerequisite: 372.

3 units, Spr (Laughlin, R)

PHYSICS 376. Superfluidity and Superconductivity—Introduction to superfluid He: two-fluid model, phonons, and rotons, Feynman description, vortices, Bogoliubov theory. Phenomenology of superconductors: London description, Ginzburg-Landau model, type-I vs. type-II materials, Josephson effects, thin films, Kosterlitz-Thouless behavior, electron-phonon coupling. BCS theory: bulk systems, tunneling, strong-coupling materials, dirty and gapless superconductivity, fluctuation effects, Ginzburg criterion. Recommended: APPPHYS 272, 273, or equivalents.

3 units, not given this year

PHYSICS 450. Introduction to String Theory—The worldsheet and spacetime physics of bosonic string theory and superstring theory. May be repeated for credit. Prerequisites: 262, 330, 331, and 332.

3 units, Aut (Kachru, S)

PHYSICS 451. Topics in String Theory—String compactification. String theory and speculative theories of physics beyond the standard model. Introduction to AdS/CFT. May be repeated for credit. Prerequisites: 262, 330, 331, 332, and 450.

3 units, Win (Kachru, S)

PHYSICS 452. Black Holes and the Anti-De-Sitter Space/Conformal Field Theory Correspondence—Quantum mechanics of black holes, and relation to string theory. Implications for particle physics phenomenology, quantum gravity, nuclear physics, cosmology, and pure mathematics. Information theory, Bekenstein Hawking entropy, the holographic principle, and string theory methods such as the AdS/CFT correspondence. Applications to physics and cosmology questions. May be repeated for credit. Prerequisites: 262, 330, 331, and 332.

3 units, Spr (Susskind, L)

PHYSICS 463. Special Topics in Astrophysics: Theoretical Cosmology—Content varies depending on participant interest. Past topics include: large-scale structure formation, the formation and structure of dark matter halos, and N-body simulations; alternative dark matter models; galaxy clustering, the halo model, and halo occupation statistics; galaxy formation models and galaxy evolution; and constraints on cosmological parameters and galaxy formation from large surveys.

3 units, alternate years, not given this year

PHYSICS 475. Advanced Topics in Condensed Matter Physics—Current literature and advanced topics. Journal club format. Content varies depending on interests of participants. May be repeated for credit. Recommended: APPPHYS 272, 273, or equivalents.

1-3 units, Aut, Win (Zhang, S), offered occasionally

PHYSICS 490. Research—Open only to Physics graduate students, with consent of instructor. Work is in experimental or theoretical problems in research, as distinguished from independent study of a non-research character in 190 and 293.

1-15 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

APPPHYS 192/292. Introductory Biophysics
3 units, Spr (Doniach, S), alternate years, not given next year

APPPHYS 207. Laboratory Electronics
3 units, Win (Fox, J)

APPPHYS 208. Laboratory Electronics
3 units, alternate years, not given this year

APPPHYS 215. Numerical Methods for Physicists and Engineers
3 units, Aut (Doniach, S)

APPPHYS 226. Physics of Quantum Information
3 units, alternate years, not given this year

APPPHYS 270. Magnetism and Long Range Order in Solids
3 units, Aut (Fisher, I)

APPPHYS 272,273. Solid State Physics
3 units, **272:** *Win,* **273:** *Spr (Kivelson, S)*

APPPHYS 315. Methods in Computational Biology
3 units, alternate years, not given this year

APPPHYS 324. Introduction to Accelerator Physics
3 units, Spr (Staff), alternate years, not given next year

APPPHYS 383. Introduction to Atomic Processes
3 units, alternate years, not given this year

APPPHYS 387. Quantum Optics and Measurements
3 units, Win (Staff), alternate years, not given next year

APPPHYS 388. Mesoscopic Physics and Nanostructures
3 units, Spr (Staff), alternate years, not given next year

APPPHYS 392. Topics in Molecular Biophysics
3 units, alternate years, not given this year

APPPHYS 473B. Topics in Condensed Matter Physics: Many Body Physics in Quantum Dots
3 units, Aut (Oreg, Y)

EE 106, Planetary Exploration
3 units, Spr (Fraser-Smith, A)

EE 268. Introduction to Modern Optics
3 units, Aut (Byer, R)

GES 222. Planetary Systems: Dynamics and Origins
3-4 units, Aut (Lissauer, J; Marley, M)

POLITICAL SCIENCE

Emeriti: (Professors) David B. Abernethy, Lucius J. Barker, Richard A. Brody, Charles Drekmeier, John W. Lewis, John Manley, James March, Hubert R. Marshall, Robert A. Packenham, Philippe Schmitter, Robert Ward, Hans N. Weiler; *(Senior Lecturer)* Elisabeth Hansot, Daniel Okimoto

Chair: James D. Fearon

Professors: David W. Brady, Joshua Cohen, James D. Fearon, John A. Ferejohn, Morris P. Fiorina, Judith L. Goldstein, Stephen H. Haber, David J. Holloway, Shanto Iyengar (on leave Autumn), Simon D. Jackman, Terry L. Karl, Stephen D. Krasner, Jon A. Krosnick (on leave), David D. Laitin, Terry M. Moe (on leave), Josiah Ober, Jean C. Oi, Jack N. Rakove, Condoleezza Rice (on leave), Douglas Rivers (on leave Winter, Spring), Scott D. Sagan, Paul M. Sniderman, Barry R. Weingast

Associate Professors: Michael A. McFaul, Rob Reich, Jonathan Rodden, Kenneth A. Schultz

Assistant Professors: Alberto Díaz-Cayeros, Beatriz Magaloni, Peter Stone (on leave), Michael R. Tomz, Jonathan Wand (on leave), Jeremy Weinstein, Phillip Lipscy, Karen Jusko, Lisa Blaydes

Professor (Research): Norman Nie

Lecturers: Tammy Frisby, Solomon Major, Andrew R. Rutten, Mary Sprague, Kathryn Stoner-Weiss

Courtesy Professors: David P. Baron, Jonathan B. Bendor, Coit D. Blacker, Gerhard Casper, Larry Diamond, Gerald A. Dorfman, Jean-Pierre Dupuy, James Fishkin, Lawrence Friedman, Keith Krehbiel, Roger Noll (emeritus), Debra M. Satz, Stephen J. Stedman

Visiting Professors: Josef Joffe, Abbas Milani, John Wallis

Visiting Associate Professor: Alice Miller

Department Offices: Encina Hall West, Room 100
Mail Code: 94305-6044
Phone: (650) 723-1806
Web Site: http://polisci.stanford.edu

Courses given in Political Science have the subject code POLISCI. For a complete list of subject codes, see Appendix.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

To receive a B.A. in Political Science, a student must:

1. Submit an application for the Political Science major to the undergraduate administrator and declare on Axess. Forms are available in Encina Hall West, Room 100. For additional information, drop by or phone (650) 723-1608. Students must complete their major declaration no later than the end of Autumn Quarter in junior year.
2. Complete 70 units including:
   - a) 45 Political Science course units to complete breadth requirements.
   - b) a 5-unit methods requirement satisfied by POLISCI 150A, 150B, 150C, 151A, 151B, ECON 102A, or STATS 60. The list of courses satisfying the methods requirement is updated annually by the department. Students should consult the Bulletin for new courses that satisfy this requirement.
   - c) 20 additional Political Science units including no more than 5 units of directed reading. 10 units of ECON 1A,B may substitute for two 5-unit POLISCI courses.
   - d) no more than two 5-unit Stanford Introductory Seminar courses can be applied toward the 70-unit major requirement.
3. Satisfy breadth requirements (45 units): each student must take two from the following Political Science courses, one of which must be in the primary concentration, the other in the secondary concentration. These courses must be completed by the end of sophomore year.

   POLISCI 1. Introduction to International Relations
   POLISCI 2. American National Government and Politics
   POLISCI 3. Introduction to Political Philosophy
   POLISCI 4. Introduction to Comparing Political Systems
   POLISCI 151A. Doing Political Science,
   or POLISCI 151B. Data Analysis for Political Science

   The primary concentration must be completed by fulfilling the depth requirement with at least 30 units (see Statement 4).

   Each major should declare a secondary concentration in another subfield, with at least 15 units in that concentration, including the introductory course for that subfield.
4. Satisfy a depth requirement. Each major should declare a primary concentration in one subfield and take at least 30 units in this concentration, including the introductory course for that subfield. Subfields include:

   International Relations (1, 110-119, 210-219, 310-319)
   American Politics (2, 120-129, 220-229, 320-329)
   Political Theory (3, 130-139, 230-239, 330-339)
   Comparative Politics (4, 140-149, 240-249, 340-349)
5. Demonstrate the capacity for sustained research and writing in the discipline. This requirement is satisfied by taking a Political Science course designated as a Writing in the Major (WIM) course.
6. Take at least one 5-unit, advanced undergraduate seminar in Political Science.
7. Students may apply a maximum of 10 units from Stanford Summer Session or courses outside Stanford. Transfer students are allowed up to 20 units of transfer units or summer session. A maximum of 15 units may be applied towards breadth requirements and 5 towards other Political Science course units. All transfer cases require petitions which must be reviewed and approved by the Director of Undergraduate Studies.
8. Directed reading and Oxford tutorial units require a petition and may only be applied towards related course work units. These units may not be used to fulfill a breadth requirement, and no more than 10 combined units of directed reading and Oxford tutorial units may count toward the required 70 Political Science units.
9. Courses counting toward the 70-unit requirement must be taken for a letter grade, although units in excess of the required 70 may be taken on a credit/no credit basis. A minimum grade of 'C' is required for courses to count towards major requirements.

MINOR

Students must complete their declaration of the minor on Axess no later than the end of the junior year.

To receive a minor in Political Science, a student must complete a minimum of 30 unduplicated units. All units must be in courses listed or crosslisted in the Department of Political Science. A maximum of 5 units of directed reading may count if supervised by a member of the department.

All units are for a letter grade. A minimum grade point average (GPA) of 2.0 (C) is required for courses to count towards minor requirements.

Concentration—The student selects a subfield in which three courses are taken. One of these courses is the introductory course, the other two at a more advanced level (numbered above 100). Where a linked set of advanced courses is offered, as with the Political Theory 130A,B,C series, the introductory course need not be taken.

The concentration corresponds to one of the subfields the department already has in place, namely, international relations, American politics, political theory, and comparative politics.

Distribution—Three courses must be in the area of concentration, as specified above, for 15 units. An additional 10 units of intermediate and advanced courses (100 level or above) must be in two additional subfields.

Transfer Work—A maximum of 10 units of work completed outside Stanford may be given Political Science credit toward the minor for transfer students. A maximum of 5 units of work completed in Stanford Summer Session or outside of Stanford for non-transfer students may be given Political Science credit toward the minor. All such cases must be individually reviewed and approved by the Director of Undergraduate Studies.

PRIZES

There are several annual prizes for undergraduate students: the Arnaud B. Leavelle Memorial Prize for the best paper in the History of Political Thought sequence (POLISCI 130A,B,C), a cash prize for the best thesis written in political theory, the Lindsay Peters, Jr., Memorial Prize for the outstanding student each year in POLISCI 2, and Cottrell Prizes for outstanding students in POLISCI 1, 3, and 4.

HONORS PROGRAM

The honors program offers qualified students an opportunity to conduct independent research, write a thesis summarizing their findings, and make a presentation of their work. During the process of research, analysis, thinking, drafting, rethinking, and redrafting, students work closely with a faculty adviser and their fellow students.

Applicants must have a 3.5 grade point average (GPA) in Political Science courses, and an adviser who must be a member of the academic council. Students are required to declare their intention to pursue honors on the Major Proposal form. Applications can be obtained from the department office.

Students pursuing honors must complete the following by the end of Spring Quarter of their junior year: Methods requirement (POLISCI 150A,B,C, 151A, 151B, STATS 60, or ECON 102A), WIM requirement, and a completed research paper from an advanced undergraduate seminar or directed reading. Students are required to enroll in one quarter of POLISCI 299Q, Junior Research Seminar, in the junior year. This credit/no-credit course is designed to help students find a manageable thesis topic and adviser.

Students who are accepted into the program should plan to make the thesis the focus of their senior year. They should enroll in POLISCI 299A,B,C, which covers research and writing directed by the student's adviser. In addition, students must enroll in POLISCI 299R, a 3-unit Autumn Quarter seminar designed to develop research and writing skills. In the Winter Quarter, students must enroll in POLISCI 299S which is a credit/no credit tutorial in which students work with other students and tutors to finish their research.

Most students find themselves in one of two groups: (1) those who already have substantial background in their thesis topic, and can expect to complete the honors program in two or three quarters for a total of 10-15 units completed in POLISCI 299A,B,C; or (2) those who have little or no previous work on the topic, and can expect to complete the program in three quarters with 15 units of work.

To complete the honors program, students must:

1. Complete all requirements for the major.
2. Enroll in one quarter of POLISCI 299Q, 299R, and 299S.
3. Enroll in at least 10 units of POLISCI 299A, B, or C, senior project. Students must take at least two quarters of Senior Project units.
4. Complete a thesis of honors quality, for a grade of 'B+' or better.

Students cannot apply units from the POLISCI 299Q, Junior Research Seminar, POLISCI 299R, Senior Research Seminar, or POLISCI 299S, Senior Honors Tutorial, toward the 70-unit requirement for the major. However, students can apply up to 10 units from POLISCI 299A,B,C Senior Project, toward the 70-unit requirement.

GRADUATE PROGRAMS

Admission—Prospective graduate students should see http://gradadmissions.stanford.edu for application materials. Applicants are required to submit a recent sample of their writing (not to exceed 35 pages) and to take the General Test of the Graduate Record Examination (GRE). Applicants whose native language is not English must take the Test of English as a Foreign Language (TOEFL). The TOEFL requirements are waived for applicants who have recently completed two or more years of study in an English-speaking country. For details concerning these tests, see the Guide to Graduate Admission, available at http://registrar.stanford.edu/shared/publications.htm#GradStud. The application deadline is December 4. Admission is offered for the Autumn Quarter only. The department expects all students to pursue a full-time program except for time devoted to teaching or research assistantships.

MASTER OF ARTS

The M.A. degree may be pursued as part of a joint degree program with one of the University's professional schools. Students interested in a joint degree should apply for admission to the M.A. program in Political Science during the Autumn Quarter of the first year in the Stanford professional school.

Doctoral candidates may elect to take the M.A. degree when they have met the following requirements:

1. Completion of at least three quarters of residency as a graduate student with 45 units of credit of which at least 25 units must be taken in Political Science graduate seminars of 300 level and above. Not more than 25 units of the 45-unit requirement may be taken in a single field.
2. At least two graduate seminars in each of two fields and at least one graduate seminar in a third field.
3. Of the remaining 20 units, not more than 10 units of work from related departments may be accepted in lieu of a portion of the work in Political Science. Not more than 10 units may be taken as directed reading.
4. Courses must be numbered above 100.
5. A grade point average (GPA) of 2.7 (B-) or better must be attained for directed reading and all course work.

The department does not offer a coterminal bachelor's and master's degree.

Doctoral candidates may pursue master's degrees from other departments. Recent examples include but are not restricted to master's degrees in Statistics and Economics. Students interested in this option should consult the relevant sections of this bulletin for both University and department requirements for master's degrees.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the Ph.D. degree are discussed in the "Graduate Degrees" section of this bulletin.

Programs of study leading to the Ph.D. degree are designed by the student, in consultation with advisers and the Director of Graduate Studies, to serve his or her particular interests as well as to achieve the general department requirements. A student is recommended to the University Committee on Graduate Studies to receive the Ph.D. degree in Political Science when the following program of study has been completed:

1. The candidate for the Ph.D. degree must offer three of the following concentrations in political science: American politics, comparative politics, international relations, methodology, political institutions, and political theory. Upon petition, a special field (for example, public law, or urban politics) may be offered as a third concentration. Students concentrate on two of these areas by fulfilling, depending on the concentration, combinations of the following: written qualifying examinations, research papers, research design, or course work. The requirement for the third concentration may be satisfied by taking either a written examination in that area or by offering a minimum of 10 units with a grade point average (GPA) of 3.0 (B) or better in the third concentration from among the formal graduate-level courses in the six divisions of the department. The third concentration cannot be satisfied by courses taken as a requirement for a first or second concentration. A third concentration in theory requires two courses in addition to the five units necessary to fulfill the program requirement. Completion of special concentrations may require more than 10 units of course work. Students are not permitted to use the following combination of concentrations for the purposes of fulfilling the requirements for the PhD: American politics, political institutions, and methodology. Students wishing to concentrate in American politics, political institutions, and methodology are not prohibited from doing so, but must add another field of concentration to their course of study.
2. The Ph.D. candidate is required to demonstrate competence in a language and/or skill that is likely to be relevant to the dissertation research. The level of competence needed for successful completion of the research is determined by the student's adviser. All candidates must complete at least 10 units of statistical methods or its equivalent. Previous instruction can be counted towards this requirement only if approved by the Director of Graduate Studies.
3. Every Ph.D. candidate must complete at least five units of graduate-level instruction in political theory.
4. By the start of the fourth quarter in residence, each first-year graduate student submits to the student's adviser a statement of purpose. This statement indicates the student's proposed major concentrations of

study, the courses taken and those planned to be taken to cover those fields, the student's plan for meeting language and/or skill requirements, plans for scheduling of comprehensive examinations and/or research papers, and, where possible, dissertation ideas or plans. This statement is discussed with, and must be approved by, the student's adviser. In the Autumn Quarter following completion of their first year, students are reviewed at a regular meeting of the department faculty. The main purposes of this procedure are, in order of importance: to advise and assist the student to realize his or her educational goals; to provide an incentive for clarifying goals and for identifying ways to achieve them; and to facilitate assessment of progress toward the degree.

5. Students must take the comprehensive exams in two major fields by the end of their second year in the program. Students are expected to have passed these examinations and to have faculty approval of their research paper by the end of their second year.
6. Upon completion of one research paper and two comprehensive exams in his or her two major concentrations, the student files an Application for Admission to Candidacy for the Ph.D. which details program plans and records. The University and the department expect that students be advanced to candidacy by the completion of their sixth quarter as a full-time student. Each second-year student is reviewed and considered for admission to candidacy in a meeting of the faculty that is typically held during the tenth week of Spring Quarter. Since completion of two comprehensive exams and a research paper are prerequisites for admission to candidacy, students should plan their first- and second-year studies so that these requirements are satisfied by the time of the faculty review meeting. In particular, students should submit their research paper to the relevant faculty readers no later than the middle of Winter Quarter, since revisions of the paper are often required prior to obtaining faculty approval.
7. During the third year, a formal dissertation proposal is submitted by the student to a thesis committee of three faculty members, including the principal adviser. The dissertation proposal requires approval by the student's dissertation adviser and the Director of Graduate Studies. Dissertation proposals must be approved by the end of the third year.
8. A candidate for the Ph.D. in Political Science is required to serve as a teaching assistant (TA) in the department for a minimum of three quarters.
9. Doctoral candidates who apply for the M.A. degree are awarded that degree on completion of the requirements outlined in the description of the M.A. program.
10. The candidate must pass the University oral examination on the area of the dissertation at a time, after the passing of the written comprehensive examinations, suggested by the candidate's dissertation committee.
11. The candidate must complete a dissertation satisfactory to the dissertation reading committee.

PH.D. MINOR

Candidates in other departments offering a minor in Political Science select two concentrations in political science in consultation with the Director of Graduate Studies and submit to her or him a program of study for approval. Written approval for the program must be obtained from the Director of Graduate Studies before application for doctoral candidacy. Students are required to complete at least 20 units in Political Science courses. Courses must be 300 level and above. Grades must be a GPA of 3.0 (B) or better. Candidates may be examined in their concentrations in the general oral examination by a member of the Department of Political Science, chosen in consultation with the Director of Graduate Studies.

Undergraduate courses and seminars in comparative politics generally fall into two groups: those dealing with a particular country or region, and those dealing with major political problems or processes. Students are encouraged to take courses from both groups, and are also urged to do course work in more than one country or region.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

Summer Quarter—During Summer Quarter, the Department of Political Science offers a variety of courses and seminars. Offerings depend upon available faculty.

The department uses the following course numbering system:

1- 99	Introductory Courses
100-199	Intermediate Undergraduate Lecture Courses
200-299	Advanced Undergraduate Seminar Courses
300-399	Advanced Undergraduate/Graduate Courses
400-500	Graduate Courses

Course information is accurate when the *Stanford Bulletin* goes to press; however, students should be aware that there may be changes and should check the quarterly *Time Schedule* for up-to-date information.

INTRODUCTORY

POLISCI 1. Introduction to International Relations—Approaches to the study of conflict and cooperation in world affairs. Applications to war, terrorism, trade policy, the environment, and world poverty. Debates about the ethics of war and the global distribution of wealth. GER:DB-SocSci

5 units, Spr (Tomz, M)

POLISCI 2. Introduction to American National Government and Politics—The role and importance of the ideal of democracy in the evolution of the American political system. American political institutions (the Presidency, Congress, and the Court) and political processes (the formation of political attitudes and voting) are examined against the backdrop of American culture and political history. The major areas of public policy in the current practice of the ideal of democracy. GER:DB-SocSci

5 units, Win (Fiorina, M; Frisby, T)

POLISCI 3. Introduction to Political Philosophy—(Same as ETHICSOC 30, PHIL 30.) State authority, justice, liberty, and equality through major works in political philosophy. Topics include human nature and citizenship, the obligation to obey the law, democracy and economic inequality, equality of opportunity and affirmative action, religion, and politics. GER:DB-Hum, EC-EthicReas

5 units, Aut (Hussain, N)

POLISCI 4. Introduction to Comparing Political Systems—Politics in major regime types including democratic, authoritarian, and communist; how types of politics affect economic development and state/society relations. GER:DB-SocSci, EC-GlobalCom

5 units, Spr (Weinstein, J)

POLISCI 16N. Politics of Economic Development—Stanford Introductory Seminar. Preference to freshmen. Why are some countries rich and others poor? What explains the policies that governments adopt, and how do those policies affect economic performance? Readings from political science and economics about Latin America and other regions. GER:DB-SocSci, Write-2

5 units, Spr (Tomz, M)

POLISCI 33Q. Legal Craft and Moral Intuitions—(Same as LAW 107Q.) Stanford Introductory Seminar. Preference to sophomores. The conflict between translating rules for social interaction into legal practices versus deciding what constitutes impermissible harm-causing, coercion, or discrimination. Approaches to this conflict through cases such as: can government forbid wetland development without compensating property owners; why might private nurses or Playboy bunnies but not flight attendants be selected on the basis of gender; why is gender equality in resource distribution provided for college athletes but not math graduate students? GER:DB-SocSci, EC-EthicReas

4 units, Win (Kelman, M)

POLISCI 35Q. Food and Politics—Stanford Introductory Seminar. Preference to sophomores. Topics include the politics of food production and distribution; organic and sustainable farming; federal farm and free trade policies; genetically-modified food; animal ethics; and the political context of famine and obesity. Community-based learning.
2 units, Win (Reich, R)

POLISCI 43N. Oil, Regime Change, and Conflict—Stanford Introductory Seminar. Preference to sophomores. Relationships among dependence on oil export, democratization and authoritarian rule, and rising conflict. Case studies including Venezuela, Nigeria, Iran, Iraq, Chad, and Indonesia. The resource curse: the impact of oil on a country's political economy. The relationship between such economic dependence and regime type. Why oil exporting countries are more prone to conflict and civil war than other countries. Research paper.
5 units, Aut (Karl, T)

POLISCI 44N. Everyday Political Life in the Authoritarian Middle East—Stanford Introductory Seminar. Preference to freshmen. How individuals respond to state policy, use informal channels to influence politics, are subject to forms of repression, and challenge authoritarian government through Islamic and other types of organizations. Focus is on Egypt, Iraq, Syria, Yemen, and Iran.
5 units, Aut (Blaydes, L)

POLISCI 45N. Civil War Narratives—Stanford Introductory Seminar. Preference to freshmen. Focus is on a new statistics-based theory to account for the susceptibility of countries to civil war. How to write a theory-based historical narrative. Students write and present an original historical narrative focusing on how well the theory explains a particular history and new factors to explain civil war onsets. GER:DB-SocSci
5 units, Win (Laitin, D)

INTERMEDIATE UNDERGRADUATE LECTURES

INTERNATIONAL RELATIONS

Students interested in international relations are encouraged to take POLISCI 1. While not a formal prerequisite for many of the courses listed below, it provides background for more advanced work.

The courses in international relations offered in Political Science can be divided into those dealing with global political, military, and economic problems, and those dealing with the foreign relations of nations or geographic regions. Students concentrating in international relations are encouraged to select their courses from both groups.

Students interested in a major in International Relations should refer to the "International Relations" section of this bulletin.

POLISCI 110A. Sovereignty and Globalization—The relationship between globalization and the viability of state sovereignty, the development of international institutions, and the international distribution of wealth and security. GER:DB-SocSci
5 units, not given this year

POLISCI 110B. Strategy, War, and Politics—Traditional and modern theories on the causes of war and sources of peace. Contrasting explanations for the origins of WW I and II; alternative theories of deterrence in the nuclear age; the causes of war in the Persian Gulf, ethnic conflicts, and terrorism in the post-Cold War era. GER:DB-SocSci
5 units, not given this year

POLISCI 110C. America and the World Economy—(Same as 110X.) (Students not taking this course for WIM, register for 110X.) American foreign economic policy. Issues: the evolution of American tariff and trade policy, the development of mechanisms for international monetary management, and American foreign investment policy reflected in the changing political goals pursued by American central decision makers. Prerequisite: 1 or equivalent. GER:DB-SocSci, WIM
5 units, Win (Goldstein, J)

POLISCI 110D. War and Peace in American Foreign Policy—(Same as 110Y.) (Students not taking this course for WIM, register for 110Y.) The causes of war in American foreign policy. Issues: international and domestic sources of war and peace; war and the American political system; war, intervention, and peace making in the post-Cold War period. GER:DB-SocSci, WIM
5 units, Spr (Schultz, K)

POLISCI 110X. America and the World Economy—(Same as 110C.) Does not fulfill WIM requirement. GER:DB-SocSci
5 units, Win (Goldstein, J)

POLISCI 110Y. War and Peace in American Foreign Policy—(Same as 110D.) Does not fulfill the WIM requirement. GER:DB-SocSci
5 units, Spr (Schultz, K)

POLISCI 111. Peace Studies—(Same as PSYCH 165.) Interdisciplinary. The challenges of pursuing peace in a world with many conflicts and rising regional, ethnic, and religious antagonisms. Historical, social, psychological, and moral perspectives. Contributions of academic disciplines to the study of peace. Students explore a conflict and offer contributions to the building of peace. Limited enrollment. GER:DB-SocSci
5 units, not given this year

POLISCI 111D. British Politics—The impact on the world's oldest democracy of major changes in policies, politics, and the institution of government made over the last two decades by Margaret Thatcher and Tony Blair. GER:DB-SocSci, EC-GlobalCom
5 units, Spr (Dorfman, G)

POLISCI 113F. The United Nations and Global Governance—The role of international institutions and organizations in the areas of health, environment, security, trade, development, and human rights. Evaluation, accountability, participation, legitimacy, and autonomy. GER:DB-SocSci
5 units, not given this year

POLISCI 114D. Democracy, Development, and the Rule of Law—(Graduate students register for 314D; same as IPS 230, INTNLREL 114D.) Links among the establishment of democracy, economic growth, and the rule of law. How democratic, economically developed states arise. How the rule of law can be established where it has been historically absent. Variations in how such systems function and the consequences of institutional forms and choices. How democratic systems have arisen in different parts of the world. Available policy instruments used in international democracy, rule of law, and development promotion efforts. GER:DB-SocSci
5 units, Aut (Stoner-Weiss, K; McFaul, M)

POLISCI 114S. International Security in a Changing World—The major international and regional security problems in the modern world. Interdisciplinary faculty lecture on the political and technical issues involved in nuclear proliferation, terrorism and homeland security, civil wars and insurgencies, and future great power rivalries. GER:DB-SocSci
5 units, Win (Sagan, S; Blacker, C)

POLISCI 116. History of Nuclear Weapons—(Same as HISTORY 103E.) The development of nuclear weapons and policies. How existing nuclear powers have managed their relations with each other. How nuclear war has been avoided so far and whether it can be avoided in the future. GER:DB-SocSci
5 units, Spr (Holloway, D)

AMERICAN POLITICS

POLISCI 120A. American Political Sociology and Public Opinion: Who We Are and What We Believe—First of team-taught, intermediate-level, three-part sequence designed to introduce students to topics in American politics and government. The sociology of the U.S. and the political beliefs and values of Americans. Students may enroll for one, two, or three quarters, but the course is cumulative so maximum benefit results from enrollment in the entire sequence. Recommended: 2. GER:DB-SocSci

5 units, not given this year

POLISCI 120B. Parties, Interest Groups, the Media, and Elections—What are the public's powers and constraints in influencing the political process? The role of parties in organizing the electorate and Congress and affecting electoral and policy outcomes. Influence of elections and interest groups in the political process, and their effect on the distribution of power. Media's impact on political participation. GER:DB-SocSci

5 units, Win (Staff)

POLISCI 120C. American Political Institutions: Congress, the Executive Branch, and the Courts—How politicians, once elected, work together to govern America. The roles of the President, Congress, and Courts in making and enforcing laws. Focus is on the impact of constitutional rules on the incentives of each branch, and on how they influence law. GER:DB-SocSci, WIM

5 units, Spr (Rutten, A)

POLISCI 121. Urban Politics—(Same as SOC 149X/249X, URBANST 111.) The major actors, institutions, processes, and policies of sub-state government in the U.S., emphasizing city general-purpose governments through a comparative examination of historical and contemporary politics. Issues related to federalism, representation, voting, race, poverty, housing, and finances. Prerequisite: POLISCI 2 or consent of instructor.

5 units, Aut (Bischoff, K)

POLISCI 122. Introduction to American Law—(Same as AMSTUD 179, LAW 106.) For undergraduates. The structure of the American legal system including the courts; American legal culture; the legal profession and its social role; the scope and reach of the legal system; the background and impact of legal regulation; criminal justice; civil rights and civil liberties; and the relationship between the American legal system and American society in general. GER:DB-SocSci

3-5 units, Aut (Friedman, L)

POLISCI 123. Politics and Public Policy—(Same as PUBLPOL 101.) How policies come to be formed. How interests compete within public institutions to turn ideas into policies. Examples of this process from contemporary policy areas, including tax, social welfare, and environmental policy; results evaluated using equity and efficiency criteria. Prerequisite: 2. GER:DB-SocSci

5 units, Aut (Sprague, M)

POLISCI 124R. Judicial Politics and Constitutional Law: The Federal System—The impact of constitutional rules on policy making in the U.S. with a focus on structural issues such as separation of powers and federalism. Topics such as: the role of unelected judges in a democracy; the rule of law; and the constitutionality of the war in Iraq. Prerequisites: 2 or equivalent, and sophomore standing. GER:DB-SocSci, WIM

5 units, Aut (Rutten, A)

POLISCI 124S. Judicial Politics and Constitutional Law: Civil Liberties—The role and participation of courts, primarily the U.S. Supreme Court, in public policy making and the political system. Judicial activity in civil liberty areas (religious liberty, free expression, race and sex discrimination, political participation, and rights of persons accused of crime). Prerequisites: 2 or equivalent, and sophomore standing. GER:DB-SocSci

5 units, Win (Rutten, A)

POLITICAL THEORY

POLISCI 130A. History of Political Thought I—(Graduate students register for 330A; same as CLASSHIS 133/333.) Political philosophy in classical antiquity, focusing on canonical works of Thucydides, Plato, Aristotle, and Cicero. Historical background. Topics include: political obligation, citizenship, and leadership; origins and development of democracy; and law, civic strife, and constitutional change. GER:SocSci

5 units, not given this year

POLISCI 130B. History of Political Thought II: Early Modern Political Thought, 1500-1700—(Graduate students register for 330B.) The development of constitutionalism, Renaissance humanism and the Reformation, and changing relationships between church and states. Emphasis is on the relationships among political thought, institutional frameworks, and immediate political problems and conflicts. The usefulness of the history of political thought to political science. GER:DB-SocSci

5 units, not given this year

POLISCI 130C. History of Political Thought III: Freedom, Reason, and Power—(Graduate students register for 330C.) Classic works in political theory since the American and French revolutions. Readings include Kant, Hegel, Marx, Nietzsche, and Dewey. GER:DB-SocSci

5 units, not given this year

POLISCI 131. Children's Citizenship: Justice Across Generations—(Same as EDUC 158.) The development of children into citizens, focusing on major social institutions responsible for their civic education: schools, families, communities, and civil society. How does each institution develop citizenship? What is the relationship between civic education and the reproduction of social equality or inequality? Do children's rights differ from those of adults? Readings: political theorists on justice, feminist theorists on family and children, court cases on tensions between the state and community interest in education, and social critics on the practice of civic education. GER:DB-SocSci, EC-EthicReas

5 units, not given this year

POLISCI 133. Ethics and Politics of Public Service—(Same as ETHICSOC 133.) Ethical and political questions in public service work, including volunteering, service learning, humanitarian assistance, and public service professions such as medicine and teaching. Motives and outcomes in service work. Connections between service work and justice. Is mandatory service an oxymoron? History of public service in the U.S. Issues in crosscultural service work. Integration with the Haas Center for Public Service to connect service activities and public service aspirations with academic experiences at Stanford. GER:DB-SocSci

5 units, Aut (Reich, R)

POLISCI 134. Democracy and the Communication of Consent—(Same as COMM 136/236.) Focus is on competing theories of democracy and the forms of communication they presuppose, combining normative and empirical issues, and historical and contemporary sources. Topics include representation, public opinion, mass media, small group processes, direct democracy, the role of information, and the prospects for deliberative democracy. GER:DB-SocSci

4-5 units, Aut (Fishkin, J)

POLISCI 136. Philosophical Issues Concerning Race and Racism—(Same as PHIL 177.) Concepts of race, race consciousness, and racism, and their connections. What is race and what is its role in racism? How should ethnic and racial identities be viewed to secure the conditions in which humanity can be seen as a single moral community whose members have equal respect? What laws, values, and institutions best embody the balance among competing goals of group loyalty, opposition to racism, and common humanity? Philosophical writings on freedom and equality, human rights, pluralism, and affirmative action. Historical accounts of group exclusion. GER:DB-Hum, EC-AmerCul

4 units, Win (Satz, D)

POLISCI 136R. Introduction to Global Justice—(Graduate students register for 336; same as INTNLREL 136R.) Recent work in political theory on the ethics of international relations. Topics include human rights, global economic justice, and the problem of global poverty.
5 units, Spr (Pasternak, A; de Bres, H)

POLISCI 136S. Justice—(Same as ETHICSOC 171, IPS 208, PHIL 171/271, PUBLPOL 207.) Focus is on the ideal of a just society, and the place of liberty and equality in it, in light of contemporary theories of justice and political controversies. Topics include protecting religious liberty, financing schools and elections, regulating markets, assuring access to health care, and providing affirmative action and group rights. Issues of global justice including human rights and global inequality. GER:DB-Hum, EC-EthicReas
5 units, Aut (Cohen, J)

POLISCI 138. Modern Political Ideologies—Prominent political ideologies that define the terms of contemporary political discourse including liberalism, conservatism, feminism, and anarchism through the intellectual debates generated by the French Revolution. Readings include Price, Burke, Godwin, Wollstonecraft, and Paine.
5 units, not given this year

COMPARATIVE POLITICS

Undergraduate courses and seminars in comparative politics generally fall into two groups: those dealing with a particular country or region, and those dealing with major political problems or processes. Students are encouraged to take courses from both groups, and are also urged to do course work in more than one country or region.

POLISCI 140. Political Economy of Development—Emphasis is on the interplay between political economic processes, and national and international factors from Latin America, Africa, and Asia. Do governments provide the foundations for economic development? The role of the state in solving problems of violence and capital accumulation. GER:DB-SocSci, EC-GlobalCom
5 units, Win (Díaz-Cayeros, A)

POLISCI 140L. China in World Politics—The implications of the rise of China in contemporary world politics and for American foreign policy, including issues such as arms and nuclear proliferation, regional security arrangements, international trade and investment, human rights, environmental problems, and the Taiwan and Tibet questions. GER:DB-SocSci, EC-GlobalCom
5 units, not given this year

POLISCI 141. The Global Politics of Human Rights—The global development and changing nature of human rights and the rise of an international human rights movement. Conflicts between national sovereignty and rights, and among types of rights. Case studies include genocide in Rwanda, holding torturers accountable in Chile and El Salvador, factory workers versus Nike, and the rights of women in S. Africa. GER:DB-SocSci
5 units, not given this year

POLISCI 141E. Elections in the U.S. and Canadian Wests: Innovation and Reform—How laws governing elections in western U.S. states and Canadian provinces affect representation, citizenship, and public policy. Emphasis is on the evolution of direct democracy, including the initiative and referendum processes, since state- and provincehood. Is there is a distinctive Western political culture?
5 units, not given this year

POLISCI 143. Nongovernmental Organizations and Development in Poor Countries—(Same as INTNLREL 143.) Relations among nongovernmental organizations, governments, international organizations, and multinational corporations. How NGOs contribute to economic growth, equity, a sustainable environment, peace and order, and democracy in poor countries. Their record on natural disaster and war relief work. How NGOs based in rich countries interact with those based in poor ones. GER:DB-SocSci
5 units, Win (Abernethy, D)

POLISCI 144T. Democracies and Dictatorships—Social scientific findings and debates; cross-sectional approach. What accounts for the emergence of democracy; under what conditions are democracies stable; why are so many developing countries ruled by dictators; why do rulers who destroy their own societies survive for so long; and what accounts for the breakdown of autocratic regimes?
5 units, Spr (Magaloni, B)

POLISCI 146S. Civil War and Violence in Africa—What conditions permit civil war? Why do people join rebel groups? Do outsiders help or hinder the resolution of civil wars? How does the prospect of external intervention influence ongoing civil wars?
5 units, Win (Johnston, P)

POLISCI 147. Comparative Democratic Development—Social, cultural, political, economic, and international factors affecting the development and consolidation of democracy in historical and comparative perspective. Individual country experiences with democracy, democratization, and regime performance. Emphasis is on the third wave of democratization over the past three decades and contemporary possibilities for democratic change. GER:DB-SocSci, EC-GlobalCom
5 units, Win (Diamond, L)

POLISCI 147S. Comparative Democratic Politics—Do contemporary democracies conform to the ideals of democratic theory? Whose interests are represented in electoral competition? How do electoral rules affect whose interests are represented? What roles do political parties serve? Are political parties effective in representing the interests of their constituents? How do electoral rules structure electoral choice and electoral behavior? Prerequisite: 4.
5 units, Win (Jusko, K)

POLISCI 148. Chinese Politics: The Transformation and the Era of Reform—(Graduate students register for 348.) For advanced undergraduates and beginning graduate students. The content, process, and consequences of reform in China from 1976 to the present. GER:DB-SocSci, EC-GlobalCom
5 units, Spr (Oi, J)

POLISCI 148R. Chinese Politics—The politics of the People's Republic of China. The origins of the Communist Revolution, the institutionalization and consequences of communist rule, and attempts to reform the system since 1978. GER:DB-SocSci
5 units, not given this year

POLISCI 148S. The U.S. and Asia During the Cold War—International relations perspective. WW II and its impact on international relations; the efforts of Allied statesmen to design a stable postwar order; the Chinese civil war; the American occupation of Japan; the Korean War; S.E. Asian independence struggles; the American alliance system in the 50s, the Sino-Soviet alliance; Indo-Pakistani conflicts; the Vietnam War; strategic realignment in the 70s; and the legacy of the Cold War on the region's international agenda and American policy priorities. The relevance of the region to the international system. GER:DB-SocSci, EC-GlobalCom
5 units, not given this year (Miller, A)

POLISCI 149S. Islam and the West—Changes in relative power and vitality of each side. The relationship in the Middle Ages revolved around power and domination, and since the Renaissance around modernity. Focus is on Muslims of the Middle East. GER:DB-SocSci
5 units, Spr (Milani, A)

POLISCI 149T. Middle Eastern Politics—Topics in contemporary Middle Eastern politics including institutional sources of underdevelopment, political Islam, electoral authoritarianism, and the political economy of oil.
5 units, Win (Blaydes, L)

POLITICAL METHODOLOGY

POLISCI 150A. Political Methodology I—(Graduate students register for 350A.) Introduction to probability and statistical inference, with applications to political science and public policy. Prerequisite: elementary calculus. GER:DB-Math

5 units, Aut (Rivers, D)

POLISCI 150B. Political Methodology II—(Graduate students register for 350B.) Understanding and using the linear regression model in a social-science context: properties of the least squares estimator; inference and hypothesis testing; assessing model fit; presenting results for publication; consequences and diagnosis of departures from model assumptions; outliers and influential observations, graphical techniques for model fitting and checking; interactions among exploratory variables; pooling data; extensions for binary responses. GER:DB-Math

5 units, Win (Jackman, S)

POLISCI 150C. Political Methodology III—(Graduate students register for 350C.) Models for discrete outcomes, time series, measurement error, and simultaneity. Introduction to nonlinear estimation, large sample theory. Prerequisite: 150B/350B.

3-5 units, Spr (Jackman, S)

POLISCI 151A. Doing Political Science—For students planning a major in Political Science. Social science methodological approaches including case studies and formal models. The common language, core concepts, and scholarly goals that lie beneath the diversity of means that political scientists use to pursue knowledge. Concepts and their use through the research of Stanford Political Science professors. Guest faculty appearances. Goal is to prepare students to do political science, not just study it. Prerequisite: POLISCI 1, 2, 3, or 4, or consent of instructor. GER:DB-Math

5 units, Win (Jusko, K)

POLISCI 151B. Data Analysis for Political Science—Operationalization of concepts, measurement, scale construction, finding and pooling/merging data, cross-tabulations, tests of association, comparison of means, correlation, scatterplots, and regression models. How to present the results of data analysis in research reports, essays, and theses. Emphasis is on getting and using data with appropriate statistical software. Prior mathematics not required. GER:DB-Math

5 units, not given this year

POLISCI 152. Introduction to Game Theoretic Methods in Political Science—(Graduate students register for 352.) Concepts and tools of non-cooperative game theory developed using political science questions and applications. Formal treatment of Hobbes' theory of the state and major criticisms of it; examples from international politics. Primarily for graduate students; undergraduates admitted with consent of instructor.

3-5 units, Win (Fearon, J)

POLISCI 157. Sampling and Surveys—(Graduate students register for 357.) The importance of sample surveys as a source of social science data including public opinion, voting, welfare programs, health, employment, and consumer behavior. Survey design, sampling theory, and estimation. Nonresponse, self-selection, measurement error, and web survey methods. Prerequisite: 150B or equivalent.

5 units, not given this year

ADVANCED UNDERGRADUATE SEMINARS

INTERNATIONAL RELATIONS

POLISCI 210R. International Conflict Resolutions and Management—(Graduate students register for 310R; same as IPS 250, LAW 656.) Interdisciplinary; approaches include social psychology, political science, game theory, and international law. Theoretical insights and practical experience in managing and resolving inter-group and international conflicts. Personal, strategic, and structural barriers that can impede the achievement of efficient solutions to conflicts. Focus is on themes that faculty affiliated with the Stanford Center of International Conflict and Negotiation (SCICN) have found useful in their research.

2-5 units, Win (Weiner, A; Holloway, D; Ross, L; Bland, B)

POLISCI 211. Political Economy of East Asia—Comparative and international political economy of E.and S.E. Asia. Industrial development and the Asian miracle, economic integration, regional cooperation, the Asian financial crisis, and contemporary challenges.

5 units, Spr (Lipscy, P)

POLISCI 212. Managing Global Complexity—(Same as IPS 201.) The value of major theories and concepts in international relations for understanding and addressing global policy issues. Country case study with policy challenges such as development, democracy promotion, proliferation, and terrorism; the challenge of creating coherent policies that do not run at cross purposes. Case study of a policy challenge that cuts across academic disciplines and policy specializations to provide the opportunity to bring together skills and policy perspectives.

3 units, Spr (Krasner, S; Stedman, S)

POLISCI 215. Explaining Ethnic Violence—What is ethnic violence and why does it occur? Should elite machinations, the psychology of crowds, or historical hatreds be blamed? Case studies and theoretical work on the sources and nature of ethnic violence. GER:DB-SocSci

5 units, Aut (Fearon, J)

POLISCI 216. Law, Economics, and Politics of International Trade—(Same as LAW 306.) Legal architecture of the WTO system; questions about its design and wisdom. Economics and politics of international cooperation on trade; the WTO as an institution and its obligations. Topics may include: the choice between regional and global approaches to trade cooperation; interface between international trade obligations and domestic regulation of health, safety and the environment; regulation of subsidies; dispute settlement system; and differential treatment of developing countries. Recommended: ECON 51 or POLISCI 110C or X.

3-5 units, Win (Sykes, A; Goldstein, J)

POLISCI 217. International Organizations—(Graduate students register for 317.) The role of international organizations in interstate cooperation. Theoretical approaches and applications. The UN, International Monetary Fund, World Bank, World Trade Organization, and regional and supranational organizations.

5 units, Spr (Lipscy, P)

POLISCI 218. U.S. Relations in Iran—The evolution of relations between the U.S. and Iran. The years after WW II when the U.S. became more involved in Iran. Relations after the victory of the Islamic republic. The current state of affairs and the prospects for the future. Emphasis is on original documents of U.S. diplomacy (White House, State Department, and the U.S. Embassy in Iran). Research paper. GER:DB-SocSci

5 units, Aut (Milani, A)

POLISCI 219. Directed Reading and Research in International Relations—May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

AMERICAN POLITICS

POLISCI 221. Tolerance and Democracy—The value of tolerance and its implications for the principles and practices of democracy. Tolerance as understood by political philosophers and citizens. Readings include: John Stuart Mill's *On Liberty*, Isaiah Berlin's *Two Concepts of Liberty*, and modern studies of public opinion. Topics include: ideas and liberty; value pluralism; the interplay of authority and obedience; the role of political elites and mass publics in democratic societies; multiculturalism. Principal forms of value conflict in contemporary liberal democracies.

5 units, Spr (Sniderman, P)

POLISCI 221E. Seminar on Race in Institutional Contexts—The extent to which the representation of Black Americans in higher education, politics, and social discourse is reflective of a more fair, just, and open society. Emphasis is on the 2008 presidential election cycle and impacts on public policy as related to the role of courts. Sources include scholarly research, reports, and data from governmental and nongovernmental agencies, the media, and participant observation. Limited enrollment. Prerequisite: junior standing.

5 units, Spr (Barker, L)

POLISCI 221F. Race and American Politics—How the issue of race has helped define the modern era of American politics. Major theories of political cleavage over public policies dealing with race.
5 units, Spr (Sniderman, P)

POLISCI 222R. Tolerance and Prejudice—Focus is on the contemporary strain in U.S. and W. European liberal democratic politics over accommodation of racial, ethnic, and religious diversity and the major threads of current political discourse including pluralism, diversity, prejudice, multiculturalism, and tolerance. GER:DB-SocSci
5 units, Win (Sniderman, P; Callan, E)

POLISCI 223D. Term Limits and American Democracy—Why voters place constitutional and statutory limits on the number of terms elected officials can serve in an office. Effects of term limits on elections and policy making in the U.S. Presidential, gubernatorial, and state legislator term limits, the congressional term limits movement, and the success of the movement in the American West.
5 units, Win (Frisby, T)

POLISCI 223S. The Imperial Temptation: U.S. Foreign Policy in a Unipolar World—How the collapse of the Soviet Union liberated the U.S. from the constraints of bipolarity. How current policy fits into earlier traditions such as Wilsonianism or realism. Normative questions; what is America's proper role in the world? GER:DB-SocSci
5 units, Aut (Joffe, J)

POLISCI 224R. Democratic Citizenship: Can Ordinary Citizens Reason about Politics?—The tradition of skepticism about whether ordinary citizens can discharge the responsibilities of democratic citizenship. How this skepticism has been strengthened by recent research on public opinion and electoral behavior. Sources include the interplay of empirical and normative democratic theory. GER:DB-SocSci
5 units, not given this year

POLISCI 227R. Polarized Politics and Special Interest Groups—The influence of special interest groups on electoral competition and policy outcomes in the U.S., and the increasing partisan polarization among elites. How money spent by special interest groups affects the types of candidates who are elected, the agendas of the parties, and the votes of Congressmen. GER:DB-SocSci
5 units, not given this year

POLISCI 229. Directed Reading and Research in American Politics—May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

POLITICAL THEORY

POLISCI 231S. Contemporary Theories of Justice—Social and political justice and contemporary debates in political theory. Recent works that develop the principles of justice, and the political arrangements that best satisfy their requirements. Limited enrollment. GER:DB-SocSci, EC-EthicReas
5 units, not given this year

POLISCI 232. Civil Society and the Nonprofit Sector—(Same as URBANST 121.) Development of the idea of civil society from early Enlightenment Europe to the contemporary U.S. Historical and theoretical foundations. Contemporary features of the nonprofit sector including its legal, economic, political, and ethical dimensions. Structure and operation of modern philanthropy and challenges of the 21st century.
2-4 units, not given this year

POLISCI 236. Theories of Civil Society, Philanthropy, and the Nonprofit Sector—The historical development and modern structure of civil society emphasizing philanthropy and the nonprofit sector. What is the basis of private action for the public good? How are charitable dollars distributed and what role do nonprofit organizations and philanthropic dollars play in a modern democracy? How do nongovernmental organizations operate domestically and globally? Readings in political philosophy, political sociology, and public policy. WIM
5 units, Spr (Reich, R; Sievers, B)

POLISCI 237. Models of Democracy—(Graduate students register for 337; same as CLASSHIS 137/237, COMM 212/312.) Ancient and modern varieties of democracy; debates about their normative and practical strengths and the pathologies to which each is subject. Focus is on participation, deliberation, representation, and elite competition, as values and political processes. Formal institutions, political rhetoric, technological change, and philosophical critique. Models tested by reference to long-term historical natural experiments such as Athens and Rome, recent large-scale political experiments such as the British Columbia Citizens' Assembly, and controlled experiments.
3-5 units, Win (Fishkin, J; Ober, J)

POLISCI 239. Directed Reading and Research in Political Theory—May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

COMPARATIVE POLITICS

POLISCI 242S. Politics of Welfare State Expansion and Reform—Major theories explaining the development of the welfare state and its impact on the organization of the political economy. The relative importance of institutional variables, social cleavages, partisanship, and ideology, and the role of economic openness in explaining cross-national differences in social policy. Recent politics of social policy adjustment, and existing differences among welfare states facing unfavorable economic and demographic developments and political pressures toward welfare state retrenchment.
5 units, not given this year

POLISCI 243R. Research Seminar in Democratization and Human Rights—Goal is to produce a minimum 30-page paper based on field research abroad. Students prepare research problem statement, meet individually with the professor, and circulate drafts for class comment. Graduate students should register for directed reading under the professor's name.
5 units, Aut (Karl, T)

POLISCI 244R. Political Economy of Disease: AIDS in Historical Perspective—Demographic, economic, cultural, and political changes in the wake of AIDS. The social dimensions of infectious diseases and epidemics; the impact of epidemics on political and economic institutions; and the political economy of responses to the AIDS crisis. Students conduct original research on causes and/or consequences of AIDS or AIDS-related policies. GER:DB-SocSci
5 units, not given this year

POLISCI 245R. Politics in Modern Iran—Modern Iran has been a smithy for political movements, ideologies, and types of states. Movements include nationalism, constitutionalism, Marxism, Islamic fundamentalism, social democracy, Islamic liberalism, and fascism. Forms of government include Oriental despotism, authoritarianism, Islamic theocracy, and liberal democracy. These varieties have appeared in Iran in an iteration shaped by history, geography, proximity to oil and the Soviet Union, and the hegemony of Islamic culture. GER:DB-SocSci, EC-GlobalCom
5 units, Win (Milani, A)

POLISCI 245T. Dictatorship and Democracy in the Middle East—Autocratic stability in the Middle East. Why are there no democracies in the Middle East except for Turkey and Israel? Sources include culture, religion, institutions, geopolitics, and resources. Varieties of authoritarianism and democracy. Conditions under which regimes might change.
5 units, not given this year

POLISCI 246T. Taxation Data and Institutions—Research seminar. How to specify hypotheses, draw logical inferences from data, and build data sets. Focus is on the use of government revenue and tax data. Students build data sets from primary sources, standardize the data according to IMF standards, and analyze it to test hypotheses drawn from the political science literature on rentier states.
2-5 units, not given this year

POLISCI 247R. Politics and Economics in Democracies—Comparative political economy. Why do some countries have larger welfare states than others? Why do some countries provide collective goods more effectively than others? WIM

5 units, Spr (Rodden, J)

POLISCI 248. Mexican Politics—Why did Mexico fail to eliminate poverty and destitution despite resources channeled to that end and a rhetoric of social justice inherited from the Revolution? The durability of the political regime, the peculiar characteristics of the Mexican process of democratization, and the regime's incentives to redress ancestral problems of inequality and destitution. Emphasis is on crafting research projects on the political economy of Mexican development, and hypothesis testing with empirical data. GER:DB-SocSci, EC-GlobalCom

5 units, Spr (Díaz-Cayeros, A)

POLISCI 248S. Latin American Politics—Fundamental transformations in Latin America in the last two decades: why most governments are now democratic or semidemocratic; and economic transformation as countries abandoned import substitution industrialization policies led by state intervention for neoliberal economic polices. The nature of this dual transformation. GER:DB-SocSci

5 units, Win (Magaloni, B)

POLISCI 249. Directed Reading and Research in Comparative Politics—May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

RESEARCH

POLISCI 299A,B,C. Senior Project—Students conduct independent research work towards a senior honors thesis. See "Honors Program" above.

1-5 units, Aut, Win, Spr (Staff)

POLISCI 299Q. Junior Research Seminar—Required of students interested in writing a senior honors thesis. Focus is on finding a manageable topic and an adviser.

2 units, Aut, Win, Spr (Rutten, A)

POLISCI 299R. Senior Research Seminar—Required of students writing honors theses. Focus is on acquiring research skills and developing an appropriate research design. WIM

3 units, Aut (Rutten, A)

POLISCI 299S. Senior Honors Tutorial—Required of students writing honors theses. Focus is on solving problems in writing a thesis such as keeping on schedule and rewriting drafts. Students work with other honors students and graduate student tutors.

2 units, Win (Rutten, A)

ADVANCED UNDERGRADUATE/GRADUATE

INTERNATIONAL RELATIONS

POLISCI 310A. International Relations Theory, Part I—First of a three-part graduate sequence. History of international relations, current debates, and applications to problems of international security and political economy.

5 units, Aut (Schultz, K)

POLISCI 310B. International Relations Theory, Part II—Second of a three-part graduate sequence. History of international relations theory, current debates, and applications to problems of international security and political economy. Prerequisite: 310A.

5 units, Win (Goldstein, J)

POLISCI 310C. Research in International Relations—Third of a three-part graduate sequence. Focus is on developing research papers begun in 310A or B, and exploring active areas of research in the field. Prerequisite: 310B.

5 units, Spr (Tomz, M)

POLISCI 310R. International Conflict Resolutions and Management—(For graduate students; see 210R; same as IPS 250, LAW 656.)

2-5 units, Win (Weiner, A; Holloway, D; Ross, L; Bland, B)

POLISCI 311. Contemporary Issues in Peace Studies—(Same as PSYCH 185/285.) Interdisciplinary. The challenges of pursuing peace in a world of conflict and regional, ethnic, and religious antagonisms. Historical, social, psychological, and moral perspectives. Current research in social psychology, political science, international relations, and negotiation theory. Student involvement in real-world efforts to identify and overcome the barriers that impede a peace settlement. Prerequisite: consent of instructor.

3 units, not given this year

POLISCI 311A,B,C. Workshop in International Relations—For graduate students. Contemporary work. Organized around presentation of research by students and outside scholars. May be repeated for credit.

1-5 units, **A:** *Aut,* **B:** *Win (Schultz, K; Sagan, S),* **C:** *not given this year*

POLISCI 313. Ideas and International Security—The role of ideas in international relations and U.S. national security. Constructivist theories of international relations, and applications to real world security issues. The formation and influence of identities and norms. How everyday discourse gives meaning to concepts such as weapons and justice. Applied topics include winning in war, immigration as a security issue, norms and legitimacy in warfare, the use and non-use of weapons of mass destruction, and the influence of transnational social networks on states. Limited enrollment.

5 units, Aut (Atkinson, C)

POLISCI 314D. Democracy, Development, and the Rule of Law—(For graduate students; see 114D; same as IPS 230, INTNLREL 114D.)

5 units, Aut (Stoner-Weiss, K; McFaul, M)

POLISCI 314S. Decision Making in U.S. Foreign Policy—(Same as IPS 314S.) Priority to IPS students. Formal and informal processes involved in U.S. foreign policy decision making. The formation, conduct, and implementation of policy, emphasizing the role of the President and executive branch agencies. Theoretical and analytical perspectives; case studies.

5 units, Spr (Blacker, C)

POLISCI 316. International History and International Relations Theory—(Same as HISTORY 202/306E.) The relationship between history and political science as disciplines. Sources include studies by historians and political scientists on topics such as the origins of WW I, the role of nuclear weapons in international politics, the end of the Cold War, nongovernmental organizations in international relations, and change and continuity in the international system.

5 units, not given this year

POLISCI 317. International Organizations—(For graduate students; see 217.)

3-5 units, Spr (Lipscy, P)

POLISCI 318R. State and Nation Building in Central Asia—Issues of identity, development, and security consequent upon the dissolution of the Soviet Union and the emergence of five independent states in Central Asia and three new states in the Southern Caucasus. The impact of 9/11, spread of radical Islamist movements in the region, and its growing role as a transit route for drugs, weapons, and possibly nuclear materials. The impact of the Soviet legacy, the nature of political and economic transformations, relations with neighboring countries, particularly Russia, Iran, Turkey, and China, and security challenges. Options facing American policy makers managing American involvement.

5 units, Spr (Lapidus, G)

POLISCI 318S. State Building—Past and present efforts by external actors to influence domestic authority structures. Topics may include: colonialism; protection of minority rights in the 19th and first half of the 20th century; U.S. intervention in the Caribbean and Central America; U.S. and Soviet intervention in Europe after WW II; Afghanistan; and Iraq. For Ph.D. students; others with consent of instructor.

5 units, Spr (Krasner, S)

POLISCI 319. Directed Reading in International Relations—May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

AMERICAN POLITICS

POLISCI 321. Creating the American Republic—(Same as HISTORY 251/352, LAW 246.) Concepts and developments in the late 18th-century invention of American constitutionalism; the politics of constitution making and ratifying; emergence of theories of constitutional interpretation including originalism; early notions of judicial review. Primary and secondary sources.

5 units, Win (Rakove, J)

POLISCI 322. Campaign Finance and Elections—The strategies and behavior of special interest groups, parties, candidates, and voters in the U.S. Emphasis is on statistical models and empirical tests of formal models. Prerequisite: 350B; 351 sequence or 352; or equivalents.

5 units, not given this year

POLISCI 323R. The Press and the Political Process—(Same as COMM 160/260.) The role of mass media and other channels of communication in political and electoral processes.

4-5 units, Win (Iyengar, S)

POLISCI 323S. Analysis of Presidential Campaigns—(Same as COMM 162/262.) Seminar. The evolution of American political campaigns, and the replacement of the political party by the mass media as intermediary between candidates and voters. Academic literature on media strategies, the relationship between candidates and the press, the effects of campaigns on voter behavior, and inconsistencies between media campaigns and democratic norms. Do media-based campaigns enable voters to live up to their civic responsibility? Has the need for well-financed campaigns increased the influence of elites over nominations? Have citizens become disengaged?

4-5 units, Spr (Iyengar, S)

POLISCI 324. Graduate Seminar in Political Psychology—(Same as COMM 308.) For students interested in research in political science, psychology, or communication. Methodological techniques for studying political attitudes and behaviors. May be repeated for credit.

1-3 units, Aut, Win, Spr (Krosnick, J)

POLISCI 329. Directed Reading and Research in American Politics—May be repeated for credit.

1-10 units, Aut, Win, Spr, Sum (Staff)

POLITICAL THEORY

POLISCI 330A. History of Political Thought I—(For graduate students; see 130A; same as CLASSHIS 133/333.)

5 units, not given this year

POLISCI 330B. History of Political Thought II: Early Modern Political Thought, 1500-1700—(For graduate students; see 130B.)

5 units, not given this year

POLISCI 330C. History of Political Thought III: Freedom, Reason, and Power—(For graduate students; see 130C.)

5 units, not given this year

POLISCI 331S. Politics and Collective Action—(Same as IPS 206A, PUBLPOL 204A.) How public policies are formulated and implemented; preference formation. The role of electoral politics, nongovernmental organizations, ideologies, and social protests. The theory of collective action. Principal agent relationships. How elected officials, bureaucrats, and interest groups shape government policies in areas including tax, environmental, trade, and social welfare policy, given their goals and available tactics. How to evaluate policies and policy making processes.

4 units, Win (Satz, D)

POLISCI 332. Graduate Seminar: John Rawls's Political Philosophy—(Same as PHIL 372D.) Leading ideas in *A Theory of Justice*, *Political Liberalism*, and *The Law of Peoples*.

5 units, Win (Cohen, J)

POLISCI 332R,S. Greek Political Economy—(Same as CLASSHIS 250A,B.) Two-part course. Did large-scale kingdoms radically change the Greek world after Alexander; or had new conditions already emerged from the Peloponnesian War? Continuities and discontinuities across the classical/hellenistic divide. Focus is on states and economies in the 4th and 3rd centuries B.C.E. Sources include primary sources and recent scholarship on Greek economic thought and practices with reference to city states (Athens, Rhodes), federations (Achaean, Aetolian), and empires (Ptolemaic, Seleukid). S: Emphasis on presentation of research by faculty and students.

4-5 units, **R:** *Win,* **S:** *Spr (Manning, J; Ober, J)*

POLISCI 333. Topics in Democratic Theory—(Same as PHIL 377.) Modern approaches to democratic theory including liberal, communitarian, republican, and participatory theories beginning with the works of Locke, Rousseau, and Mill. Writers: John Rawls, Ronald Dworkin, Jeremy Waldron, Joshua Cohen, Habermas, Petit, Iris Marion Young, Ian Shapiro, and Amy Gutman.

3-5 units, not given this year

POLISCI 336. Introduction to Global Justice—(For graduate students; see 136R; same as INTNLREL 136R.)

5 units, Spr (Pasternak, A; de Bres, H)

POLISCI 337. Models of Democracy—(For graduate students; see 237; same as CLASSHIS 137/237, COMM 212/312.)

3-5 units, Win (Fishkin, J; Ober, J)

POLISCI 339. Directed Reading and Research in Political Theory—May be repeated for credit.

1-5 units, Aut, Win, Spr, Sum (Staff)

COMPARATIVE POLITICS

POLISCI 340R. Political Economics—How governments collect revenue, allocate spending, and obtain credit, as determined by variations in institutional and political conditions. The emphasis in a democracy on the provision of public goods and services and representative accountability as against the emphasis in less democratized settings on the extractive capacity of the state, the temporal horizons of rulers, and the purchase of political support with money.

5 units, not given this year

POLISCI 340S. Political Economy of Post-Communism—The sources of the collapse of the communist states in E. Europe and the former Soviet Union. The relationship between political reform and economic change, emphasizing democracy versus dictatorship, liberalization, stabilization and privatization, and the role of external actors in internal change in the region. Models and historical analogs for analyzing the emergence of post-communist politics.

5 units, Spr (McFaul, M)

POLISCI 341T. Comparative Democratization and Regime Change—Issues of democracy, its definition, problems of transition and consolidation, and comparison. The relationship between democracy and the military, the economy, and the interstate system.

5 units, not given this year

POLISCI 343R. African Civil Wars in Comparative Perspectives: A Research Seminar—Taught jointly with Columbia University via videoconferencing. Topics include causes of civil war, patterns of recruitment and participation, organization of rebel groups, strategies of warring factions, bargaining in the context of peace processes, and civil war termination. Required research paper using original datasets from instructors. Prerequisites: econometric modeling and graduate course work in comparative politics, international relations, and statistics.

5 units, not given this year

POLISCI 344. Politics and Geography—The role of geography in topics in political economy, including development, political representation, voting, redistribution, regional autonomy movements, fiscal competition, and federalism.
3-5 units, Win (Rodden, J)

POLISCI 344U. Political Culture—An approach to culture emphasizing equilibrium attributes through relationships among culture, choice, coordination, and common knowledge. Implications for the study of political processes and institutions.
5 units, Spr (Laitin, D)

POLISCI 346S. The Logic of Authoritarian Government, Ancient and Modern—(Same as HISTORY 378A.) If authoritarianism is less economically efficient than democracy, and if authoritarianism is a less stable form of political organization than democracy, then why are there more authoritarian governments than democracies? To address this paradox, focus is on theoretical and empirical literature on authoritarian governments, and related literatures on the microeconomic analysis of property rights and credible commitments.
5 units, Aut (Haber, S)

POLISCI 347T. Democracy and Dictatorship—Autocracy as the most common form of political regime in the developing world. How autocracies behave; their institutional diversity. Differences among dictatorships in regard to stability, propensities to end in violent conflict, economic development, and levels of repression.
3-5 units, Spr (Magaloni, B)

POLISCI 348. Chinese Politics: The Transformation and the Era of Reform—(For graduate students; see 148.)
5 units, Spr (Oi, J)

POLISCI 348R. Workshop: China Social Science—(Same as SOC 368.) For Ph.D. students in the social sciences and history. Research on contemporary society and politics in the People's Republic of China. May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, Aut, Win, Spr (Walder, A; Zhou, X; Oi, J)

POLISCI 348S. Contemporary Chinese Foreign Relations—Competing approaches to PRC foreign policy including Beijing's evolving goals and policies, the institutions and instruments of PRC foreign policy, and the processes of decision making. Application of these perspectives and methods to a research paper.
5 units, Spr (Miller, A)

POLISCI 349. Directed Reading and Research in Comparative Politics—May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

POLITICAL METHODOLOGY

POLISCI 350A,B,C. Political Methodology—(For graduate students; see 150A,B,C.)
A: *5 units, Aut (Rivers, D)*
B: *5 units, Win (Jackman, S)*
C: *3-5 units, Spr (Jackman, S)*

POLISCI 351A. Foundations of Political Economy—(Same as POLECON 680.) Emphasis is on formal models of collective choice, public institutions, and political competition. Topics include interest group politics, bureaucratic behavior, electoral competition, and political decentralization.
4 units, Aut (Hatfield, J)

POLISCI 351B. Economic Analysis of Political Institutions—(Same as POLECON 681.) Applying techniques such as information economics, games of incomplete information, sequential bargaining theory, repeated games, and rational expectations of microeconomic analysis and game theory to political behavior and institutions. Agenda formation in legislatures, government formation in parliamentary systems, the implications of legislative structure, elections and information aggregation, lobbying, electoral competition and interest groups, the control of bureaucracies, interest group competition, and collective choice rules.
4 units, Win (Shotts, K)

POLISCI 351C. Testing Models of Governmental Decision Making—(Same as POLECON 682.) Applications of formal models to decision making in the U.S. national government, emphasizing the legislative branch. Topics include strategies of committees, roll call voting, the budget process, policy formation, effects of special rules, congressional/presidential relations, and congressional/agency relations.
4 units, Spr (Krehbiel, K)

POLISCI 352. Introduction to Game Theoretic Methods in Political Science—(For graduate students; see 152.)
3-5 units, Win (Fearon, J)

POLISCI 353A. Workshop in Statistical Modeling—Theoretical aspects and empirical applications of statistical modeling in the social sciences. Guest speakers. Students present a research paper. Prerequisite: 350B or equivalent.
1-5 units, not given this year

POLISCI 353B. Workshop in Statistical Modeling—Continuation of 353A. Prerequisite: 353A.
1-5 units, not given this year

POLISCI 353C. Workshop in Statistical Modeling—Continuation of 353A. May be repeated for credit. Prerequisite: 353A.
1-5 units, not given this year

POLISCI 354F. Applied Bayesian Analysis—(Same as ANTHSCI 254.) Bayesian modeling in the social sciences emphasizing applications in political science, anthropological science, sociology, and education testing. Topics include: Bayesian computation via Markov chain Monte Carlo; Bayesian hierarchical modeling; Bayesian models for latent variables and latent states (measurement modeling); dynamic models; and Bayesian analysis of spatial models. Implementation of Bayesian approaches (priors, efficient sampling from posterior densities), data analysis, and model comparisons. Final project. Prerequisites: exposure to statistical modeling such as 200-level STATS or POLISCI 150/350B,C, or ANTHSCI 292.
3-5 units, Spr (Jones, J; Jackman, S)

POLISCI 355. Advanced Topics in Research Methods—Applications to American and comparative politics and international relations.
1-5 units, not given this year

POLISCI 357. Sampling and Surveys—(For graduate students; see 157.)
5 units, not given this year

POLITICAL INSTITUTIONS

POLISCI 362. New Economics of Organization—Survey of economic approaches to organization, emphasizing theory and application, with attention to politics.
5 units, Spr (Weingast, B)

POLISCI 364. Politics and Organization—(Same as POLECON 664.) Emphasis is on political institutions and formal organizations, and the norms, expectations, and routines characteristic of informal political structure.
4 units, Win (Bendor, J)

POLISCI 365. Organizational Decision Making—Behavioral theories of organization. Emphasis is on the institutional applications of bounded rationality. Models of incrementalism; evolutionary models of change; organizational learning. The differences between predictions of theories of perfect rationality and those of imperfect rationality. Organizational responses (constructive and pathological) to constraints on information processing. Institutional contexts; public agencies and firms.
5 units, not given this year

POLISCI 369. Directed Reading and Research in Political Organizations—Advanced individual study in public administration.
1-10 units, Aut, Win, Spr, Sum (Staff)

GRADUATE

POLISCI 400. Dissertation
1-10 units, Aut, Win, Spr, Sum (Staff)

POLISCI 402. Methods of Analysis Program in the Social Sciences (MAPSS) Workshop—(Same as COMM 310.) Colloquium series. Creation and application of new methodological techniques for social science research. Presentations on methodologies of use for social scientists across departments at Stanford by guest speakers from Stanford and elsewhere. See http://mapss.stanford.edu. May be repeated for credit.
1 unit, Aut, Win, Spr (Krosnick, J)

POLISCI 403. International Conflict Resolution Colloquium—(Same as LAW 611, PSYCH 283.) Interdisciplinary. Theoretical insights and practical experience in managing and resolving inter-group and international conflicts. Personal, strategic, and structural barriers that can impede the achievement of efficient solutions to conflicts. Sources include social psychology, political science, game theory, and international law. Themes derived from faculty affiliation and research with the Stanford Center of International Conflict and Negotiation (SCICN).
2-5 units, Win (Weiner, A; Holloway D; Ross, L)

POLISCI 411A,B,C. Research Seminar in International Security and Social Science—Advanced graduate students, faculty, and visitors present current research on contemporary problems in international security.
1 unit, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Eden, L; Sagan, S)*

POLISCI 420A. Approaches to the Study of American Politics—Theories of American politics, focusing on Congress, the presidency, the bureaucracy, and the courts.
5 units, Aut (Weingast, B)

POLISCI 420B. Topics in American Political Behavior—For graduate students with background in American politics embarking on their own research. Current research in American politics, emphasizing political behavior and public opinion. Possible topics: uncertainty and ambivalence in political attitudes, heterogeneity in public opinion, the structure of American political ideology, political learning, the media as a determinant of public opinion, and links between public opinion and public policy.
5 units, Win (Sniderman, P)

POLISCI 420C. American Political Institutions—Field seminar. Major theoretical perspectives, controversies, and literature on the substance of American politics, including Congress, the Presidency, federalism, bureaucracy, and the courts. Preparation for performing publishable research. Prerequisites: 420A,B.
5 units, Spr (Ferejohn, J)

POLISCI 422. Campaigns, Elections, and Public Opinion—Research seminar. Frontiers in mass political behavior. Sources include data sets from the 2004 election cycle. Prerequisite: 420B or equivalent.
2-5 units, Aut, Win, Spr (Sniderman, P; Fiorina, M)

POLISCI 424. Introduction to Political Psychology—Current issues in public opinion and political psychology. The design and analysis of experiments embedded in survey research. Focus is on reviewing the research literature and analyzing relevant data sets.
5 units, not given this year

POLISCI 431. Collective Action in Democratic Athens—(Same as CLASSHIS 431.) How can a collectivity reap the social benefits of cooperation in the face of the tendency of self-seeking individuals to defect? The problem is pressing in democracies, which require cooperation by diverse persons, and in competitive environments such as the classical Greek city states. Focus is on the organizational design of classical Athens as a state; how political institutions organized useful social and technical knowledge.
5 units, not given this year

POLISCI 432. Graduate Seminar: Global Justice—(Same as PHIL 372C.) The applicability of the idea of justice to global politics; the foundations and substance of human rights; problems of accountability, democracy, and the rule of law in global governance; and issues of distributive justice.
5 units, not given this year

POLISCI 434. Democracy and the Constitution—(Same as PHIL 374C.) Connections between democratic theory and constitutional theory. Sources include literature from political philosophy, constitutional law, and jurisprudence, and arguments about freedom of expression, campaign finance, legislative apportionment, and privacy. Readings from Scalia, Breyer, Ely, Ackerman, Dahl, Habermas, Dworkin, Przeworski, Riker, and Schumpeter.
5 units, not given this year

POLISCI 435. Topics in the Philosophy of Social Science—Topics relevant to present-day political science practice including: the foundation of probability theory; theories of scientific progress; the scope and limits of rational choice theory; and interpretive social science.
5 units, not given this year

POLISCI 436R. Luck, Law, and Morality—(Same as LAW 431.) The role of luck in moral and political theory and the law. Possible topics include: luck in legal liability and punishment (strict liability, attempts, risk regulation versus harm regulation); the possibility that rightness of conduct or worth of character might depend on luck; whether the point of egalitarianism is to correct for the impact of luck on fate; and whether there is anything left to the person after the impact of luck on life. Readings include Rawls, Williams, Nussbaum, Dworkin, Roemer, Cohen, Nagel, Hart, and Waldron. Prerequisite: graduate standing.
3 units, Win (Cohen, J; Fried, B)

POLISCI 440A. Theories in Comparative Politics—Required of Political Science Ph.D. students with comparative politics as first or second concentration; others by consent of instructor. Theories addressing major concerns in the comparative field including democracy, regime change, the state, revolutions, national heterogeneity, and economic performance.
5 units, Win (Laitin, D; Blaydes, L)

POLISCI 440B. Political Economy of Development—(Same as HISTORY 378E.) Required of Political Science Ph.D. students with comparative politics as a first or second concentration; others by consent of the instructor. The origins of political and economic institutions and their impact on long run outcomes for growth and democracy. Emphasis is on the analysis of causal models, hypothesis testing, and the quality of evidence.
5 units, Aut (Haber, S)

POLISCI 440C. Methods in Comparative Politics—Required of Political Science Ph.D. candidates with comparative politics as a first or second concentration; others by consent of instructor. Current methodological standards in comparative politics. Students develop their own research design that meets these standards.
5 units, Spr (Laitin, D; Jusko, K)

POLISCI 440D. Workshop in Comparative Politics—Faculty, guest speakers, and graduate students conducting research in comparative politics present work-in-progress. Graduate students may enroll for up to 5 total units apportioned by quarter. Auditors welcome. Graduate students whose major or minor field is comparative politics must make at least one presentation to the seminar.
1-5 units, Aut, Win, Spr (Díaz-Cayeros, A; Magaloni, B)

POLISCI 440E. Political Economy of Advanced Industrialized Democracies—Theories of comparative political economy organized as a progression from micro- to macro-level explanations. Sources of political cleavages over economic policies and the formation of political coalitions. Theories positing that differences in the organization of interest groups lead to systematic differences in economic outcomes. The economic and political consequences of differences in partisanship, political institutions, regime types, and the level of economic openness.
5 units, not given this year

POLISCI 441. Politics of Development—Theoretical understanding of how political processes and institutions are reflected in poverty and inequality; the creation of land, labor, and credit markets; and the configuration of fiscal, monetary, and trade policies. The politics of developing countries with emphasis on contrasts between Latin America and Africa.
5 units, Win (Díaz-Cayeros, A)

POLISCI 442. Qualitative and Field Methods—Qualitative methods for data gathering and analysis in political science. Theoretical literature on research design; challenges associated with analysis; techniques for fieldwork. Topics include case selection, levels of analysis, process tracing, ethical concerns in the field, participant observation, interviewing, archival research, survey design, and field experiments. Prerequisites: 440A,B,C.
5 units, not given this year

POLISCI 443S. Political Economy of Reform in China—Content, process, and problems of China's post-Mao reforms. Changes in property rights, markets, credit, and the role of the state in economic development. Comparative insights about reform in the Chinese communist system that distinguishes it from the experience of regimes in E. Europe and the former Soviet Union.
5 units, Aut (Oi, J)

POLISCI 444. Comparative Political Economy: Advanced Industrial Societies—Political economy approaches to key policy outcomes including redistribution, the size of government, fiscal behavior, and pork-barrel politics. Theories related to institutions, interest groups, and geography, focusing on middle- and upper-income countries.
3-5 units, Spr (Rodden, J)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

EDUC 260X. Understanding Statistical Models and their Social Science Applications—(Same as HRP 239, STATS 209.)
3 units, Win (Rogosa, D)

FRENGEN 295. Science, Technology, and Society in Europe and the U.S.: Ethical Debates and Controversies
3-5 units, Win (Dupuy, J)

HISTORY 92A. The Historical Roots of Modern East Asia
5 units, Win (Sommer, M; Wigen, K)

HISTORY 150A. Colonial and Revolutionary America
5 units, Aut (Rakove, J)

HISTORY 203A/303A. Theories of the State from the Ancient World to the Present
4-5 units, Win (Baker, K; Sheehan, J)

HUMBIO 171. The Death Penalty: Human Biology, Law, and Policy
3 units, Spr (Abrams, W)

HUMBIO 172A. Children, Youth, and the Law
5 units, alternate years, not given this year

HUMBIO 172B. Children, Youth, and the Law
5 units, Win (Abrams, W), alternate years, not given next year

INTNLREL 120. The Organization and Behavior of Democracies
5 units, Aut (Mcelwain, K)

INTNLREL 125. Japanese Postwar Politics
5 units, Win (Mcelwain, K)

INTNLREL 133. Introduction to Comparative and International Political Economy
5 units, Spr (Mcelwain, K)

INTNLREL 140B. Theories of International Law
5 units, Win (Steinberg, R)

MS&E 193/193W/293. Technology and National Security
3 units, Aut (Perry, W; Hecker, S)

PUBLPOL 102. Organizations and Public Policy
5 units, Aut (Hannan, M)

PUBLPOL 183. Philanthropy and Social Innovation
5 units, Spr (Arrillaga, L)

PUBLPOL 204B. Organizations—(Same as IPS 206B.)
4 units, Spr (Stedman, S; Satz, D)

SOC 117A/217A. China Under Mao
5 units, Aut (Walder, A)

SOC 167A/267A. Asia-Pacific Transformation
5 units, Win (Shin, G)

OVERSEAS STUDIES

Courses approved for the Political Science major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

BEIJING

OSPBEIJ 26. Corporate Governance and the Privatization of Chinese Enterprises
5 units, Spr (Klausner, M)

OSPBEIJ 66. Essentials of China's Criminal Justice System
5 units, Aut, Spr (Wang, S)

BERLIN

OSPBER 15. Shifting Alliances? The European Union and the U.S.
4-5 units, Win (Brückner, U)

OSPBER 115X. The German Economy: Past and Present
4-5 units, Aut (Klein, I)

OSPBER 126X. A People's Union? Money, Markets, and Identity in the EU
4-5 units, Aut (Brückner, U)

FLORENCE

OSPFLOR 19. Political Institutions and the Language of Politics: A Comparative Study of Italy and the U.S.
4 units, Spr (Pistelli, L)

OSPFLOR 39. Envisioning Rights: Europe and America
5 units, Win (Karl, T)

OSPFLOR 77. Italian Politics Between Europe and the Mediterranean
5 units, Win (Morel, L)

OSPFLOR 78. An Extraordinary Experiment: Politics and Policies of the New European Union
5 units, Aut (Morlino, L)

OSPFLOR 97. Current Issues in Human Rights and International Justice
4 units, Spr (Vierucci, L)

OSPFLOR 106V. Italy: From Agrarian to Postindustrial Society
4 units, Aut (Mammarella, G)

KYOTO

OSPKYOTO 24. Japan in Contemporary International Affairs
5 units, Spr (MacDougall, T)

OSPKYOTO 215X. The Political Economy of Japan
4-5 units, Spr (Hayashi, T)

MOSCOW

OSPMOSC 20. The Soviet Union in World War II
5 units, Aut (Holloway, D)

OSPMOSC 22. Russia and the World
3 units, Aut (Holloway, D)

OSPMOSC 61. Problems and Prospects of Post-Soviet Eurasia
5 units, Aut (Trenin, D)

OXFORD

OSPOXFRD 18. Making Public Policy: An Introduction to Political Philosophy, Politics, and Economics
5 units, Win (McMahon, R)

OSPOXFRD 24. British and American Constitutional Systems in Comparative Perspective
4-5 units, Aut (McMahon, R)

OSPOXFRD 31. The European Union: Politics and Policy Making
5 units, Aut (Hobolt, S)

OSPOXFRD 35. Modern UK and European Government and Politics
4-5 units, Spr (Cappocia, G)

OSPOXFRD 141V. European Imperialism and the Third World, 1870-1970
5 units, Spr (Jackson, A)

PARIS

OSPPARIS 20. Reforming Europe: The Challenges Ahead
4-5 units, Win (Kahn, S)

OSPPARIS 34. Emerging European Constitutionalism: The Role of Constitutional Courts in Europe since WW II
3 units, Win (Ferejohn, J)

OSPPARIS 35. Political Thought of the French and American Revolutions
5 units, Win (Ferejohn, J)

OSPPARIS 211X. Political Attitudes and Behavior in Contemporary France
4-5 units, Aut (Mayer, N; Muxel, A)

SANTIAGO

OSPSANTG 116X. Modernization and its Discontents: Chilean Politics at the Turn of the Century
5 units, Spr (Correa, G)

OSPSANTG 129X. Latin America in the International System
4-5 units, Win (Fuentes, C)

OSPSANTG 221X. Political Transition and Democratic Consolidation: Chile in Comparative Perspective
5 units, Aut (Micco, S)

MORRISON INSTITUTE FOR POPULATION AND RESOURCE STUDIES

Faculty: (Director) Marcus Feldman (Biological Sciences), William H. Durham (Anthropology), Paul R. Ehrlich (Biological Sciences), Lawrence H. Goulder (Economics and Freeman Spogli Institute for International Studies), Li Shuzhuo (Xi'an Jiaotong University, China), Shripad Tuljapurkar (Biological Sciences)

Institute Office: 371 Serra Mall (Gilbert 116)
Mail Code: 94305-5020
Phone: (650) 723-7518
Email: morrisoninstitute@stanford.edu
Web Site: http://www.stanford.edu/group/morrinst/

Although Stanford University does not have a degree program in population studies, it does have scholars of international reputation in specialties such as demographic history, demographic methods, economic demography, epidemiology, population biology, population genetics, and the sociology and anthropology of populations.

The Morrison Institute for Population and Resource Studies is an interdisciplinary group serving three major functions: (1) encouraging graduate work in population and resource studies through fellowship grants and supervision, (2) instituting courses and seminars in population and resource studies, and (3) bringing visiting faculty to Stanford to strengthen existing course offerings. The institute also organizes an interdisciplinary Colloquium on Population Studies to introduce upper-division undergraduates and graduate students to issues in population-related specialties.

COURSES

Many departments offer courses focusing on issues related to the study of populations and resource use. The following course is sponsored by the Morrison Institute.

BIOSCI 146. Population Studies—Series of talks by distinguished speakers introducing approaches to population and resource studies.
1 unit, Win (Feldman, M)

PSYCHOLOGY

Emeriti: (Professors) Gordon H. Bower, John H. Flavell, Albert H. Hastorf, Eleanor E. Maccoby, David L. Rosenhan, David E. Rumelhart, Roger N. Shepard, Carl Thoresen, Barbara Tversky, Robert B. Zajonc, Philip G. Zimbardo; (*Senior Lecturer*) Lyn K. Carlsmith

Chair: Brian Wandell

Professors: Albert Bandura, Laura L. Carstensen, Herbert H. Clark, Carol Dweck, Ian H. Gotlib, Leonard M. Horowitz, John D. Krumboltz, Mark R. Lepper (on leave Autumn), Ellen M. Markman (on leave Autumn, Spring), Hazel R. Markus, James L. McClelland, Dale Miller, Lee D. Ross, Claude M. Steele, Ewart A. C. Thomas (on leave Winter, Spring), Brian Wandell, Jeffrey J. Wine

Associate Professors: Jennifer L. Eberhardt, Anne Fernald, James J. Gross, Jeanne L. Tsai (on leave Autumn), Anthony Wagner

Assistant Professors: Lera Boroditsky, Kalanit Grill-Spector, Susan C. Johnson, Brian Knutson, Samuel M. McClure, Benoît Monin, Michael Ramscar, Gregory M. Walton

Associate Professor (Teaching): Catherine Heaney

Lecturers: Amie Haas, Beverly Hartman, Jeanne Lepper, Adrienne Lomangino, Teceta Thomas Tormala

Courtesy Professors: William C. Dement, Gary H. Glover, Jon Krosnick, William T. Newsome, Anne C. Petersen, Richard J. Shavelson

Other Affiliation: Albert Ahumada, Jr., Donald Norman, Andrew B. Watson

Director, Bing Nursery School: Jeanne Lepper

Department Offices: Jordan Hall, Building 420
Mail Code: 94305-2130
Department Phone: (650) 725-2400
Web Site: http://psychology.stanford.edu/

Courses given in Psychology have the subject code PSYCH. For a complete list of subject codes, see Appendix.

The courses and research opportunities in the Department of Psychology introduce students to the corpus of data on, and explanations of, human nature and human behavior. Through the study of abnormal behavior, aging, child development, cognitive processes, decision making, emotion, group behavior, infancy, language, learning and memory, personality, social perception, visual perception, and other related topics, students are introduced to the properties of sensory, cognitive, and affective systems, and of their interrelationships; to the reciprocal effects of one person on another; and to the effects on behavior of the physical, social, and cultural environment. The research programs of the faculty and students focus on the study of basic psychological mechanisms and, where appropriate, on relating basic research to the analyses and solutions of important societal problems.

The department, housed in Jordan Hall, maintains shop facilities and many computer-equipped laboratories. Bing Nursery School, located on campus at 850 Escondido Road, provides a laboratory for child observation, training in nursery school teaching, and research. It was constructed with funding from the National Science Foundation and a special grant from Mrs. Anna Bing Arnold and Dr. Peter Bing.

The department provides (1) courses designed for the general student, (2) a major program leading to the degree of Bachelor of Arts, including options for honors and a specialization in one of four content area tracks, (3) a minor program, (4) a coterminal master's degree program leading to the degree of Master of Arts, and (5) programs of graduate study and research leading to the degree of Doctor of Philosophy. Applications are not accepted for the master's degree except as noted below.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

Major Requirements—Students declaring a major in Psychology must complete a minimum of 70 units of course work in Psychology, 60 of which must be taken in the Psychology department. The remaining 10 units can be taken outside of the Psychology department but must be pre-approved by the student services office or faculty adviser. These courses should represent a coherent thematic focus. One way to achieve this focus is through a field of study. Courses taken to satisfy the 70-unit requirement must be taken for a grade of 'C-' or better (except for courses offered only on a satisfactory/no credit basis). Majors must take PSYCH 1, Introduction to Psychology, and PSYCH 10, Introduction to Statistical Methods, or a comparable Statistics course. Advanced placement (AP) credit may no longer be used toward the Psychology major requirements. Beyond these two required courses, students must complete at least five of the following ten core Psychology courses, with a minimum of two from each area A and B:

Area A Courses:
BIOSCI 20. Introduction to Brain and Behavior
PSYCH 30. Introduction to Perception
PSYCH 45. Introduction to Learning and Memory
PSYCH 55. Introduction to Cognition and the Brain

Area B Courses:
PSYCH 60. Introduction to Developmental Psychology
PSYCH 70. Introduction to Social Psychology
PSYCH 75. Introduction to Cultural Psychology
PSYCH 80. Introduction to Personality Psychology
PSYCH 90. Introduction to Clinical Psychology
PSYCH 95. Introduction to Abnormal Psychology

Students who declared a major in Psychology prior to the 2005-06 academic year may choose to adhere to the 55-unit major requirement, taking PSYCH 1 and 10, five core courses, and elective courses, totaling 55 units.

Students must take one Writing in the Major (WIM) course in Psychology, and should check the *Stanford Bulletin* yearly as these courses may change. The department also strongly recommends that all majors take at least one advanced seminar.

Students may count up to 10 units of research, independent study. and practica (including but not limited to PSYCH 194, 195, 281) toward the Psychology major. Students who are teaching assistants for a Psychology course or are enrolled in the senior honors program are allowed up to 15 units in independent study and research. Any units beyond the limit of 10 or 15 may be counted toward the 180 units required for graduation.

Summer Quarter Psychology courses are not equivalent to courses given during the regular academic year and, while applicable toward the 70 units needed for the major, may not be used to fulfill the core course requirement. Additionally, a course taken during the Summer Quarter cannot be used to replace the grade of a non-Summer Quarter course, even if the title and units of the two courses are the same.

Beyond the Minimal Requirements—The following recommendations may be helpful to students who wish to plan a program which goes beyond the minimal requirements listed above:

1. Within the general major, the student may take advanced undergraduate or graduate courses, including seminars. The student may also take advantage of widespread opportunities for directed research, working closely with individual faculty and graduate students.
2. The student may apply to the senior honors program, described below.
3. The student may elect to pursue one of four fields of study: Cognitive Sciences; Health and Development; Mind, Culture, and Society; or Neuroscience, described below.

The training obtained from the pursuit of any of these options is valuable not only for students considering graduate work in psychology, but also for those thinking of professional careers outside of psychology in fields such as business, counseling, education, law, or medicine.

MINOR

Declaration—Students who wish to declare a minor field of concentration in Psychology must do so no later than the deadline for their application to graduate.

Requirements—Completion of a minimum of 35 units in Psychology is required for the minor, including PSYCH 1, Introduction to Psychology, and PSYCH 10, Introduction to Statistical Methods, or a comparable statistics course. Advanced placement (AP) credit may no longer be used towards the Psychology minor. The minor must include three of ten core courses, with a minimum of one from each of two areas (A: BIOSCI 20; PSYCH 30, 45, 55; and B: 60, 70, 75, 80, 90, 95) and elective Psychology courses of at least three units each, totaling 35 units. Students who declared a Psychology minor prior to the 2002-03 academic year may choose any three of the ten core courses. Students who declared a Psychology minor prior to the 2005-06 academic year may choose to complete seven total courses: PSYCH 1 and 10, three core courses, and two elective courses. Independent study, research, and practica cannot be counted toward the minor. Summer Quarter Psychology courses are not applicable toward the 35 units needed for the minor. All courses used to fulfill the requirements of the minor must be passed with a grade of 'C-' or better, except for courses offered only on a satisfactory/no credit basis. No more than 10 units of transfer credit may be counted toward the Psychology minor.

CREDIT FROM OUTSIDE THE DEPARTMENT

Psychology majors must complete at least 60 units of course work toward their major at Stanford within the Psychology department. Psychology minors may count no more than a total of 10 units credit from outside the department toward the minor. Both majors and minors may use only one course from outside the department to fulfill core course requirements. Additional courses may be used to fulfill the 70-unit major requirement, but may not be counted as core courses.

There are two types of credit from outside the department: external transfer credit for courses taken at institutions other than Stanford and credit for courses in other Stanford departments. A student must have already declared Psychology as a major or minor in order to submit a petition for transfer credit. Stanford credit for courses completed at other institutions must have been granted by the External Credit Evaluation section of the Registrar's Office; those units may be applied toward the 180 units required for graduation. To have credit from outside the department evaluated to fulfill requirements toward the Psychology major or minor, students complete an Undergraduate Petition form, available from the student services office, and submit it with a course syllabus. Students requesting external transfer credit must also submit a copy of the signed transcript from the External Credit Evaluation section of the Registrar's Office showing the number of Stanford units granted for the course. The Psychology department then evaluates external credit courses and courses from other Stanford departments to determine if they can be applied toward Psychology major or minor requirements.

FIELDS OF STUDY

Students in the major program, including those in the senior honors program, may elect to specialize in one of four fields of study: Cognitive Sciences; Health and Development; Mind, Culture, and Society; or Neuroscience. Fields of study consist of a coherent set of courses leading to advanced undergraduate or even graduate-level courses in an area. In the ideal case, the student who specializes would acquire an understanding of a range of psychological processes, as well as an appreciation of the significance of these processes in the chosen area of application. In this way, specialization could facilitate the student's preparation for a professional career in, for example, medicine, business, or counseling, as well as for graduate work in Psychology.

Specialization in a field of study is optional, although students who do not wish to complete all the requirements for a track may still want to use the track as a guideline for an integrated program in Psychology. Students who choose to complete a field of study must meet the requirements for the major plus the additional requirements designated for the field of study. Typically the courses required for a field of study include one or two required courses, four to six recommended courses in Psychology, one or two advanced seminars, and three or four courses in related disciplines. Psychology courses completed for the field of study count toward satisfying the major requirements. Courses from other departments listed for the field of study may count toward the 10 outside units for the major requirement, but must be pre-approved by the student services office or faculty adviser.

The Mind, Culture, and Society field of study includes a two quarter research practicum; students are encouraged to apply for this track by Autumn Quarter of their junior year. Application forms are available from the student services office. There is no application for the other fields of study, but all fields of study are declared on Axess and students must submit a field of study form that can be found at http://www-psych.stanford.edu/undergraduate_forms.html or at the student services office. Completion of a field of study is noted on a student's transcript, but not on the diploma. Information about the required and recommended courses for each field of study is available from the student services office.

HONORS PROGRAM

The senior honors program is designed for exceptionally able Psychology majors who wish to pursue a year of intensive supervised independent research. Admission to the program is made at the end of the student's junior year on the basis of (1) excellent academic performance, (2) previous research experience, and (3) two letters of recommendations by faculty and/or graduate students. Applications are available late Spring Quarter and are to be turned in to the student services office with a current transcript and recommendations by June 2, prior to the student's senior year.

Students interested in the program should involve themselves in research as early as possible and should acquire a broad general background in Psychology, including statistics, and a deep background in their chosen area. The honors program is particularly appropriate for students planning to go to graduate school in Psychology or in other social sciences, as well as in computer science, business, law, and medicine.

During Autumn Quarter of their senior year, honors program students participate in a weekly seminar. Initially, discussions are on general methods and issues in psychological research, but most of the sessions are devoted to discussions of students' presentations of their proposed research. During the quarter, students meet with their advisers to develop their experimental program and begin data collection. At the end of Autumn Quarter, students turn in a written proposal. Winter and Spring quarters are devoted to completing the research, analyzing the data, and writing the thesis, which is submitted mid-May. Students give oral presentations of their projects at the annual Honors Convention, scheduled for the day between classes and exams. This convention is attended by undergraduates, graduate students, and faculty.

GRADUATE PROGRAMS

MASTER OF ARTS

The Department of Psychology normally offers a Master of Arts degree only to students concurrently enrolled in its Ph.D. program or to students currently pursuing Stanford B.A. or M.A. degrees. Admission to the program is by Psychology faculty nomination only. All applicants must satisfy University residency requirements for the degree and are responsible for consulting with their primary departments or the Financial Aid Office about the effects of the proposed program on their current funding. General University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin.

Stanford undergraduates who would like advanced training in Psychology may apply for a coterminal M.A. degree in Psychology. To do so, students should consult with the student services office. Along with a coterminal program application, applicants must submit (1) a statement of purpose, (2) a preliminary program plan specifying the courses in which they intend to enroll to fulfill degree requirements, (3) at least two letters of recommendation from Stanford faculty members familiar with their academic work, (4) a current Stanford undergraduate transcript, and (5) a written nomination by a member of the Psychology faculty willing to serve as the student's master's degree adviser. This program is limited in size and admission is selective. Applicants must have earned a minimum of 120 units towards graduation as shown on the undergraduate transcript. The department's deadline for the submission of an application to the coterminal program is January 10.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

In exceptional cases, students concurrently enrolled in another doctoral or professional program at Stanford may also apply for the M.A. degree. Such applicants also consult with the student services office.

Students must complete at least 45 units of Psychology courses for the degree. (For coterminal degree students, course work for the master's degree may not duplicate courses taken for the undergraduate degree.) Of these 45 units, at least 27 must be in Psychology courses numbered 200 or above. Units from research, teaching, practica, independent study, and lab courses, such as PSYCH 258, 269, 275, 281, 282, and 297, may not be counted toward these 27 units. Two of the graduate courses of at least 3 units each (one from Area A and one from Area B below) are required. In addition, at least one upper division statistics course is required. The course must be approved by the student's adviser. It is recommended that all coterminal students enroll in PSYCH 196, Contemporary Psychology.

Courses to be counted toward the master's degree must be passed with a grade of 'B-' or better, unless the course is offered only on a satisfactory/no credit basis. Units from research, teaching, practica, independent study, and lab courses, such as PSYCH 258, 269, 275, 281, 282, and 297, may be counted toward the remaining required 18 units. Psychology courses numbered in the 100-level and courses from other Stanford departments may be used to satisfy the remaining 18 units. Courses specifically for undergraduates, such as undergraduate honors courses, and courses offered in the Summer Quarter may not be counted toward the master's program unit requirements. Demonstration of competence in the design and execution of psychological research is also required for receipt of the master's degree. This demonstration entails completion of a master's thesis containing original research. If the student is currently doing a senior honors thesis, this honors thesis may be accepted as proof of research competence provided the honors thesis is judged to be master's level research by the student's adviser and the department's Committee on Graduate Studies. If the student has completed an honors thesis in Psychology in the prior year, the student would be expected to continue independent research during the coterminal year and to submit this research in a written report which, together with the completed honors thesis, would constitute the master's thesis. All students are required to make an oral presentation of their research during the Spring Quarter, and to present their thesis or written report in June. Applicants to the coterm program must have an adviser in the department, or approved by the department, who agrees to supervise the student's research. Students in the program may be terminated at the beginning of the Winter Quarter if they do not have an adviser, or if they are not making satisfactory progress in research or course work.

Area A Courses:

202. Cognitive Neuroscience
205. Foundations of Cognition
210. Memory and Learning
221. Applied Vision and Image Systems
228. Ion Transport
251. Affective Neuroscience
261. Emotion
261A. Learning and Cognition in Activity

Area B Courses:

211. Developmental Psychology
212. Social Psychology
213. Personality and Psychopathology
215. Mind, Culture, and Society
217. Topics and Methods in Cultural Psychology
259. Emotions: History, Theories, Research
271. Applications of Social Psychology

DOCTOR OF PHILOSOPHY

There are no specific course requirements for admission to the doctoral program. However, an applicant should have research experience as an undergraduate, as well as the equivalent of an undergraduate major in Psychology. The major focus of the doctoral program is on research training, and admission is highly selective.

Applicants for admission must submit their scores on the general Graduate Record Examination as part of the application. GRE subject scores are recommended.

General University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

In addition to fulfilling Stanford University requirements for the degree, the following departmental requirements are stipulated.

First-Year Course Requirements—During the first year of graduate study, the student must take PSYCH 207, Proseminar for First-Year Ph.D. Graduate Students, at least one approved graduate statistics course, and at least two core courses from the list following:

202. Neuroscience
205. Foundations of Cognition
211. Developmental Psychology
212. Social Psychology
    or 215. Mind, Culture, and Society
213. Personality

Students in each area may be required to take up to two additional non-core graduate courses in their area of specialization.

The student is expected to spend at least half of the time in research from the beginning of the first year of graduate study to the completion of the Ph.D., normally taking no more than 10 units of course work each quarter. At the end of the first year of graduate study, the student must file with the department a written report of the first-year research activities. The deadline for filing this report is June 1.

Second Year Course Requirements—By the end of the second year of graduate study, the student must complete the core courses listed above and take a second approved graduate course in statistics.

Third-Year and Beyond—Students are expected to form a research committee, which must include the dissertation reading committee, before the initiation of the dissertation research. The research committee includes the dissertation adviser and consists of at least three faculty members, at least two of whom should be in the Psychology department. For University guidelines for the composition of the dissertation reading committee, see the "Graduate Degrees" section of this bulletin.

The research committee must meet no later than the first day of classes of Spring Quarter of the third year, and determines the timeline for further development of the dissertation research project. Subsequent meetings are triggered by the completion of one of two documents: a dissertation proposal (DP) or a conceptual analysis of the dissertation area (CADA). The timing and sequencing of the DP and CADA are developed by the student in consultation with the committee. As a general guide, one of the two preliminary elements (CADA or DP) should be completed by the end of the third Summer Quarter and the second should be completed by the end of the fourth Spring Quarter. Students are free to alter the membership of the committee at any time during the process, subject to consultation with the adviser.

The DP should be a description of the proposed research. The CADA provides a framework for the research topic of the dissertation, addresses the central issues within the specialty area, and reviews the pertinent literature.

Advanced Course or Minor Requirements—The candidate must complete 12 units of advanced graduate course work or a Ph.D. minor in another department. If a student waives the minor requirement in favor of the 12 advanced units, the student must fulfill the advanced course requirement by taking (a) non-core graduate courses required by a particular area, *or* (b) graduate-level courses in other departments comparable in quality to Psychology's graduate courses. If there is any question about comparability, the student should consult the adviser, student services, and, in some cases, the graduate education committee chair before taking the course.

Orals—The candidate must pass the University oral examination, which also serves as a dissertation defense. A committee is formed to review the oral examination, including the research committee and one oral examination committee chair from outside of the Psychology department. The oral examination consists of a 40-45-minute presentation to the department of the completed dissertation research. Parents and friends are welcome to attend. Following the presentation, the student and the committee convene for a discussion of the dissertation and the presentation.

Dissertation Requirements—The candidate must complete a dissertation satisfactory to the dissertation reading committee prior to the oral examination. Minor revisions to formatting may be made after the oral examination.

Ph.D. candidacy expires five years after admission to candidacy at the end of the second year of study. Reapplication requires department reexamination.

STUDENT EVALUATIONS

First-Year Evaluation—It is the department's policy to evaluate the progress of each graduate student at the end of the first year of graduate study. As part of the procedure, each student is required to file with the department a report of the first-year research activities.

Students should discuss this report and the evaluation procedures with their adviser as early as possible in their first year. The report is due on June 2. If the student fulfills the academic promise displayed upon entrance, he or she is invited to continue to the doctorate.

The first-year evaluation is primarily based on three factors:

1. quality of research carried out in the first year
2. performance in courses (especially required courses)
3. recommendations of the adviser (including a commitment on the part of that adviser to continue in that role)

Second-Year Evaluation—A similar evaluation is conducted at the end of the second year of graduate training involving the same criteria as the first year; however, the student is not required to submit a paper. Students who do not make satisfactory progress during the second year may be dropped from the program.

THE DOCTORAL TRAINING PROGRAM

As indicated by the requirements described above, a student must concentrate in any one of several areas within psychology. Regardless of area, however, the training program places emphasis on the development of research competence, and students are encouraged to develop those skills and attitudes that are appropriate to a career of continuing research productivity.

Two kinds of experience are necessary for this purpose. One is the learning of substantial amounts of technical information. A number of courses and seminars are provided to assist in this learning, and a student is expected to work out a program, with his or her adviser, to attain this knowledge in the most stimulating and economical fashion.

A second aspect of training is one that cannot be gained from the courses or seminars. This is firsthand knowledge of, and practical experience with, the methods of psychological investigation and study. These methods include ways of behaving with the people or animals being studied. Students are provided with whatever opportunities they need to reach those levels of competence representative of doctoral standing. Continuing research programs, sponsored by members of the faculty, offer direct opportunities for experience in fields represented by the faculty's many research interests.

Each student achieves competence in unique ways and at different rates. Each student and adviser share in planning a program leading to the objectives discussed. The student is expected to spend half of his or her time on research and normally takes no more than 10 units of course work per quarter.

TEACHING REQUIREMENT

The department views experience in supervised teaching as an integral part of its graduate program. Regardless of the source of financial support, all students serve as teaching assistants for at least five Psychology courses during their graduate study. Of the courses, two must be PSYCH 1, Introduction to Psychology, and/or PSYCH 10, Statistical Methods. Students are discouraged from participating in teaching during the first year of graduate study. Students typically progress from closely supervised teaching to more independent work. Some students may be invited to offer a supervised, but essentially independent, seminar during their final year of graduate study.

PH.D. MINOR

Candidates for the Ph.D. degree in other departments may elect a minor in Psychology. To obtain a minor, the student must complete 20 units of course work at the graduate level in the Department of Psychology, excluding PSYCH 275 (graduate-level research). Crosslisted graduate courses can be used to satisfy this requirement. All courses counting toward the Ph.D. minor must be passed with a grade of 'B-' or better (unless the course is offered only on a satisfactory/no credit basis).

COGNITIVE SCIENCE PROGRAM

Psychology participates, along with the departments of Computer Science, Linguistics, and Philosophy, and the School of Education, in an interdisciplinary program of cognitive science. The program is intended to provide students with an interdisciplinary education as well as a deeper concentration in psychology. Doctoral students in Psychology are eligible to participate in the cognitive science program. Students who complete the requirements receive a special designation in cognitive science along with the Ph.D. in Psychology. To receive this field designation, students must complete 30 units of approved courses, 18 of which must be taken in two disciplines outside psychology. For information or course approval, contact the student services office.

PSYCHOLOGY COLLOQUIUM

The Psychology Colloquium meets on most Wednesday afternoons at 3:45. Speakers from Stanford and other institutions present topics of current interest. Graduate students are expected to attend.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement.

SUMMER SESSION

The courses announced for the Summer Session are those regularly scheduled in the department curriculum. Additional courses may be announced by Stanford Summer Session at http://summer.stanford.edu.

STANFORD INTRODUCTORY SEMINARS

PSYCH 8N. Life Span Development—Stanford Introductory Seminar. Preference to freshmen. People continue to change in systematic ways throughout life, but developmental psychology has focused mostly on childhood. Focus is on conceptual models that direct developmental research on adulthood and old age, and the empirical literature concerning developmental changes in cognition, motivation, and emotion. GER:DB-SocSci

3 units, Spr (Carstensen, L)

PSYCH 12N. Self Theories—Stanford Introductory Seminar. Preference to freshmen. The impact on motivation and performance in school, business, sports, and relationships of people's beliefs in a fixed self versus a self that can be developed. How such self theories develop and can be changed. Readings include research articles and popular writings. GER:DB-SocSci

3 units, Aut (Dweck, C)

PSYCH 16N. Amines and Affect—Stanford Introductory Seminar. Preference to freshmen. How serotonin, dopamine, and norepinephrine influence people's emotional lives. GER:DB-SocSci

3 units, Win (Knutson, B)

PSYCH 17N. Language and Society: How Languages Shape Lives—Stanford Introductory Seminar. Preference to freshmen. Do people who speak different languages think differently? What role does language play in politics, law, and religion? The role of language in individual cognition and in society. Breaking news about language and society; the scientific basis for thinking about these broad issues. GER:DB-SocSci

3 units, Aut (Boroditsky, L)

PSYCH 18N. Early Social Cognitive Development—Stanford Introductory Seminar. Preference to freshmen. Focus is on the development of attachment and its impact on psychological functioning.

3 units, Spr (Johnson, S)

OPEN TO ALL STUDENTS

PSYCH 1. Introduction to Psychology—Human behavior and mental processes including the nervous system, consciousness, learning, memory, development, emotion, psychopathology, interpersonal process, society, and culture. Current research. GER:DB-SocSci

5 units, Aut (Gross, J), Win (Monin, B), Spr (Knutson, B)

PSYCH 10. Introduction to Statistical Methods: Precalculus—(Same as STATS 60/160.) Techniques for organizing data, computing, and interpreting measures of central tendency, variability, and association. Estimation, confidence intervals, tests of hypotheses, t-tests, correlation, and regression. Possible topics: analysis of variance and chi-square tests, computer statistical packages. GER:DB-Math

5 units, Aut (Thomas, E), Win (Walther, G), Spr, Sum (Staff)

PSYCH 30. Introduction to Perception—Perceptual psychology and sensory neuroscience, emphasizing vision and hearing. Topics include anatomy and physiology of the eye and ear, and of the visual and auditory areas of the brain, pitch and loudness perception, speech perception, color vision, depth and motion perception, and object and face recognition. Recommended: 1. GER:DB-NatSci

3 units, Win (Grill-Spector, K)

PSYCH 45. Introduction to Learning and Memory—The literature on learning and memory including cognitive and neural organization of memory, mechanisms of remembering and forgetting, and why people sometimes falsely remember events that never happened. Cognitive theory and behavioral evidence integrated with data from patient studies and functional brain imaging. Recommended: 1.

3 units, Spr (Wagner, A)

PSYCH 55. Introduction to Cognition and the Brain—Major topics in cognitive psychology and neuroscience, including empirical approaches to perception, language, learning, memory, knowledge representation, problem solving, and reasoning. WIM

4 units, Win (Boroditsky, L)

PSYCH 60. Introduction to Developmental Psychology—Psychological development from birth to adulthood, emphasizing infancy and the early and middle childhood years. The nature of change during childhood and theories of development. Recommended: 1. GER:DB-SocSci

3 units, Aut (Johnson, S)

PSYCH 60A. Introduction to Developmental Psychology Section—Guided observation of children age 2-6 at Bing Nursery School. Corequisite: 60.

2 units, Aut (Hartman, B; Lomangino, A)

PSYCH 70. Introduction to Social Psychology—The influence of other people on individuals' thoughts, emotions, and behaviors. Factors that affect how people perceive themselves and others; what causes people to like, dislike, love, help, or hurt others; and how social psychology helps to understand questions about law, business, and health. Recommended: 1. GER:DB-SocSci, WIM

4 units, Spr (Tormala, T)

PSYCH 75. Introduction to Cultural Psychology—The cultural sources of diversity in thinking, emotion, motivation, self, personality, morality, development, and psychopathology. Recommended: 1. GER:DB-SocSci, EC-GlobalCom

5 units, alternate years, not given this year

PSYCH 80. Introduction to Personality Psychology—Concepts and research methods, major theoretical approaches, and related empirical findings. The psychodynamic, trait, biological, humanistic, behavioral, social learning, cognitive, and cultural perspectives. Prerequisite: PSYCH 1. GER:DB-SocSci

3 units, Spr (Tsai, J)

PSYCH 90. Introduction to Clinical Psychology—Topics include the history of clinical psychology, models and assessment of personality, behavior, cognition, psychopathology, and approaches to the treatment of abnormal behavior. Emphasis is on current theory, research, issues in, and the role of clinical psychology in contemporary society. Recommended: 1. GER:DB-SocSci

3 units, Aut (Haas, A)

PSYCH 95. Introduction to Abnormal Psychology—Theories of and approaches to understanding the phenomenology, etiology, and treatment of psychological disorders among adults and children. Research findings and diagnostic issues. Recommended: PSYCH 1. GER:DB-SocSci

3 units, Win (Staff)

PSYCH 101. Community Health Psychology—(Same as HUMBIO 128.) Social ecological perspective on health emphasizing how individual health behavior is shaped by social forces. Topics include: biobehavioral factors in health; health behavior change; community health promotion; and psychological aspects of illness, patient care, and chronic disease management. Prerequisites: HUMBIO 3B or PSYCH 1, or equivalent.

4 units, Win (Heaney, C)

PSYCH 102. Longevity—(Same as NENS 202.) Interdisciplinary. Challenges to and solutions for the young from increased human life expectancy: health care, financial markets, families, work, and politics. Guest lectures from engineers, economists, geneticists, and physiologists. GER:DB-SocSci

3 units, Win (Rando, T; Carstensen, L)

PSYCH 110. Research Methods and Experimental Design—Structured research exercises and design of an individual research project. Prerequisite: consent of instructor.

5 units, not given this year

PSYCH 119. Public Policy and Psychology—(Same as PUBLPOL 172.) Applications of psychology to public and social policy. Topics include the influence of psychological research and individual psychology on the creation of policy, and the influence of policy on attitudes and behavior at the personal and societal levels. How psychological theory can be used to shape policies and policy making in areas such as environment, education, criminal justice, and health.

5 units, Spr (Tormala, T)

PSYCH 120. Cellular Neuroscience: Cell Signaling and Behavior—(Same as BIOSCI 153.) Neural interactions underlying behavior. Prerequisites: 1 or basic biology. GER:DB-NatSci

4 units, Aut (Wine, J)

PSYCH 121. Ion Transport and Intracellular Messengers—(Graduate students register for 228.) Ion channels, carriers, ion pumps, and their regulation by intracellular messengers in a variety of cell types. Lab demonstrations and hands-on introduction to techniques such as patch clamping. Recommended: 120 or introductory course in biology or human biology.

1-3 units, Spr (Wine, J)

PSYCH 125. Beyond Stereotype Threat: Claiming a Rightful Place in an Academic Community—(Same as CTL 130.) Stereotype threat as mitigating the quality of a student's test performance; its impact on academic success at Stanford. How to reduce the impact of stereotype threat on Stanford students.

3 units, Win (Glickman, A)

PSYCH 130. Introduction to Cognitive Science—(Same as LINGUIST 144, PHIL 190, SYMBSYS 100.) The history, foundations, and accomplishments of the cognitive sciences, including presentations by leading Stanford researchers in artificial intelligence, linguistics, philosophy, and psychology. Overview of the issues addressed in the Symbolic Systems major. GER:DB-SocSci

4 units, Spr (Davies, T)

PSYCH 131. Language and Thought—(Graduate students register for 262.) The psychology of language including: production and understanding in utterances; from speech sounds to speaker's meaning; children's acquisition of the first language; and the psychological basis for language systems. Language functions in natural contexts and their relation to the processes by which language is produced, understood, and acquired. Prerequisite: 1 or LINGUIST 1. GER:DB-SocSci

4 units, Aut (Clark, H)

PSYCH 133. Human Cognitive Abilities—(Same as EDUC 369.) Psychological theory and research on human cognitive abilities; their nature, development, and measurement; and their importance in society. Persistent controversies and new areas of research, recent perspectives on the nature-nurture debate and the roles of genetics, health and education in shaping HCAs. Prerequisite: PSYCH 1 or equivalent. (PSE) GER:DB-SocSci
3 units, not given this year

PSYCH 134. Seminar on Language and Deception—Deceptive, exploitative, and other noncooperative uses of language. How is language used to deceive or exploit? Where are these techniques practiced and why? What are the personal, ethical, and social consequences of these practices? Prerequisite: 131, LINGUIST 1, or PHIL 181. GER:DB-SocSci
3 units, Win (Clark, H)

PSYCH 137. Birds to Words: Cognition, Communication, and Language—(Graduate students register for 239A; same as HUMBIO 145.) Although the communicative abilities of animals are determined by their genetic endowment, and human communicative skills dwarf those of other species, the relation between language and genetics remains the subject of debate. Is human language genetically specified? Or are human communicative powers just one facet of human cognitive advantage? Focus is on the nature and origins of language, using evidence from studies of animals, children, and adults. GER:DB-SocSci
4 units, Aut (Fernald, A; Ramscar, M)

PSYCH 141. Cognitive Development—Topics and issues on cognitive development, developmental changes in memory, conceptual organization, logical reasoning, and communication skills. Prerequisite: 1. GER:DB-SocSci
3 units, not given this year

PSYCH 143. Developmental Anomalies—For advanced students. Developmental disorders and impairments. What the sparing of mental abilities in otherwise devastating disorders (or vice versa) tells about the mind and its development in the normal case. Examples of disorders and impairments: autism, congenital blindness, deafness, mental retardation, attachment disorder, and Williams syndrome. Limited enrollment. Prerequisites: 60, 141, and consent of instructor. GER:DB-SocSci
3 units, Spr (Johnson, S)

PSYCH 145. Seminar on Infant Development—For students preparing honors research. Conceptual and methodological issues related to research on developmental psycholinguistics; training in experimental design; and collection, analysis, and interpretation of data.
1-2 units, Spr (Fernald, A)

PSYCH 146. Observation of Children—Learning about children through guided observations at Bing Nursery School, Psychology's lab for research and training in child development. Physical, emotional, social, cognitive, and language development. Recommended: 60.
3-5 units, Win, Spr (Hartman, B; Lomangino, A)

PSYCH 147. Development in Early Childhood—Supervised experience with young children at Bing Nursery School. 3 units require 4 hours per week in Bing classrooms throughout the quarter; 4 units require 7 hours per week; 5 units require 10.5 hours per week. Seminar on developmental issues in the Bing teaching/learning environment. May be repeated for credit. Recommended: 60 or 146, or consent of instructor.
3-5 units, Aut, Win, Spr (Winters, J; Chandra, P)

PSYCH 149. The Infant Mind: Cognitive Development over the First Year—How do babies learn so much in so little time? Emphasis is on cognitive and perceptual development, and the relationship between brain and behavior in infancy. Prerequisite: 1. Recommended: 60 or 141. GER:DB-SocSci
3 units, not given this year

PSYCH 152. Mediation for Dispute Resolution—(Same as EDUC 131.) Mediation as more effective and less expensive than other forms of settling disputes such as violence, lawsuits, or arbitration. How mediation can be structured to maximize chances for success. Simulated mediation sessions.
3 units, Aut (Krumboltz, J)

PSYCH 155. Introduction to Comparative Studies in Race and Ethnicity—(Same as CSRE 196C, ENGLISH 172D.) How different disciplines approach topics and issues central to the study of ethnic and race relations in the U.S. and elsewhere. Lectures by senior faculty affiliated with CSRE. Discussions led by CSRE teaching fellows. GER:DB-SocSci
5 units, Win (Moya, P; Markus, H)

PSYCH 158. Emotions: History, Theories, and Research—(Graduate students register for 259.) Theoretical and empirical issues in the domain of emotions. The history of emotion theories, current approaches, and the interaction between emotion and cognition.
1-3 units, Win (Zajonc, R)

PSYCH 161. Emotion—(Graduate students register for 261.) The scientific study of emotion. Topics: models of emotion, emotion antecedents, emotional responses (facial, subjective, and physiological), functions of emotion, emotion regulation, individual differences, and health implications. Focus is on experimentally tractable ideas. GER:DB-SocSci
3 units, Win (Gross, J)

PSYCH 163. Interpersonal Basis of Abnormal Behavior—The role of interpersonal problems and processes in producing forms of psychopathology including mild and severe disorders. Conventional empirical methods clarify the origin, nature, and treatment of emotional and personality disorders. Prerequisite: PSYCH 1. GER:DB-SocSci
3 units, Win (Horowitz, L)

PSYCH 165. Peace Studies—(Same as POLISCI 111.) Interdisciplinary. The challenges of pursuing peace in a world with many conflicts and rising regional, ethnic, and religious antagonisms. Historical, social, psychological, and moral perspectives. Contributions of academic disciplines to the study of peace. Students explore a conflict and offer contributions to the building of peace. Limited enrollment. GER:DB-SocSci
5 units, not given this year

PSYCH 166. Seminar on Personal and Social Change—Social cognitive approaches to personal and social change. Applications of sociocognitive theory to the modification of psychological dysfunctions in familial, educational, medical, and organizational settings. Ethical and value issues in behavior change.
3 units, Win (Bandura, A)

PSYCH 167. Seminar on Aggression—The causes and modification of individual and collective aggression. Major issues in aggression: social labeling of injurious conduct, social determinants of aggression, effects of the mass media, institutionally sanctioned violence, terrorism, psychological mechanisms of moral disengagement, modification of aggressive styles of behavior, and legal sanctions and deterrence doctrines.
3 units, not given this year

PSYCH 168. Emotion Regulation—(Graduate students register for 268.) The scientific study of emotion regulation. Topics: historical antecedents, conceptual foundations, autonomic and neural bases, individual differences, developmental and cultural aspects, implications for psychological and physical health. Focus is on experimentally tractable ideas. GER:DB-SocSci
3 units, Spr (Gross, J)

PSYCH 171. Research Seminar on Aging—Two quarter practicum exposes students to multiple phases of research by participating in a laboratory focusing on social behavior in adulthood and old age. Review of current research; participation in ongoing data collection, analysis, and interpretation. Prerequisites: 1, research experience, and consent of instructor.
4 units, Aut, Win, Spr (Carstensen, L)

PSYCH 177. Senior Seminar on Mind, Culture, and Society—For seniors in the Mind, Culture, and Society track.
3 units, Aut (Markus, H)

PSYCH 179. The Psychology of Everyday Morality—(Graduate students register for 270.) For graduate students, coterms, and senior Psychology majors. Traditional approaches focusing on how morality colors mundane human activities such as eating and on morality as defined by actors themselves rather than social scientists. Moral hypocrisy, food and disgust, taboo trade-offs, moral reproach, and prejudice with compunction. Limited enrollment. Prerequisite: 70 and consent of instructor.

4 units, not given this year

PSYCH 180C. Asian American Sexualities—(Same as ASNAMST 180C, CSRE 180C.) Seminar. Mutual constitution of culture and sexuality among Asian Americans; attitudes, behaviors, taboos, and identity. How masculinity and femininity are portrayed in the media; cultural attitudes toward homosexuality; and sexual politics. Social, political, and psychological implications.

5 units, Win (Chiang, I)

PSYCH 183. Mind, Culture, and Society Labwork—Required of and limited to research assistants in the mind, culture, and society lab. The development of analytical thinking with reference to how social identities such as race, class, gender, and culture affect psychological experiences across domains including education, law, business, and health.

2-3 units, Aut, Win, Spr (Eberhardt, J; Markus, H)

PSYCH 184. Applied Social Psychology—Combination of social psychology with solving problems in the real world. Methodological and theoretical foundations associated with conducting applied research on social issues such as violence, stereotyping and prejudice, work satisfaction, the justice system, education, the environment, the health care industry, the welfare system, and the mass media. Recommended: 1, 70.

4 units, Win (Tormala, T)

PSYCH 185. Contemporary Issues in Peace Studies—(Graduate students register for 285; same as POLISCI 311.) Interdisciplinary. The challenges of pursuing peace in a world of conflict and regional, ethnic, and religious antagonisms. Historical, social, psychological, and moral perspectives. Current research in social psychology, political science, international relations, and negotiation theory. Student involvement in real-world efforts to identify and overcome the barriers that impede a peace settlement. Prerequisite: consent of instructor. GER:DB-SocSci

3 units, not given this year

PSYCH 189. Stanford Center on Longevity Practicum—Student involvement in an interdisciplinary center aimed at changing the culture of human aging using science and technology.

3 units, Aut, Win, Spr, Sum (Carstensen, L)

PSYCH 192. Career and Personal Counseling—(Same as EDUC 134/234.) Methods of integrating career and personal counseling with clients and counselors from differing backgrounds. Practice with assessment instruments. Case studies of bicultural role conflict. Informal experience in counseling.

3 units, Spr (Krumboltz, J)

PSYCH 193. Special Laboratory Research—May be repeated for credit. Prerequisites: 1, 10, and consent of instructor.

1-6 units, Aut, Win, Spr, Sum (Dweck, C)

PSYCH 194. Reading and Special Work—Independent study. May be repeated for credit. Prerequisite: consent of instructor.

1-3 units, Aut, Win, Spr, Sum (Staff)

PSYCH 195. Special Laboratory Projects—Independent study. May be repeated for credit. Prerequisites: 1, 10, and consent of instructor.

1-6 units, Aut, Win, Spr, Sum (Staff)

PSYCH 196. Contemporary Psychology: Overview of Theory, Research, Applications—Capstone experience for juniors and seniors that bridges course work with research opportunities. Lectures representing the department's areas: social, personality, developmental, neuroscience, and cognitive psychology. Faculty present current research. Discussions led by advanced graduate students in the field represented by that week's guest. Students write research proposals. Small grants available to students to conduct a pilot study of their proposed research. Limited enrollment. Prerequisite: consent of instructor.

3 units, Aut (Clark, H)

PSYCH 197. Advanced Research—Limited to students in senior honors program. Weekly research seminar, independent research project under the supervision of an appropriate faculty member. A detailed proposal is submitted at the end of Autumn Quarter. Research continues during Winter and Spring quarters as 198. A report demonstrating sufficient progress is required at the end of Winter Quarter.

1-4 units, Aut (Eberhardt, J)

PSYCH 198. Senior Honors Research—Limited to students in the senior honors program. Finishing the research and data analysis, written thesis, and presentation at the Senior Honors Convention. May be repeated for credit.

1-4 units, Win, Spr (Eberhardt, J)

PSYCH 199. Temptations and Self Control—(Graduate students register for 299.) Why do people do things that that they come to regret? How can people minimize behavior such as exercise avoidance, angry words, overeating, unsafe sex, and dangerous driving? Sources include classical and current research from experimental psychology, neuroscience, behavioral economics, and neuroeconomics. Real-world applications.

2 units, Aut (Magen, E)

PRIMARILY FOR GRADUATE STUDENTS

Undergraduates admitted only by consent of instructor.

PSYCH 201. Social Psychology Lecture Series—Required of social psychology graduate students. Guest lecturers from Stanford and other institutions. May be repeated for credit.

3 units, not given this year

PSYCH 202. Cognitive Neuroscience—Graduate core course. The anatomy and physiology of the brain. Methods: electrical stimulation of the brain, neuroimaging, neuropsychology, psychophysics, single-cell neurophysiology, theory and computation. Neuronal pathways and mechanisms of attention, consciousness, emotion, language, memory, motor control, and vision. Prerequisite: 207 or consent of instructor.

3 units, Spr (Wandell, B; Grill-Spector, K)

PSYCH 204A. Computational Neuroimaging—Advanced seminar. For students working with functional magnetic resonance imaging (fMRI). The physiological basis of the signal measured using fMRI. Possibilities for experiment design and interpretation of the signal with respect to other physiological and behavioral measurements. Emphasis is on experimental design, software tools, and pulse sequences for fMRI experiments.

1-3 units, Spr (Wandell, B)

PSYCH 204B. Computational Neuroimaging: Analysis Methods—Data analysis techniques for neuroimaging data using real and simulated data sets. Basic MR physics and BOLD signals. Topics include: linearity of the fMRI signal; time versus space resolution tradeoffs; and correlation analysis. Reverse engineering: can cognitive states be predicted from brain activation?

1-3 units, Aut (Wandell, B; Grill-Spector, K)

PSYCH 205. Foundations of Cognition—Topics: attention, memory, language, similarity and analogy, categories and concepts, learning, reasoning, and decision making. Emphasis is on processes that underlie the capacity to think and how these are implemented in the brain and modeled computationally. The nature of mental representations, language and thought, modular versus general purpose design, learning versus nativism. Prerequisite: 207 or consent of instructor.

1-3 units, Win (Ramscar, M)

PSYCH 207. Professional Seminar for First-Year Ph.D. Graduate Students—Required of and limited to first-year Ph.D. students in Psychology. Major issues in contemporary psychology with historical backgrounds.

2-3 units, Aut (Wandell, B)

PSYCH 208. Advanced Topics in Self-Defense—Seminar. Threats to the self and how people deal with them. Readings from social psychological areas including social comparison, self-affirmation, self-completion, self-discrepancy, shame and guilt, terror management, dimensions of self-worth, self-regulation, self-presentation, psychophysiology, and moral identity. Enrollment limited to 15.
1-3 units, Win (Monin, B)

PSYCH 209A. The Neural Basis of Cognition: A Parallel Distributed Processing Approach Lab—Models and data to support the notion that brain representations are patterns of activity over widely dispersed populations of neurons, that mental processing involves coherent distributed engagement of neurons in these populations, and that learning and development occur primarily through the adjustment of the strengths of the connections between the neurons. How models may be used to explain aspects of human cognition, development, and effects of brain damage on cognition. Prerequisites: linear algebra, differential equations, a programming course, and two courses in psychology or neuroscience.
4-6 units, Win (McClelland, J)

PSYCH 209B. Applications of Parallel Distributed Processing Models to Cognition and Cognitive Neuroscience—Research seminar. Builds on project proposal developed in 209A. Hands-on use of computational models to address phenomena in cognitive psychology and cognitive neuroscience. Classic and modern papers, and student presentations of their own projects. Final paper in the form of a journal article submission. Prerequisite: 209A.
4 units, Spr (McClelland, J)

PSYCH 210. Foundations of Memory—Memory and human cognition. Behavioral and neural data indicate that memory is not a unitary faculty but consists of multiple systems that support learning and remembering, each with its own processing characteristics and neurobiological substrates. What is known about memory emphasizing the cognitive and neural architectures of working, declarative, and nondeclarative memory.
3 units, Aut (Wagner, A)

PSYCH 211. Developmental Psychology—Prerequisite: 207 or consent of instructor.
1-3 units, Win (Markman, E; Dweck, C)

PSYCH 212. Social Psychology—Prerequisite: 207 or consent of instructor.
1-3 units, Win (Lepper, M; Ross, L)

PSYCH 213. Personality and Psychopathology—Theory and research. Prerequisite: 207 or consent of instructor.
1-3 units, Spr (Horowitz, L)

PSYCH 215. Mind, Culture, and Society—Social psychology from the context of society and culture. The interdependence of psychological and sociocultural processes: how sociocultural factors shape psychological processes, and how psychological systems shape sociocultural systems. Theoretical developments to understand social issues, problems, and polity. Works of Baldwin, Mead, Asch, Lewin, Burner, and contemporary theory and empirical work on the interdependence of psychology and social context as constituted by gender, ethnicity, race, religion, and region of the country and the world. Prerequisite: 207 or consent of instructor.
3 units, Win (Markus, H; Steele, C)

PSYCH 216. Public Policy and Social Psychology: Implications and Applications—(Same as IPS 207B, PUBLPOL 205B.) Theories, insights, and concerns of social psychology relevant to how people perceive issues, events, and each other, and links between beliefs and individual and collective behavior. Topics include: situationist and subjectivist traditions of applied and theoretical social psychology; social comparison, dissonance, and attribution theories; social identity, stereotyping, racism, and sources of intergroup conflict and misunderstanding; challenges to universality assumptions regarding human motivation, emotion, and perception of self and others; the problem of producing individual and collective changes in norms and behavior.
4 units, Spr (Ross, L)

PSYCH 217. Topics and Methods Related to Culture and Emotion—Theories and research on culture and emotion, including applications to clinical, educational, and occupational settings. May be repeated for credit.
1-3 units, Win (Tsai, J)

PSYCH 218. Early Social Cognitive Development—Current literature on social and cognitive development in infancy emphasizing the interface between the two domains. May be repeated for credit.
1-3 units, not given this year

PSYCH 221. Applied Vision and Image Systems—The design and control of color imaging devices (display, printers, cameras, and scanners). Aspects of human vision relevant to software and hardware design. Topics: digital halftoning, color calibration, color metrics, flicker sensitivity, motion compensation, human spatial resolution, visual masking, JPEG principles, printer design, scanner design, and color software architecture. Lab.
1-3 units, Win (Wandell, B)

PSYCH 223. Social Norms—(Same as OB 630.) Research and theory on the origins and function of social norms. Topics include the estimation of public opinion, the function of norms as ideals and standards of judgment, and the impact of norms on collective and individual behavior. How to identify and formulate tractable research questions.
4 units, Spr (Miller, D)

PSYCH 227. Seminar in Psycholinguistics: Models of Human and Machine Speech and Language Processing—(Same as LINGUIST 247.) May be repeated for credit.
2-4 units, not given this year

PSYCH 228. Ion Transport and Intracellular Messengers—(Undergraduates register for121; see 121.)
1-3 units, Spr (Wine, J)

PSYCH 230. Aping: Imitation, Control and the Development of the Human Mind—Seminar. The idea that a childhood that prolongs a state of stimulus-bound helplessness beyond that of animals is the price human beings pay for the benefits of shared cognitive structures. How such structures enable social collaboration, language, and the transmission and sharing of knowledge. Sources include psychological data from animals and humans, and recent discoveries in neuroscience.
1-3 units, Spr (Ramscar, M)

PSYCH 232. Brain and Decision Making—Neuroeconomics combines experimental techniques from neuroscience, psychology, and experimental economics, such as electrophysiology, fMRI, eye tracking, and behavioral studies, and models from computational neuroscience and economics. May be repeated for credit. Prerequisite: consent of instructor.
3 units, not given this year

PSYCH 233. MATLAB and Psychtoolbox for the Behavioral Sciences—Topics such as experiment design, stimulus presentation, counterbalancing, response collection, data analysis, and plotting. Programming experiments. Final project programming a complete behavioral experiment relevant to student's research. Prerequisite: introductory programming such as CS 105 or 106, or consent of instructor.
1-3 units, Win (Yoon, J; Toskos, A; Chen, J)

PSYCH 234. Topics in Affective Disorders—Current research topics including epidemiology and phenomenology of affective disorders, psychological theories of depression, gender differences in affective disorders, cognitive and social functioning of depressed persons, psychobiology of affective disorders, depression in children, postpartum depression, suicide issues in the treatment of depression, and cultural aspects of affective disorders. Prerequisite: graduate standing in Psychology or consent of instructor.
1-3 units, given next year

PSYCH 239A. Birds to Words: Cognition, Communication, and Language—(Undergraduates register for 137; see 137; same as HUMBIO 145.)
4 units, Aut (Fernald, A; Ramscar, M)

PSYCH 243. General Development Seminar—May be repeated for credit. Prerequisite: consent of instructors.
1-2 units, Win (Markman, E; Fernald, A; Johnson, S)

PSYCH 244. Psychology of Aging—Theory and research in gerontology. Normal and abnormal changes that occur in biological, cognitive, and psychological aging. Environmental factors that influence the aging process. Prerequisite: graduate standing in Psychology or consent of instructor.
1-3 units, not given this year

PSYCH 249. Human Motivation—Current research and theory including questions concerning the nature of human motives, intrinsic motivation, self-regulation, the roles of affect and cognition, and lifespan and cultural influences on motivation. Prerequisite: graduate standing in Psychology or consent of instructors.
1-3 units, Spr (Dweck, C; Lepper, M)

PSYCH 250. High-level Vision—Theories and ongoing research. Topics: behavioral studies pertaining to representation of objects; generalization and invariances; learning new categories; neuropsychological deficits; properties of high-level visual areas in monkeys and human beings; and theories and models of object and face recognition.
1-3 units, Spr (Grill-Spector, K), alternate years, not given next year

PSYCH 251. Affective Neuroscience—Theory and research. Comparative and human research approaches map affective function to neuroanatomical and neurochemical substrates. Prerequisite: consent of instructor.
3 units, Win (Knutson, B)

PSYCH 252. Statistical Methods for Behavioral and Social Sciences—(Same as NENS 202.) For students who seek experience and advanced training in empirical research. Analysis of data from experimental through factorial designs, randomized blocks, repeated measures; regression methods through multiple regression, model building, analysis of covariance; categorical data analysis through two-way tables. Integrated with the use of statistical computing packages. Prerequisite: 10 or equivalent.
1-6 units, Aut (Thomas, E)

PSYCH 253. Statistical Theory, Models, and Methodology—Practical and theoretical advanced data analytic techniques such as loglinear models, signal detection, meta-analysis, logistic regression, reliability theory, and factor analysis. Prerequisite: 252 or EDUC 257.
3 units, alternate years, not given this year

PSYCH 255. Topics in Personality and Abnormal Psychology—Topic varies every year. This year's topic is personality disorders. May be repeated for credit. Prerequisites: 207, 213.
1-3 units, Aut (Horowitz, L)

PSYCH 257. Individually Supervised Practicum—Satisfies INS requirements for curricular practical training. Relevant experience for graduate students as part of their program of study. May be repeated for credit. Prerequisites: graduate standing in Psychology, consent of adviser.
3-5 units, Aut, Win, Spr, Sum (Staff)

PSYCH 258. Graduate Seminar in Social Psychology Research—For students who are already or are planning to become involved in research on social construal and the role that it plays in a variety of phenomena, notably the origin and escalation of conflict.
1-3 units, Aut, Win, Spr (Zajonc, R)

PSYCH 259. Emotions: History, Theories, and Research—(Undergraduates register for 158; see 158.)
1-3 units, Win (Zajonc, R)

PSYCH 261. Emotion—(Undergraduates register for 161; see 161.)
3 units, Win (Gross, J)

PSYCH 261A. Learning and Cognition in Activity—(Same as EDUC 295.) Methods and results of research on learning, understanding, reasoning, problem solving, and remembering, as aspects of participation in social organized activity. Principles of coordination that support cognitive achievements and learning in activity settings in work and school environments.
3 units, not given this year

PSYCH 262. Language and Thought—(Undergraduates register for 131; see 131.)
4 units, Aut (Clark, H)

PSYCH 266. Current Debates in Learning and Memory—Memory is not a unitary faculty, but consists of multiple forms of learning and remembering. The cognitive and neural architectures of memory, focusing on the application of functional brain imaging (primarily fMRI and ERP).
1-3 units, not given this year

PSYCH 267. Human Memory: Facts, Fallacies, and Fragile Powers—Seminar. Applications of memory concepts in everyday life and in social and clinical settings. Topics include personal identity, childhood amnesia, autobiographic memory, emotions and memory, memory distortions, illusions, self-serving biases, recovery of repressed memories, false memories, implicit memories, and unconscious influences on social behavior, with applications to psychopathology.
1-3 units, not given this year

PSYCH 268. Emotion Regulation—(Undergraduates register for 168; see 168.)
3 units, Spr (Gross, J)

PSYCH 269. Graduate Seminar in Personality Research—May be repeated for credit. Prerequisite: graduate standing in Psychology.
1 unit, Aut, Win, Spr (Gotlib, I)

PSYCH 270. The Psychology of Everyday Morality—(Undergraduates register for 179; see 179.)
4 units, not given this year

PSYCH 272. Special Topics in Psycholinguistics—May be repeated for credit. Prerequisite: consent of instructor.
1-3 units, Spr (Clark, H)

PSYCH 273. Graduate Seminar on Language, Cognition, and Perception—Current topics and debates. Readings from psychology, linguistics, neuroscience, ethology, anthropology, and philosophy. May be repeated for credit.
3 units, Aut (Boroditsky, L)

PSYCH 275. Graduate Research—Intermediate-level research undertaken with members of departmental faculty. Prerequisite: consent of instructor.
1-15 units, Aut, Win, Spr, Sum (Staff)

PSYCH 279. Topics in Cognitive Control—The processes that enable flexible behavior by biasing contextually relevant perceptual, mnemonic, and response representations or processing pathways. Cognitive control is central to volitional action, allowing work with memory, task/goal states, and overriding inappropriate responses. Current models of cognitive control, functional neuroimaging, and neuropsychological evidence.
1-3 units, Win (Wagner, A)

PSYCH 281. Practicum in Teaching—Enrollment limited to teaching assistants in selected Psychology courses. May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

PSYCH 282. Practicum in Teaching PSYCH 1—Logistical TA training including: preparing for sections; creating, correcting exams; grading an iterative writing assignment; office hours; review sessions; developing audiovisual expertise; communicating via coursework. Review of student evaluations with instructor to set goals and strategies. Second quarter focuses on pedagogical improvement. Limited to current PSYCH 1 TAs. May be repeated for credit.
1-2 units, Aut (Gross, J), Win (Monin, B), Spr (Knutson, B)

PSYCH 283. International Conflict Resolution Colloquium—(Same as LAW 611, POLISCI 403.) Interdisciplinary. Theoretical insights and practical experience in managing and resolving inter-group and international conflicts. Personal, strategic, and structural barriers that can impede the achievement of efficient solutions to conflicts. Sources include social psychology, political science, game theory, and international law. Themes derived from faculty affiliation and research with the Stanford Center of International Conflict and Negotiation (SCICN).
2-5 units, Win (Weiner, A; Ross, L)

PSYCH 285. Contemporary Issues in Peace Studies—(Undergraduates register for 185; see 185; same as POLISCI 311.)
3 units, not given this year

PSYCH 290. Graduate Research Methods—Primary tool use for psychologists: basics of experiment design; computer-based experiments; web-based experiments; data analysis packages and data presentation; exploratory statistics; eye-tracking methods; psychophysiology methods; survey construction; corpus and discourse analysis; and perhaps hypnosis. Prerequisite: Ph.D. student in Psychology.
2 units, Win (Staff)

PSYCH 291. Psychology Teaching Methods—Open to graduate students and advanced undergraduates. Principles of good teaching. Students practice teaching skills.
1-2 units, Aut (Marshall, S; Master, A; Rattan, A)

PSYCH 296. Methods in Personality and Social Psychology—Experimental survey and multivariate methods. Topics: archival and correlational studies; experimental and quasi-experimental design; formulating the research problem; going from abstract ideas to concrete instances; handling research artifacts; measuring and analyzing change data; observational techniques; organizing data: professional and ethical issues; triangulation; validity and reliability of measurement. Practicum format. Research proposal. Prerequisite: graduate standing in Psychology or consent of instructor.
1-3 units, not given this year

PSYCH 297. Seminar for Coterminal Master of Arts—Contemporary issues and student research. Student and faculty presentations.
1-2 units, Aut, Win, Spr (Clark, H)

PSYCH 299. Temptations and Self Control—(Undergraduates register for 199; see 199.)
2 units, Aut (Magen, E)

PSYCH 459. Frontiers in Interdisciplinary Biosciences—(Crosslisted in departments in the schools of H&S, Engineering, and Medicine; students register through their affiliated department; otherwise register for CHEMENG 459.) For specialists and non-specialists. Sponsored by the Stanford BioX Program. Three seminars per quarter address scientific and technical themes related to interdisciplinary approaches in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and the world present breakthroughs and endeavors that cut across core disciplines. Pre-seminars introduce basic concepts and background for non-experts. Registered students attend all pre-seminars; others welcome. See http://www.stanford.edu/group/biox/courses/459.html. Recommended: basic mathematics, biology, chemistry, and physics.
1 unit, Aut, Win, Spr (Robertson, C)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOSCI 150/250. Human Behavioral Biology—(Same as HUMBIO 160.)
5 units, Spr (Sapolsky, R), alternate years, not given next year

COMM 308. Graduate Seminar in Political Psychology—(Same as POLISCI 324.)
1-3 units, Aut, Win, Spr (Krosnick, J)

EDUC 233A. Adolescent Development and Mentoring in the Urban Context
3 units, Aut (LaFromboise, T)

EDUC 252. Introduction to Test Theory
3-4 units, Spr (Haertel, E)

LINGUIST 140/240. Language Acquisition I
4 units, Aut (Clark, E)

LINGUIST 241. Language Acquisition II
1-4 units, Win (Clark, E)

POLISCI 402. Methods of Analysis Program in the Social Sciences (MAPSS) Workshop—(Same as COMM 310.)
1 unit, Aut, Win, Spr (Krosnick, J)

PUBLIC POLICY PROGRAM

Director: Bruce M. Owen (Stanford Institute for Economic Policy Research)

Deputy Director: Gregory L. Rosston (Stanford Institute for Economic Policy Research)

Associate Director and Senior Lecturer: Geoffrey Rothwell (Economics, Public Policy)

Executive Committee: Laurence Baker (Medicine), Jonathan Bendor (Business), David Brady (Political Science, Hoover Institution), Timothy Bresnahan (Economics), Samuel Chiu (Management Science and Engineering), Morris Fiorina (Political Science), Judith Goldstein (Freeman Spogli Institute for International Studies, Political Science), David Grusky (Education), Stephen Haber (Hoover Institution), Eric A. Hanushek (Hoover Institution), Deborah Hensler (Law), Daniel Kessler (Business and Law), David Kreps (Graduate School of Business), Roger Noll (Stanford Institute for Economic Policy Research), Leonard Ortolano (Civil and Environmental Engineering), Bruce Owen (Stanford Institute for Economic Policy Research), Sean Reardon (Education), Lee Ross (Psychology), Gregory Rosston (Stanford Institute for Economic Policy Research), Debra Satz (Philosophy), John B. Shoven (Stanford Institute for Economic Policy Research), Stephen Stedman (Freeman Spogli Institute for International Studies)

Affiliated Faculty: Donald Barr (Sociology), Jayanta Bhattacharya (Medicine), Coit Blacker (Freeman Spogli Institute for International Studies), Timothy Bresnahan (Economics), Paul Brest (Law), Jeremy Bulow (Graduate School of Business), John Cogan (Hoover Institution), Eamonn Callan (Education), Martin Carnoy (Education), Joshua Cohen (Political Science), Lynn Eden (Freeman Spogli Institute for International Studies), Lawrence Friedman (Law), Judith Goldstein (Freeman Spogli Institute for International Studies, Political Science), Lawrence Goulder (Economics, Freeman Spogli Institute for International Studies), Eric A. Hanushek (Hoover Institution), Thomas C. Heller (Law, Freeman Spogli Institute for International Studies), Nicholas Hope (Stanford Center for International Development), Jon A. Krosnick (Communications, Political Science), Thomas MaCurdy (Economics), Mark McClellan (Economics, School of Medicine; on leave), Robert McGinn (Management Science and Engineering), Milbrey McLaughlin (Education), Terry Moe (Political Science), Norman Nie (Political Science), A. Mitchell Polinsky (Law), Lee Ross (Psychology), John B. Shoven (Economics, Hoover Institution, Stanford Institute for Economic Policy Research), Jeff Strnad (Law), Barton Thompson (Law), Michael Tomz (Political Science), David Victor (Law), Jonathan Wand (Political Science), Barry Weingast (Political Science), Frank Wolak (Economics)

Lecturers: Laura Arrillaga, Ward Hanson (Stanford Institute for Economic Policy Research), Jonathan D. Greenberg (Law), Anjini Kochar (Stanford Institute for Economic Policy Research), Eva Meyersson Milgrom (Stanford Institute for Economic Policy Research), Joe Nation, Mary Sprague (Political Science), Scott Wallsten, Patrick Windham

Teaching Fellows: Sebastien Gay, Kirsten Oleson, Hiroki Takeuchi

Program Office: Encina Hall West, Room 204
Mail Code: 94305-6050
Program Phone: (650) 725-0109
Web Site: http://www.stanford.edu/dept/publicpolicy/

Courses given in Public Policy Program have the subject code PUBLPOL. For a complete list of subject codes, see Appendix.

The undergraduate Public Policy curriculum is intended to expose students to the basic concepts and tools used in evaluating public policy options and outcomes, and to prepare students for entry-level positions in organizations concerned with such analysis. Although the concepts and tools are of wider applicability, the institutional context is chiefly American. Economics and quantitative analyses are central to but not sufficient for modern public policy analysis; political science, law, philosophy, organizational behavior, and cognitive psychology are among other necessary disciplinary perspectives. Political philosophy and ethics form the foundations of public policy. Political science offers insights to the decision making process and information needs of a democracy. Organizational behavior focuses on the decisions made outside the market environment in hierarchies, bureaucracies, and teams. Nearly all public policy is formulated as law, and economic analysis of legal rules and institutions is key to effective implementation of policy decisions.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The core courses in the Public Policy Program develop the skills necessary to assess the performance of alternative approaches to policy implementation, evaluate the effectiveness of policies, understand the political constraints faced by policy makers, and appreciate the conflicts in fundamental human values that often animate the policy debate. After completing the core, students apply these skills by focusing their studies in one of several areas of concentration. The areas of concentration address specific fields of public policy, types of institutions, or a deeper development of the tools of policy analysis. Students design their own concentrations with the help of their academic advisers and the approval of the program director. Students must submit a list of their proposed concentration course work and a brief written defense of its coherence in advance of taking concentration courses. Areas of concentration are not declared on Axess; they do not appear on the transcript or diploma.

Recent areas of concentration include:

Advanced Methods of Policy Analysis
Design of Public Institutions
Development and Growth Policies
Education
Environment, Resources, and Population
Health Care
International Policies
Law and the Legal System
Social Policy: Discrimination, Crime, Poverty

Completion of the program in Public Policy requires 87 units of course work.

1. Prerequisite courses, 44 units: POLISCI 2; ECON 1A, 1B, 50, 51, 102A, 102B; MATH 51; and MS&E 180. ECON 50 and 51 must be taken for a letter grade. A maximum of 10 units of the other prerequisite courses may be taken credit/no credit.
2. Core courses: a 25-unit sequence of 5-unit PUBLPOL courses (101, 102, 103A, B, or C, 104, and 106), which students should plan to complete by the end of junior year. All core courses must be completed for a letter grade.
3. Concentration: majors must complete at least 15 units of course work in a concentration. The post-core course work must be approved by a concentration adviser and the director. Concentration course work must be completed for a letter grade.
4. Seniors are required to participate in one quarter (at least 3 units) of the Senior Seminar (PUBLPOL 200A, B, or C). Majors also must submit at least one research paper during the senior year and present it during the Senior Seminar. The senior paper may be a term paper or report for either the senior seminar or another course, or an honors thesis. PUBLPOL 200B (Winter Quarter) is organized as a practicum in which small student teams analyze real world policy problems faced by Bay Area agencies and produce a report for use by the client. The senior seminar must be completed for a letter grade.
5. Students must complete the Public Policy core, concentration area courses and the senior seminar with a grade point average (GPA) of 2.3 (C+) or higher.
6. It is recommended that the major be declared by the end of sophomore year but no later than the end of Autumn Quarter of the junior year. Application forms are available in the Public Policy Program office and on the web site.

The Public Policy Program encourages students to attend Stanford in Washington and to participate in appropriate Stanford internship programs, especially those available through the Haas Center for Public Service.

MINORS

The Public Policy Program offers a minor that is intended to provide students with interdisciplinary training in applied social sciences. Students who pursue the minor are required to take the courses listed below for a total of 35 units in Public Policy and its supporting disciplinary departments. Because University rules prohibit double-counting courses, the requirements for a minor differ according to the student's major requirements. All courses for the minor must be completed for a letter grade.

For students whose major department or program requires no courses in economics and political science, the requirements for a Public Policy minor are:

Subject and Catalog Number	*Units*
ECON 1A,B, 50, 51	20
POLISCI 2	5
PUBLPOL 101	5
PUBLPOL 104	5

For students who are Economics majors or who satisfy a major requirement by taking ECON 50, but have taken no courses in political science, the requirements for a Public Policy minor are:

ECON 51	5
POLISCI 2	5
PUBLPOL 101	5
PUBLPOL 102	5
PUBLPOL 103A or B or C	5
PUBLPOL 104	5
PUBLPOL 106	5

For students who are Political Science majors or who satisfy a major requirement by taking POLISCI 2 but no courses in Economics, the requirements for a Public Policy minor are:

ECON 1A,B, 50, 51, 102A	25
PUBLPOL 104	5
PUBLPOL 106	5

For Sociology majors, the requirements for a Public Policy minor are:

ECON 1A,B, 50, 51, 102A	25
PUBLPOL 103A or B or C	5
PUBLPOL 104	5

For students who major in another interdepartmental program such as International Relations and who satisfy major requirements by taking ECON 50, POLISCI 2, and an introductory course in statistics such as ECON 102A or STATS 60, the requirements for a Public Policy minor are:

ECON 51, 102B	10
PUBLPOL 101	5
PUBLPOL 102	5
PUBLPOL 103A or B or C	5
PUBLPOL 104	5
PUBLPOL 106	5

HONORS PROGRAM

The Public Policy Program offers students the opportunity to pursue honors work during the senior year. To graduate with honors in Public Policy, a student must:

1. Apply for admission to the honors program no later than the end of Spring Quarter of the junior year.
2. Complete the requirements for the B.A. in Public Policy and achieve a grade point average (GPA) of 3.5 in the following courses: the Public Policy core; the student's concentration area courses; the Senior Seminar; PUBLPOL 199, Senior Research; and PUBLPOL 105. Students are encouraged to complete PUBLPOL 105 by the end of Spring Quarter of the junior year and PUBLPOL 200A during Autumn Quarter. Courses not taken at Stanford are not included in calculating the GPA.
3. Submit an honors thesis by enrolling in at least 8 but no more than 15 units of PUBLPOL 199, Senior Research, during the senior year and receive a final grade on the senior thesis of at least a 'B+.' The honors thesis must demonstrate mastery of relevant analytical tools and address a policy issue.

Students who intend to pursue honors work should plan their academic schedules so that most of the core courses are completed before the beginning of the senior year, and all of the core and concentration courses are completed by the end of Winter Quarter of senior year. This scheduling gives students both the time and the necessary course background to complete a senior research project during Spring Quarter. In addition, honors students are encouraged to enroll in PUBLPOL 197, Junior Honors Seminar, during Winter or Spring Quarter; this course focuses on developing a research plan and the research skills necessary to complete a thesis.

To apply, a student must submit a completed application to the Public Policy Program office with a brief description of the thesis. The student must obtain the sponsorship of a faculty member who approves of the thesis description and who agrees to serve as a thesis adviser. Students intending to write a thesis involving more than one discipline may wish to have two advisers, at least one of whom is a member of the Public Policy affiliated faculty.

The honors thesis must be submitted to both the thesis adviser and the Public Policy Program office. Graduation with honors requires that the thesis be approved by both the adviser and the Director of the Public Policy Program. The role of the director is to assure that the thesis deals with an issue of public policy and satisfies the standards of excellence of the program. However, the grade for the honors thesis is determined solely by the adviser. In order to be considered for University and department awards, the final thesis must be submitted to the program office no later than the third Wednesday in May in both hard copy and electronic forms. All other theses must be submitted by the last Friday in May in both hard copy and electronic forms.

Members of the core faculty in Public Policy are available to provide assistance in selecting a senior thesis topic and adviser.

GRADUATE PROGRAMS

University requirements for the master's degree are described in the "Graduate Degrees" section of this Bulletin.

The Graduate Program in Public Policy offers two degrees: Master in Public Policy (M.P.P.), a two-year program leading to a professional degree, and Master of Arts in Public Policy (M.A.P.P.), a one-year program not intended as a professional degree. The following joint degree programs are also offered: Juris Doctor/Master in Public Policy (J.D./M.P.P); Doctor of Philosophy in Economics, Education, Psychology, or Sociology with a joint Master in Public Policy (Ph.D./M.P.P); Master of Business Administration with a joint Master in Public Policy (M.B.A./M.P.P.); Master of Arts in International Policy Studies with a joint Master in Public Policy (M.A.I.P.S./M.P.P.). Requirements for the joint degrees differ; details are available from the program office and on the program web site.

Courses in the graduate program in Public Policy offer advanced skills necessary to assess the performance of alternative approaches to policy making and implementation, evaluating program effectiveness, understanding the political constraints faced by policy makers, and appreciating the conflicts in fundamental human values that often animate policy debate. After completing the graduate core curriculum, students apply these skills by focusing their studies in a practicum for the M.P.P., or a master's thesis for the M.A.P.P. Students in the M.P.P. program also complete at least one concentration tailored to the student's primary degree program or the student's interests and skills.

ADMISSIONS

Applications for graduate study in Public Policy are accepted only from Stanford students currently enrolled in any graduate degree program or external applicants seeking a joint degree. External applicants for joint degrees must apply to the department or school offering the primary graduate degree (i.e., Ph.D., M.B.A., or J.D.), indicating an interest in the joint M.P.P.; applicants admitted to the primary degree program are then evaluated for admission to the M.P.P. program. Students currently enrolled in any Stanford graduate program may, with the consent of that program, apply either for the applicable joint degree or for a stand-alone Public Policy degree, adding the M.P.P. or M.A.P.P. to their current degree program. Applications are reviewed and accepted on a rolling basis but must be received no later than May 1.

PROGRAM REQUIREMENTS

The graduate program in Public Policy consists of a common core set of courses requiring approximately one year of study, plus a 10-unit practicum and concentration course work for the M.P.P., or a master's thesis for the M.A.P.P. All graduate degree candidates must submit an acceptable official Master's Degree Program Proposal to the Public Policy office by the end of Autumn Quarter and must amend this proposal formally if plans for meeting the degree requirements change. The stand-alone M.P.P. requires 90 units of course work and requires approximately two years. The stand-alone M.A.P.P. requires 42 units of course work plus a 5-unit master's thesis, and requires approximately one year. The joint M.P.P. degree programs require 90 units of which up to 45 units may also count toward the primary degree. The joint degree programs add approximately one year to the time required for the primary degree. Each joint degree program differs in its extended core and concentration course requirements; details on specific degrees are available at the program office and on the web site.

The graduate Public Policy core curriculum is required for all graduate degree programs. Core courses must be taken for a letter grade. The core must be completed with a grade point average (GPA) of 3.0 (B) or better. Students are expected to devote one year full-time to the M.P.P. core; for joint-degree students, typically this is the second year at Stanford. Students are required to participate in the weekly colloquia series. Students for whom any given core course would duplicate prior studies may substitute a more advanced course in the same subject matter.

Prerequisites—Graduate students in Public Policy are expected to be literate in mathematics, statistics, and economics at the level of MATH 41, ECON 50, and STATS 60.

Core curriculum consisting of the following courses—PUBLPOL 201A,B, 202A,B, 203A,B, 204A,B, 205A,B, 206 (M.P.P. only), 207. (46 units for M.P.P.; 42 units for M.A.P.P.)

Practicum (M.P.P. students)—10 units of PUBLPOL 209.

Concentration (M.P.P. students)—M.P.P. students complete course work in a specialized field or fields, chosen from existing Stanford courses with the prior approval of the student's adviser and the program director.

Master's Thesis (M.A.P.P. students only)—The 5-unit thesis must be submitted to the Public Policy Program office in both electronic and hard copy no later than the last Friday in May.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirement.

PUBLPOL 101. Politics and Public Policy—(Same as POLISCI 123.) How policies come to be formed. How interests compete within public institutions to turn ideas into policies. Examples of this process from contemporary policy areas, including tax, social welfare, and environmental policy; results evaluated using equity and efficiency criteria. Prerequisite: POLISCI 2. GER:DB-SocSci

5 units, Aut (Sprague, M)

PUBLPOL 102. Organizations and Public Policy—Analysis of organizational processes emphasizing organizations that operate in a non-market environment. Prerequisite: ECON 1A. GER:DB-SocSci

5 units, Aut (Hannan, M)

PUBLPOL 103A. Introduction to Political Philosophy—(Same as PHIL 30.) State authority, justice, liberty, and equality through major works in political philosophy. Topics include human nature and citizenship, the obligation to obey the law, democracy and economic inequality, equality of opportunity and affirmative action, religion, and politics. GER:DB-Hum, EC-EthicReas

5 units, Aut (Hussain, N)

PUBLPOL 103B. Ethics and Public Policy—(Same as MS&E 197, STS 110.) Ethical issues in science- and technology-related public policy conflicts. Focus is on complex, value-laden policy disputes. Topics: the nature of ethics and morality; rationales for liberty, justice, and human rights; and the use and abuse of these concepts in policy disputes. Case studies from biomedicine, environmental affairs, technical professions, communications, and international relations. GER:DB-Hum, EC-EthicReas

5 units, Win (McGinn, R)

PUBLPOL 103C. Justice—(Same as PHIL 171.) Focus is on the ideal of a just society, and the place of liberty and equality in it, in light of contemporary theories of justice and political controversies. Topics include protecting religious liberty, financing schools and elections, regulating markets, assuring access to health care, and providing affirmative action and group rights. Issues of global justice including human rights and global inequality. GER:DB-Hum, EC-EthicReas

5 units, Aut (Cohen, J)

PUBLPOL 104. Economic Policy Analysis—(Same as ECON 150.) The relationship between microeconomic analysis and public policy making. How economic policy analysis is done and why political leaders regard it as useful but not definitive in making policy decisions. Economic rationales for policy interventions, methods of policy evaluation and the role of benefit-cost analysis, economic models of politics and their application to policy making, and the relationship of income distribution to policy choice. Theoretical foundations of policy making and analysis, and applications to program adoption and implementation. Prerequisite: ECON 50.

5 units, Spr (Cogan, J)

PUBLPOL 105. Quantitative Methods and Their Applications to Public Policy—Reviews material covered in prerequisites with applications of qualitative independent variable techniques to labor market data. Maximum likelihood estimation and qualitative dependent variable models with an application to voting models. Final papers estimate influence of quantitative and qualitative independent variables on Congressional voting probabilities. Prerequisites: ECON 102A,B. GER:DB-SocSci

5 units, Spr (Rothwell, G)

PUBLPOL 106. Economics of Legal Rules and Institutions—(Same as ECON 154.) The design and consequences of legal rules. Common ideas that run through law including individual rationality, economic efficiency, conventional and Coasian analyses of externalities, enforcement, costs, and market consequences of legal restrictions on contract terms. Private versus public enforcement of law; the tradeoff between certainty and severity of punishment; the choice between ex post and ex ante sanctions; and the choice between property and liability rules. Applications to property, intellectual property, contract, criminal, tort, family, and environmental law. Prerequisite: ECON 50. WIM

5 units, Aut (Owen, B)

PUBLPOL 117. Econometrics for Public Policy Majors—Descriptive statistics, regression analysis, analysis of variance, heteroskedasticity, serial correlation, errors in variables, and simultaneous equations. Prerequisites: Public Policy major; ECON 50 and 102A.

5 units, not given this year

PUBLPOL 121. Policy and Climate Change—Science and economics, including recent findings. History and evolution of local, state, regional, national, and international policy. California's recent landmark climate change bill. Future policy prospects, emphasizing national and international levels.

5 units, Aut (Nation, J)

PUBLPOL 125. Law and Public Policy—How the U.S. government promotes, uses, and regulates new technologies; how it decides technology policies; and debates over how to use technology to advance national goals. Topics: American attitudes towards technology; technologies for defense, homeland security, energy, health, and economic competitiveness; and when and how to regulate nanotechnology, stem cell research, government surveillance, and digital copyright. Prerequisite: POLISCI 2. GER:DB-SocSci

5 units, Aut (Greenberg, J)

PUBLPOL 154. Politics and Policy in California—State politics and policy making, including the role of the legislature, legislative leadership, the governor, special interests, campaign finance, the public, ballot initiatives, the state constitution, the media, and the role of research organizations. Case studies may include pension reform, health care, term limits and other political reform measures, open primaries, infrastructure improvements, and the budget. Changes in constitutional and in state statutes that can improve policy making in California.

5 units, Win (Nation, J)

PUBLPOL 156. Health Care Policy and Reform—Competing health care reform proposals at the state and local levels. Focus is on California including proposals for expanding coverage for children, a single payer system, employer and individual mandates. Recent proposals in other states including Massachusetts, Maine, and Vermont; their relation to national efforts. Attention to local reform efforts, including in San Francisco. Prospects for future policy.
5 units, Spr (Nation, J)

PUBLPOL 168. Global Organizations: Managing Diversity—(Same as SOC 168/268.) Analytical tools derived from the social sciences to analyze global organizations and projects, and applied to the tradeoffs between different designs of teams and organizations. Focus is on tribal mentality and how to design effective organizations and projects for policy implementation within and across institutional settings. Recommended: 102, MS&E 180, or SOC 160. GER:DB-SocSci
5 units, Win (Meyersson Milgrom, E)

PUBLPOL 172. Public Policy and Psychology—(Same as PSYCH 119.) Applications of psychology to public and social policy. Topics include the influence of psychological research and individual psychology on the creation of policy, and the influence of policy on attitudes and behavior at the personal and societal levels. How psychological theory can be used to shape policies and policy making in areas such as environment, education, criminal justice, and health.
5 units, Spr (Tormala, T)

PUBLPOL 183. Philanthropy and Social Innovation—Philanthropy's role in modern society and the translation of its vision and capital into social action. Topics: individual giving; philanthropic history and industry; foundation models and infrastructure; philanthropic strategy and grantmaking; accountability and board governance; global and corporate philanthropy; and public policy engagement. Readings: business school cases and industry articles. Guest speakers include individual donors and foundation presidents. Final project: students evaluate grant proposals and make funding recommendations. Enrollment limited to 15. GER:DB-SocSci
5 units, given next year (Arrillaga, L)

PUBLPOL 184. Poverty and Policies in Developing Economies—Economic models of growth and poverty, differences in growth rates among countries, and the persistence of poverty. Models of physical and human capital accumulation, and recent theories of the importance of institutions, social capital, and political factors. The effectiveness of social policies in developing countries, emphasizing India, in the light of theories of growth and poverty, and in terms of immediate goals and long-term consequences. Policies include schooling and health, anti-poverty, banking, and political decentralization. Prerequisites: ECON 1A,B. GER:DB-SocSci
5 units, Win (Kochar, A)

PUBLPOL 194. Technology Policy—How the U.S. federal government promotes, uses, and regulates new technologies; how it decides technology policies; and debates over how to use technology to advance national goals. Topics: American attitudes towards technology; technologies for defense, homeland security, energy, health, and economic competitiveness; and when and how to regulate nanotechnology, stem-cell research, government surveillance, and digital copyright. Prerequisite: POLISCI 2.
5 units, Win (Windham, P)

PUBLPOL 197. Junior Honors Seminar—(Same as ECON 198.) Primarily for students who expect to write an honors thesis. Weekly sessions discuss writing an honors thesis proposal (prospectus), submitting grant applications, and completing the honors thesis. Readings focus on writing skills and research design. Students select an adviser, outline a program of study for their senior year, and complete a prospectus by the end of the quarter. Seniors working on their theses also may enroll and present their research to the seminar participants. Seniors are required to make substantial progress on their thesis by the end of the quarter. Enrollment limited to 25.
5 units, Win (Staff), Spr (Rothwell, G)

PUBLPOL 198. Directed Readings in Public Policy—May be repeated for credit.
1-5 units, Aut, Win, Spr (Staff)

PUBLPOL 199. Senior Research—May be repeated for credit.
1-15 units, Aut, Win, Spr (Staff)

PUBLPOL 199B. Senior Honors Seminar—Research, statistical, and writing support for Public Policy honors students.
1 unit, Win (Gay, S)

PUBLPOL 200A,B,C. Senior Seminar—Students conduct original research for oral presentations and a paper on a policy-related topic. Topic and methods of analysis determined by student in consultation with instructor. Goal is to improve analytical, research, writing, and communication skills. Prerequisites: core courses in Public Policy or consent of instructor.
3-5 units, **A:** *Aut,* **B:** *Win (Sprague, M),* **C:** *Spr (Gay, S)*

PUBLPOL 201A. Microeconomics—(Same as IPS 204A.) Microeconomic concepts relevant to decision making. Topics include: competitive market clearing, price discrimination; general equilibrium; risk aversion and sharing, capital market theory, Nash equilibrium; welfare analysis; public choice; externalities and public goods; hidden information and market signaling; moral hazard and incentives; auction theory; game theory; oligopoly; reputation and credibility.
4 units, Aut (Bulow, J)

PUBLPOL 201B. Cost-Benefit Analysis and Evaluation—(Same as IPS 204B.) Ex ante and ex post evaluation of projects and policies, value of life calculations, and welfare evaluation of public and private decisions. Welfare measures; tradeoffs between efficiency and equity. Second best. Behavioral economics: psychological mechanisms behind static choice, intertemporal choice, choice under risk and uncertainty, choice in social situations, and hedonics. Statistical decision theory. Use of incentives in implementing policies. Relationship between microeconomic analysis and public policy making. Economic rationales for policy interventions. Economic models of politics and application to policy making. Relationship of income distribution to policy choice.
4 units, Spr (Kessler, D)

PUBLPOL 202A. Introduction to Law—Differences between common and civil law systems; judge-made law and judicial process; courts and litigation; legislation and its interpretation; administrative law and regulation. Separation of powers and federalism; constitutional law and civil liberties; criminal justice; empirical studies of the legal profession and legal behavior; social change and its impact on the legal order; law and economic development.
2 units, Win (Friedman, L)

PUBLPOL 202B. Economic Analysis of Law—(Same as LAW 277.) How legal rules and institutions can correct market failures. The economic function of contrasts; role of legal remedies to resolve disputes when contracts fail. The choice between encouraging private parties to initiate legal actions to correct externalities and governmental actors such as regulatory authorities. Economics of litigation; how private incentives to bring lawsuits differ from the social value of litigation. Economic motives to commit crimes; optimal governmental response to crime. Prerequisites: intermediate-level microeconomics; some calculus.
4 units, Win (Polinsky, M)

PUBLPOL 203A. Principles of Research Design and Analysis: Methods—(Same as IPS 205A.) How professionals in non-research fields can be informed consumers of policy-related empirical research. Qualitative and quantitative research techniques and methodological requirements for sound research results. Formulating research questions. Experimental design. Choosing appropriate research strategies. Survey research design. Case study methods. Interviewing and observational techniques. Measurement including financial, cost, national income, and regulatory accounting.
4 units, Aut (Louie, T)

PUBLPOL 203B. Principles of Research Design and Analysis: Tools—(Same as IPS 205B, LAW 366.) Policy analysis tools for government, research institutes, and academic settings, and for empirical issues in litigation, investment banking, consulting, and finance. Multiple regression analysis, multilevel modeling, and Bayesian analysis. Topics include hypothesis testing, regression specification, logistic regression, probit, heteroscedasticity, serial correlation, errors in the variables, instrumental variables, simultaneous equations, generalized linear models, simulation, model checking, causal inference, and missing data imputation. Hands-on analysis using popular statistical packages.

4 units, Win (Strnad, J)

PUBLPOL 204A. Politics and Collective Action—(Same as IPS 206A, POLISCI 331S.) How public policies are formulated and implemented; preference formation. The role of electoral politics, nongovernmental organizations, ideologies, and social protests. The theory of collective action. Principal agent relationships. How elected officials, bureaucrats, and interest groups shape government policies in areas including tax, environmental, trade, and social welfare policy, given their goals and available tactics. How to evaluate policies and policy making processes.

4 units, Win (Satz, D)

PUBLPOL 204B. Organizations—(Same as IPS 206B.) Policy reform and organizational resistance. Organizations include government and other bureaucracies such as not-for-profit schools, universities, hospitals, international organizations, political parties, and agencies. Hubris and policy making, including pathologies of decision making and planning, abuse of intelligence, biased information, overselling to publics, lack of knowledge about context, and unintended consequences.

4 units, Spr (Stedman, S; Eden, L)

PUBLPOL 205A. Judgment and Decision Making—(Same as IPS 207A, LAW 333.) Theories and research on heuristics and biases in human inference, judgment, and decision making. Experimental and theoretical work in prospect theory emphasizing loss and risk aversion. Support theory. Challenges that psychology offers to the rationalist expected utility model; attempts to meet this challenge through integration with modern behavioral economics. Decision making biases and phenomena of special relevance to public policy such as group polarization, group think, and collective action.

4 units, Aut (Brest, P)

PUBLPOL 205B. Public Policy and Social Psychology: Implications and Applications—(Same as IPS 207B, PSYCH 216.) Theories, insights, and concerns of social psychology relevant to how people perceive issues, events, and each other; links between beliefs and individual and collective behavior. Topics include: situationist and subjectivist traditions of applied and theoretical social psychology; social comparison, dissonance, and attribution theories; social identity, stereotyping, racism, and sources of intergroup conflict and misunderstanding; challenges to universality assumptions regarding human motivation, emotion, and perception of self and others; the problem of producing individual and collective changes in norms and behavior.

4 units, Spr (Ross, L)

PUBLPOL 206. Writing and Rhetoric for Policy Audiences—Techniques of effective writing and argument for addressing decision makers, interest groups, and the public. The importance of apparent simplicity; uses and misuses of history and historical analogies; and incentives, cognitive limits, and biases of audiences. Why some arguments become traditional. Sources include historical briefing papers and oral arguments. Students write briefing papers and make oral arguments, individually and in teams. Enrollment limited. Prerequisite: consent of instructor.

4 units, Spr (Owen, B)

PUBLPOL 207. Justice—(Same as ETHICSOC 171, IPS 208, PHIL 171, PHIL 271, POLISCI 136S.) Focus is on the ideal of a just society, and the place of liberty and equality in it, in light of contemporary theories of justice and political controversies. Topics include protecting religious liberty, financing schools and elections, regulating markets, assuring access to health care, and providing affirmative action and group rights. Issues of global justice including human rights and global inequality. GER:DB-Hum, EC-EthicReas

5 units, Aut (Cohen, J)

PUBLPOL 209. Practicum—(Same as IPS 209.) Applied policy exercises. Multidisciplinary student teams apply skills to a contemporary problem in a major policy exercise with a public sector client such as a government agency. Problem analysis, interaction with the client and experts, and presentations. Emphasis is on effective written and oral communication to lay audiences of recommendations based on policy analysis.

10 units, given next year

PUBLPOL 231. Political Economy of Health Care in the United States—(Same as MGTECON 331, HRP 391.) Economic tools and institutional and legal background to understand how markets for health care products and services work. Moral hazard and adverse selection. Institutional organization of the health care sector. Hospital and physician services markets, integrated delivery systems, managed care, pharmaceutical and medical device industries. Public policy issues in health care, medical ethics, regulation of managed care, patients' bill of rights, regulation of pharmaceuticals, Medicare reform, universal health insurance, and coverage of the uninsured. International perspectives, how other countries' health care systems evolved, and what the U.S. can learn from their experiences.

4 units, Spr (Kessler, D; Bundorf, K)

STANFORD IN WASHINGTON

Certain courses offered at Stanford in Washington are approved for the Public Policy major, including the core. Contact the program office for details.

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ECON 1A. Introductory Economics A

5 units, Aut (Clerici-Arias, M), Win (Makler, C), Sum (Staff)

ECON 1B. Introductory Economics B

5 units, Win (Amador, M), Spr (Cojoc, D), Sum (Staff)

ECON 50. Economic Analysis I

5 units, Aut (Abramitzky, R), Spr (Tendall, M), Sum (Staff)

ECON 51. Economic Analysis II

5 units, Aut (Tendall, M), Win (Einav, L), Sum (Staff)

ECON 102A. Introduction to Statistical Methods (Postcalculus) for Social Scientists

5 units, Aut, Win (Steiner, F)

ECON 102B. Introduction to Econometrics

5 units, Win (Mahajan, A), Spr (Staff)

HUMBIO 171. The Death Penalty: Human Biology, Law, and Policy

3 units, Spr (Abrams, W)

MATH 51. Linear Algebra and Differential Calculus of Several Variables

5 units, Aut, Win (Staff), Spr (Lucianovic, M), Sum (Staff)

MS&E 180. Organizations: Theory and Management

4 units, Aut (Siino, R), Spr (Eisenhardt, K)

POLISCI 2. Introduction to American National Government and Politics

5 units, Win (Fiorina, M; Frisby, T)

OVERSEAS STUDIES

Courses approved for the Public Policy major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

PARIS

OSPPARIS 153X. Health Systems and Health Insurance: France and the U.S., a Comparison across Space and Time

4-5 units, Win (Fessler, J)

RELIGIOUS STUDIES

Emeriti: (Professors) Arnold Eisen, René Girard, Edwin M. Good, Robert C. Gregg, Van Harvey, David S. Nivison
Chair: Hester G. Gelber
Professors: Carl W. Bielefeldt, Hester G. Gelber, Paul Harrison, Thomas Sheehan, Lee Yearley
Associate Professors: Shahzad Bashir, Charlotte Fonrobert, Brent Sockness
Assistant Professor: Behnam Sadeki
Lecturers: Keila Diehl, Linda Hess, Naoko Kumada, Ariella Radwin
Acting Associate Professor: Fabrizio Pregadio
Acting Assistant Professor: Barbara Pitkin
Visiting Professors: J. Rebecca Lyman, David Malkiel
Visiting Associate Professor: Jennifer Rose
Affiliated Faculty: Jean-Pierre Dupuy (French and Italian), Maud Gleason (Classics), Jack Kollmann (Russian, East European and Eurasian Studies)

Department Offices: Building 70
Mail Code: 94305-2165
Phone: (650) 723-3322
Web Site: http://www.stanford.edu/dept/relstud/

Courses given in Religious Studies have the subject code RELIGST. For a complete list of subject codes, see Appendix.

The purpose of Religious Studies is to understand and interpret the history, literature, thought, and social structures of various religious traditions and cultures. The department offers courses at several levels, described below.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The goal of the Religious Studies undergraduate curriculum is to give students exposure to the set of phenomena called religion and the leading theories and methods by which religion is studied in the modern university. The department's courses are designed to engage students existentially and to assist them in thinking about intellectual, ethical, and sociopolitical issues in the world's religions. No less important, the department faculty seek to provide tools for understanding the complex encounters among religious ideas, practices, and communities, and the past and present cultures which have shaped and been shaped by religion. Courses therefore expose students to leading concepts in the field of religious studies such as god(s), sacrifice, ritual, scripture, prophecy, and priesthood; to approaches developed over the past century, including the anthropological, historical, psychological, philosophical, and phenomenological, that open religion to closer inspection and analysis; and to major questions, themes, developments, features, and figures in the world's religious traditions. The department encourages and supports the acquisition of languages needed for engagement with sacred texts and interpretive traditions as well as study abroad at Stanford's overseas centers where religions can be observed and experienced in their culture of origins.

MAJOR

The curriculum for majors is designed to move students sequentially from foundational courses, through deeper investigations, culminating in integrative research courses. Thus, the introductory sequence is designed to lead to a wide array of courses which build on this foundation, with topics including: particular traditions such as Judaism or Buddhism; comparative studies such as nonviolence in Hinduism and Buddhism, or Muslim and Christian interpretations of scripture; specific topics such as mysticism, gender and religion, or theodicy; and distinctive approaches such as the philosophy of religion or ritual studies. Majors complete their careers with integrative courses which afford opportunity for research and consolidation of the knowledge and skills gained earlier.

A Bachelor of Arts in Religious Studies requires 60 units of course work. At least 44 units are taken in courses numbered above 100. Ten units out of the 60 may be taken for the grade of 'CR/NC.'

1. At least eight of the 60 units must be courses at the introductory level. Students may satisfy this requirement by taking either:
   a) IHUM 68A,B. Approaching Religion: Tradition, Transformation, and the Challenge of the Present (Winter/Spring sequence), or
   b) one course in each of the following categories: introduction to religious traditions (courses numbered 11-50) and academic approaches to the study of religion (courses numbered 51-99). In consultation with the Undergraduate Director, one Stanford Introductory Seminar in Religious Studies may be applied to this introductory requirement.
2. At least 29 units are to be taken in intermediate lecture and seminar courses numbered 100-289. Of these, at least two seminars are required from courses numbered above 200. Language courses relating to students' study of religion within the department, such as Arabic, biblical Hebrew, New Testament Greek, Chinese, or Japanese, but not counted towards the University language requirement may, with departmental approval, be counted among these 29 units.
3. 15 units in integrative courses:
   a) *Majors' Seminar:* RELIGST 290, Theories of Religion (5 units; Winter Quarter of junior year; fulfills WIM requirement)
   b) *Senior Essay or Honors Thesis Research:* RELIGST 297 (3-5 units; up to 10 units over two quarters)
   c) *Senior Majors' Colloquium:* RELIGST 298 (5 units, Spring Quarter, graded S/NC)
   d) completion of either a senior essay or honors thesis. See below concerning the difference between these options.
4. Each student, in consultation with his/her adviser, works out a focus of study centering either on a particular religious tradition or on a theme or problem which cuts across traditions such as ritual, ethics, scripture, or gender.

SENIOR ESSAY

A 25-30 page essay on a topic chosen by the student and approved by the adviser upon receipt of a student's proposal by the end of the third quarter prior to expected graduation. The character and content of the essay, which is meant to allow the student to call into play knowledge and skills learned in the course of the major, may take several forms. For example, a student may return to a subject studied earlier but now pursued with more questions or from a new perspective, or research a recent or new topic of interest in the field, or offer a carefully framed critical assessment of what has been learned in the major based on review of influential sources, theories, and methods of studying religion. The senior essay is read and graded by the student's adviser and one other member of the Religious Studies faculty.

HONORS THESIS

A 40-80 page research paper on a topic chosen by the student and approved by the adviser upon receipt of a proposal in the fourth quarter prior to expected graduation. The paper, supported by mastery of primary and secondary scholarship, advances a well-reasoned, supportable thesis. Writers of honors theses must have a grade point average (GPA) of 3.5 in Religious Studies courses, and at least 3.2 overall, and are expected to have already demonstrated success in writing research papers. The honors thesis is read and graded by the student's adviser and one other member of the Religious Studies faculty. Theses earning a grade of 'B+' or above receive honors.

MINOR

A minor in Religious Studies requires a minimum of 30 graded units. Students must declare the minor no later than the last day of the quarter, two quarters before degree conferral.

Requirements for the minor include:

1. Two introductory courses. To satisfy this requirement, students take either:
   a) IHUM 68A,B. Approaching Religion: Tradition, Transformation, and the Challenge of the Present (Winter/Spring sequence), or

   b) one course in each of the following categories: introduction to religious traditions (courses numbered 11-50) and academic approaches to the study of religion (courses numbered 51-99). In consultation with the Undergraduate Director, one Stanford Introductory Seminar in Religious Studies may be applied to this introductory requirement.
2. Five intermediate lecture and seminar courses, 100-289.
3. One course in directed reading (RELIGST 199) may count towards the minor.
4. Students may petition for other Stanford courses to fulfill minor requirements, but they must take courses from at least two Religious Studies faculty members.
5. Students are strongly encouraged to focus their program of study either in a religious tradition or in a theme which cuts across traditions. In consultation with their advisers, students may design the minor in Religious Studies to complement their major.

MAJOR IN RELIGIOUS STUDIES AND PHILOSOPHY

The departments of Religious Studies and Philosophy jointly nominate for the B.A. students who have completed a major in the two disciplines. See a description of this joint major under the "Philosophy" section of this bulletin, or in the guidelines available from the undergraduate director of either department.

GRADUATE PROGRAMS

MASTER OF ARTS

University regulations pertaining to the M.A. are listed in the "Graduate Degrees" section of this bulletin. The following requirements are in addition to the University's basic requirements.

The student completes at least 45 units of graduate work at Stanford beyond the B.A. degree, including either the RELIGST 290, Majors Seminar, or 304A or B, Theories and Methods, with consent of instructor. Residence may be completed by three quarters of full-time work or the equivalent.

The student's plan of courses is subject to approval by the Graduate Director. No field of specialization is expected, but students may focus work in particular areas. Advanced and graduate courses in other departments may be taken. No thesis is required; a thesis, if elected, may count for as many as 9 units.

Each student demonstrates reading knowledge of at least one foreign language.

DOCTOR OF PHILOSOPHY

University regulations regarding the Ph.D. are found in the "Graduate Degrees" section of this bulletin. The following requirements are in addition to the University's basic requirements.

Residence—Each student completes three years (nine quarters) of full-time study, or the equivalent, in graduate work beyond the B.A. degree, and a minimum of 135 units of graduate course work (excluding the dissertation).

Field of Study—The Ph.D. signifies special knowledge of a field of study and potential mastery of an area of specialization within it. The faculty of the department have established certain fields of study in which the department's strengths and those of other Stanford departments cohere. They are: East Asian religions, Christianity, Judaism, religious ethics, and modern Western religious thought. Students who wish to specialize in other fields must obtain early approval by the faculty.

Stages of Advancement—

1. In the first two years, the student refines an area of specialization within the chosen field of study in preparation for candidacy.
2. After attaining candidacy, the student concentrates on the area of specialization in preparation for the qualifying examination.
3. The student writes a dissertation and defends it in the University oral examination.

Languages—Each student demonstrates a reading knowledge of two foreign languages, including French or German. Each student also demonstrates reading knowledge of other ancient or modern languages necessary for the field of study, area of specialization, and dissertation topic.

Courses—Each student satisfactorily completes the two graduate seminars (304A,B), two quarters of the pedagogy seminar (391), and one reading seminar before the candidacy decision. Other courses are taken with the approval of a faculty adviser in consideration of the student's field of study.

Candidacy—At the end of each academic year, the department's faculty recommend second-year students for candidacy on the basis of all relevant information, and especially on the student's candidacy dossier which includes the approved declaration of an area of specialization, certification for one foreign language, and two substantial papers written for courses during the previous two years.

Paper-in-Field—During the third year, under the supervision of their advisers, students prepare a paper suitable for submission to an academic journal in their field. The paper is read and approved by at least two faculty members in the department.

Teaching Internship—At least one teaching internship under the supervision of faculty members is undertaken at a time negotiated with the Graduate Director. Students receive academic credit for the required internship, which is a project of academic training and not of employment.

Qualifying Examination—To qualify for writing a dissertation, the student must pass a comprehensive examination in the chosen field and the area of specialization. The student must complete the second language requirement before taking the qualifying examination.

Dissertation—The dissertation contributes to the humanistic study of religion and is written under the direction of the candidate's dissertation adviser and at least two other members of the Academic Council. The University oral examination is a defense of the completed dissertation.

PH.D. MINOR IN RELIGIOUS STUDIES

Candidates for the Ph.D. in other departments may select a Ph.D. minor in Religious Studies. The minor requires at least 24 units in Religious Studies at the 200 level or above. Four of the 24 units should be in "Theories and Methods."

JOINT PH.D. IN RELIGIOUS STUDIES AND HUMANITIES

Religious Studies participates in the Graduate Program in Humanities leading to the joint Ph.D. in Religious Studies and Humanities, described in the "Interdisciplinary Studies in Humanities" section of this bulletin.

COURSES

INTRODUCTION TO THE HUMANITIES (IHUM)

The following Introduction to the Humanities courses are taught by Religious Studies department faculty members. IHUM courses are typically available only to freshmen seeking to fulfill GER:1 requirements; see the "Introduction to the Humanities" section of this bulletin for further information. Prospective majors in Religious Studies are advised to consider satisfying their GER:IHUM-2,3 requirements by registering for the following IHUM courses.

IHUM 68A. Approaching Religion—Two quarter sequence. Challenges facing the world's religions in responding to issues such as globalization, feminism, science, pluralism, and individualism. How Christianity, Islam, Hinduism, and Buddhism underwent transformations, grappling with the tension between making necessary changes and preserving tradition. Encounters between these religious traditions and the forces of contemporary social change. GER:IHUM-2,3

IHUM 68A: *4 units, Win (Sheehan, T; Bashir, S)*
IHUM 68B: *4 units, Spr (Hess, L; Bielefeldt, C)*

INTRODUCTORY

RELIGST 5N. Three Sacred Stories of Judaism, Christianity, and Islam—Stanford Introductory Seminar. Preference to freshmen. Interpretations of the scriptural narratives of Sarah and Hagar/Hajar, Jonah/Yunus and the great fish, and Mary/Maryam, the mother of Jesus/'Isa, by the rabbis, the first Christian theologians, and early commentators on the Qur'ân, and by artists in the three traditions. GER:DB-Hum, EC-GlobalCom

3-4 units, Aut (Gregg, R)

RELIGST 7N. The Divine Good: Secular Ethics and Its Discontents—Stanford Introductory Seminar. Preference to freshmen. What is the good and how does it orient human choice and activity? Is it natural to human beings, or in some way transcendent? How do people come to know it? Why do people often fail to do the good they know? What human capacities and dispositions enable its enactment or attainment? What resources does religion offer for its reparation? Classical and modern readings in moral theory emphasizing the difference that religious aspiration makes for moral reflection. GER:DB-Hum, EC-EthicReas

4 units, Win (Sockness, B)

RELIGST 8N. Francis of Assisi: An Exemplary Saint—Stanford Introductory Seminar. Preference to freshmen. The making of a new model of saint at a time of cultural change in the Middle Ages. What Francis as a paradigm of the model self reveals about the ethical and religious imagination, past and present. Texts include Francis' writings and primary documents that chronicle the founding of the Franciscan order. GER:DB-Hum

3 units, Aut (Gelber, H)

RELIGST 10C. A Global Focus on Current Affairs—Required of priority residents in Castano; open to others. May be repeated for credit. (AU)

1 unit, Spr (Gelber, H)

RELIGST 10L. Lantana Humanities Seminar—Required of focus residents in Lantana; open to other Lantana residents. May be repeated for credit. (AU)

1 unit, Aut, Win, Spr (Sockness, B; Pitkin, B)

RELIGST 11. Religious Classics of Asia: India's *Ramayana* Epic—The *Ramayana* as one of the most important religious and cultural texts of India. Its heroes, Rama and Sita, as incarnations of the supreme God and Goddess and models for ideal manhood and womanhood. Textual and performative versions including Valmiki's 2,000-year-old Sanskrit poem, medieval vernacular versions, rural women's folk songs, and the TV serial of 1988-89. *Ramayana* traditions through the lenses of religion, literature, performance, popular culture, gender, and politics. GER:DB-Hum, EC-GlobalCom

3 units, not given this year

RELIGST 12. Introduction to Hinduism—Historical study from earliest period to the present, including religious poetry, narrative, performance, concepts of self and liberation, yoga, ritual, God and gods, views of religion through history, region, class, caste, and gender. GER:DB-Hum, EC-GlobalCom

4 units, Win (Hess, L)

RELIGST 14. Introduction to Buddhism—From its beginnings to the 21st century. Principal teachings and practices, institutional and social forms, and artistic and iconographical expressions. GER:DB-Hum, EC-GlobalCom

4 units, Win (Harrison, P)

RELIGST 18. Introduction to Zen Buddhism—Classical Zen thought in China, and its background, origins, and development. GER:DB-Hum, EC-GlobalCom

4 units, not given this year

RELIGST 20. Introduction to the Zoroastrian Religion—The origins of Zoroastrianism, its role in the Iranian empires, and its relation to Judaism, Christianity, Manichaeism, and Islam, and its later forms and function in Iran, India, and its diaspora. The impact of the religion on European literati such as Voltaire, Mozart, the romantic poets, and Nietzsche. GER:DB-Hum

3 units, Win (Rose, J)

RELIGST 23. Introduction to Judaism—The historical development of Jewish religious thought and practice, from the biblical period to the present. Scriptural, liturgical, midrashic, legal, historical, and philosophical texts reflecting that development. The Sabbath, and annual festivals and sacred days. GER:DB-Hum

4 units, Aut (Radwin, A)

RELIGST 24. Introduction to Christianity—The historical development of Christian religious thought and practice from Jesus to the present. Emphasis is on the formation of Christianity's major teachings and their transformation and diverse expressions in the medieval, reformation, and modern periods. Readings focus on primary texts. GER:DB-Hum

4 units, Spr (Pitkin, B)

RELIGST 27. Introduction to Islam—Ideas, foundation texts, competing interpretive hegemonies, and historical compromises and syntheses that shaped and inform Islam. Readings from the Qur'ân, hadîth, and seminal theological texts in translation. GER:DB-Hum, EC-GlobalCom

4 units, not given this year

RELIGST 35. Introduction to Chinese Religions—(Formerly 55.) Confucianism, Daoism, Buddhism, and the interchange among these belief systems and institutions. Set against the background of Chinese history, society, and culture, with attention to elite and popular religious forms. GER:DB-Hum, EC-GlobalCom

4 units, Win (Pregadio, F)

RELIGST 46. Introduction to Daoism—(Formerly 56.) Historical survey from origins to the present. Main schools, notions, communal rites, and individual practices, and the relation of Daoism to facets of Chinese culture. GER:DB-Hum

4 units, not given this year

RELIGST 52. The Problem of God—(Formerly 32.) Monotheism is a belief for which people continue to live and die. Philosophical inquiry into the concept of God through its classic formulations, modern critics, and contemporary defenders. What has the idea of God meant to serious minds in the past? And in the modern or postmodern world? GER:DB-Hum

4 units, not given this year

RELIGST 54. The Roots of Right and Wrong in Christianity, Judaism, and Islam—What Christian, Jewish, and premodern Muslim thinkers have to say about these questions: what makes an act right or wrong; can a basis for right and wrong be identified independently of revealed religion; is observing commands and prohibitions sufficient to lead a life of virtue and refinement? Readings in primary texts. GER:DB-Hum

4 units, Win (Sadeki, B)

RELIGST 57. Millennium, Messiahs, and Mayhem—How the apocalypse has captured the imaginations and influenced the behaviors of many Jews and Christians who predict the end of the world during their lifetimes, whether facilitated by the arrival of a human or divine emissary, preceded by a cataclysm, or announced by a renunciation of normative morals. Examples include the Book of Revelations, the Dead Sea Scrolls, the Brotherhood of the Free Spirit, Shabtai Tzvi, Jacob Frank, the Mormons, and Chabad Chasidism.
4 units, Aut (Levinsky, D)

RELIGST 62. Philosophy of Religion—(Formerly 42.) Classic and modern questions through Western and Eastern traditions: the coherence of theism, relativism, verification and ethics of belief, and implications of science. Readings from traditional and modern texts. GER:DB-Hum
4 units, not given this year

RELIGST 82. Approaches to the Study of Religion: Christianity—Historical and contemporary Christianity from four viewpoints: ritual and prayer; sacred texts and creeds; ethics and life; and community governance. GER:DB-Hum
4 units, not given this year

RELIGST 84. Mystics, Pilgrims, Monks, and Scholars: Religious Devotion in Medieval Christianity—The variety and vitality of religious expression in medieval Christian Europe. How Christians sought God through mystical encounter, the structure of monastic life, visits to shrines, devotion to the saints, and the study of scripture and ancient Christian wisdom. Readings focus on primary texts. GER:DB-Hum
4 units, not given this year

UNDERGRADUATE LECTURES

RELIGST 101. Islamic Theology, 700-1300 C.E.—How did attitudes towards God's nature define and distinguish different theological movements in premodern Islam? Were theological differences due to different methods of interpreting the Qur'ân? God's power, free will versus predestination, the age of the Universe. Political and social contexts. Readings mostly in primary sources. GER:DB-Hum
3 units, Aut (Sadeki, B)

RELIGST 104. Views of the Human Body in Daoism—The human body as seen in Daoist traditions and related areas, particularly cosmology and medicine. Major sources including images and charts, and the views of the human being that they reflect. GER:DB-Hum
4 units, not given this year

RELIGST 107. Hindus and Muslims in South Asia—The history of Hindus and Muslims living together in S. Asia for over 1,000 years. Peace and conflict, composite cultures, and interdependent social worlds. Partition in 1947 and the creation of separate nations. Religion, arts, society, and politics. GER:DB-Hum, EC-GlobalCom
4 units, not given this year

RELIGST 112. Handmaids and Harlots: Biblical Women in Jewish and Christian Traditions—Miraculous births, wandering in the wilderness, encounters with angels: stories of Hagar, Sarah, Hannah, and Mary, and how their tales are read and re-told by later Jews and Christians. Sources include the Hebrew Bible and New Testament, Jewish and Christian commentary, and religious iconography. GER:DB-Hum, EC-Gender
4 units, not given this year

RELIGST 113A. Sacred Space and the Supernatural in Japanese Religion—Ties to place in Japanese religious history, legends, and religious practices. The role of Japan's mountains in the religious imagination.
4 units, Aut (Klonos, G)

RELIGST 114A. Sacred Journeys in Chinese Religion—Journey themes in Shamanic, Buddhist, Daoist, and popular Chinese religion from ancient to early modern period. Genres and traditions such as ancient shamanesses and their ecstatic trysts with nature deities, Daoist poets and their literary flights, and monks and their legendary westward journeys in search of Buddhist scripture.
4 units, Spr (Cook, T)

RELIGST 116. Daoist Thought, Daoist Religion—Main traditions and lineages of Daoism over its two and a half millennia of history. Sources include translated primary sources and secondary studies.
4 units, Spr (Pregadio, F)

RELIGST 118. Gandhi, King, and Nonviolence—(Same as HISTORY 105.) Lives, times, theory, and practice of Mohandas Gandhi and Martin Luther King, Jr.; their significance to issues of violence and nonviolence today.
4 units, Win (Carson, C; Hess, L)

RELIGST 124. Sufi Islam—The complex of Islamic intellectual and social perspectives subsumed under the term Sufism. Sufi mystical philosophies and historical and social evolution. Major examples include: Qushayrî, Râbi'a, Junayd, Hallâj, Sulamî, Ibn al-'Arabî, Rûmî, Nizâm al-Dîn Awliyâ'. Social and political roles of Sufi saints and communities. Readings include original prose and poetry in translation, secondary discussions, and ethnography.
4 units, Aut (Bashir, S)

RELIGST 126. Protestant Reformation—16th-century evangelical reformers (Luther, Calvin) and reform movements (Lutheran, Reformed, Anabaptist) in their medieval context. GER:DB-Hum
4 units, not given this year

RELIGST 129. Modern Jewish Thought—From the early Enlightenment to the present. Universalism, subjectivity, and redemption within Judaism's encounter with modernity as reflected on by Jewish intellectuals within the Western philosophical tradition; how modern Jewish intellectuals have shaped and been shaped by current debates. Challenges to religious identity by secularism, capitalism, and the nation state. Messianism, mysticism, reactionary romanticism, critical theory, post-Holocaust philosophy, spirituality, and feminism. Thinkers include Spinoza, Marx, Freud, Buber, Strauss, the Frankfurt school, Benjamin, Arendt, and Levinas.
4 units, Spr (Lerner, A)

RELIGST 132. Jesus the Christ—How did Jesus of Nazareth, who never claimed to be Christ or divine, become the son of God after his death? Sources include the history of first-century Judaism and Christianity. GER:DB-Hum
4 units, Win (Sheehan, T)

RELIGST 133. Inventing Christianity in Late Antiquity—The transformation of an apocalyptic sect into an imperial religion from 200 to 600 C.E. Shifts in structures of authority, worship, and belief mapped against shifts in politics, economics and religion in the larger Roman empire. Cultural visions of this history including Edward Gibbon's *Decline and Fall of the Roman Empire*, Dan Brown's conspiracy theory in *The Da Vinci Code*, and Elaine Pagels' *The Secret Gospel of Thomas*. GER:DB-Hum
4 units, Spr (Lyman, R)

RELIGST 135. Daoist Ideals of Sainthood—Differing representations of the ideal of sainthood in Daoist texts from different backgrounds. Views of the Dao and application to self-cultivation, ethics, and government. GER:DB-Hum
4 units, Win (Pregadio, F)

RELIGST 136. Buddhist Yoga—Buddhist models of spiritual practice emphasizing issues in the interpretation of the contemplative path. GER:DB-Hum, EC-GlobalCom
4 units, Win (Bielefeldt, C)

RELIGST 140. Crusades: Interdisciplinary Approaches—(Same as ENGLISH 103, HISTORY 215, MEDVLST 165.) Causes, meanings, meaningfulness, and commemoration of the Christian expeditions against Muslims, pagans, and heretics. Primary and secondary sources.
3-5 units, Spr (Buc, P; Summit, J; Gelber, H)

RELIGST 144. John Calvin and Christian Faith—Close reading and analysis of Calvin's *Institutes of the Christian Religion* as a classic expression of Christian belief. GER:DB-Hum
4 units, Aut (Pitkin, B)

RELIGST 148. From Jesus to Paul—Jesus considered himself God's definitive prophet, but he did not think he was God, and had no intention of founding a new religion. How did this Jewish prophet become the gentile God and the founder of Christianity? The role of Paul. GER:DB-Hum
4 units, not given this year

RELIGST 151/251. Indian Devotional Poetry—(Graduate students register for 251.) Poetry is a major vehicle of religious expression and understanding in India, but it is also music, performance, social experience. Lyric poetry devoted to Shiva, Krishna, Kali, and the God said to be beyond names and forms. Oral and written transmission, folklore, and performance theory. The transformations that occur when religious literature becomes song. GER:DB-Hum
4 units, Spr (Hess, L)

RELIGST 154. Buddhism Today: Responses to New Global Challenges—How do the traditions of Buddhism cope with new social, ethical, and global challenges? Case studies from Sri Lanka, Japan, and the West. The historical position of Buddhist social thought. Buddhism's ascetic and meditative legacy: friend or foe of social engagement? GER:DB-Hum, EC-GlobalCom
4 units, not given this year

RELIGST 156. Goddesses and Gender in Hinduism—India's tradition of worshiping female forms of the divine, including Kali, Durga, Lakshmi, Saraswati, Radha, Sita, and local deities. The stories, histories, iconographies, theologies, arts, and practices associated with these goddesses. How the worship of goddesses impacts the lives of women. Readings include *Is the Goddess a Feminist?* GER:DB-Hum, EC-Gender
4 units, not given this year

RELIGST 159. Music and Religion in South Asia—Music and religion have been closely related for millennia in the India subcontinent. Topics include theories of sound, mantra, music as yoga, guru-disciple relationship, devotional singing, gods and their relation to music, aesthetic theory, classical and folk forms, and Hindu and Muslim traditions. Practical instruction in music. GER:DB-Hum, EC-GlobalCom
4-5 units, not given this year

RELIGST 164. Ritual Musics of the World—(Same as CASA 164.) The roles of music in human ritual life. Psychological and physical effects of music in healing and trance-inducing rituals; its power to create and affirm communities and other affective ties; and its effectiveness as a medium for spiritual knowledge. What can be learned about people, places, and cultures through sound; how does music express and shape social identity and culture; how are belief systems and patterns of social interaction encoded and made manifest in musical practices? GER:DB-Hum, EC-GlobalCom
4 units, Aut (Diehl, K)

RELIGST 167. Medieval Religious Philosophy—(Same as PHIL 101.) Focus is on God, world, and words. A pervasive assumption about the structure of the world, that it reflected the categories of God's mind and emerged from an act of divine speech, gave impetus to the interest in the nature of language and its relation to the world. Scripture served as one kind of divine communication to human beings, and *The Book of the World* as another. The problem of universals, the question of how words relate to God, epistemology, theories of reference, and semiotics. Readings from Augustine, Anselm, Aquinas, Scotus, and Ockham. GER:DB-Hum
4 units, not given this year

RELIGST 172. Sex, Body, and Gender in Medieval Religion—Anxiety about sex and the body increased markedly during the early years of Christianity, while the doctrine of the Incarnation put the human body at the center of religious concern. Ideals of virginity, chastity, ascetic self-denial of necessities like food, sleep, and freedom from pain were central to lay and clerical piety. The religious theory and practice associated with questions about sex, body, and gender in the Middle Ages as constructed in literature, mythology, ritual, mystic, and monastic texts. GER:DB-Hum, EC-Gender
4 units, not given this year

UNDERGRADUATE DIRECTED READING

RELIGST 199. Individual Work—Prerequisite: consent of instructor and department. May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

UNDERGRADUATE SEMINARS

RELIGST 201/301. Classical Islamic Law—(Graduate students register for 301; same as LAW 586.) Emphasis is on methods of textual interpretation. History of premodern Islamic law, including origins, formation of schools of law, and social and political contexts.
4-5 units, Win (Sadeki, B)

RELIGST 210. Translating the *Daode Jing*—One of the most frequently translated works in world literature. Challenges faced by translators, support from commentaries and related sources, and assumptions underlying translations into Western languages. Recommended: classical Chinese. GER:DB-Hum
4 units, not given this year

RELIGST 212. *Chuang Tzu*—The *Chuang Tzu (Zhuangzi)* in its original setting and as understood by its spiritual progeny. Limited enrollment. GER:DB-Hum
5 units, Win (Yearley, L)

RELIGST 216. Japanese Buddhism—Recent scholarship.
4 units, Spr (Bielefeldt, C)

RELIGST 217/317. Japanese Studies of Religion in China—(Graduate students register for 317.) Readings in Japanese secondary sources on Chinese religions.
3 units, Aut (Kumada, N)

RELIGST 217A. Tibetan Ritual Life—(Same as CASA 127.) The human life cycle, the calendar year, and pilgrimage as organizing principles to examine Tibetan Buddhist and lay rituals that mark important occasions, bless people and places, ward off danger, heal wounds, alleviate suffering, predict the future, affirm Tibetan identity, and inspire political activism. Material culture and performative aspects of Tibetan rituals, the meanings of these rituals to those who participate in them, and the role of ritual in human culture. GER:DB-Hum, EC-GlobalCom
5 units, Win (Diehl, K)

RELIGST 222. Literature and Society in Medieval Islam—The development of literary traditions, 600-1500. Major poetic and prose topoi through examples from Arabic, Persian, and Turkish literature in translation. Literature's place in Islamic societies and biographies of significant authors. The religious value of literary forms. Literary canons as unifying agents in different parts of the medieval Muslim world. Comparison between high and folk literatures. The role of aesthetic paradigms in the formation of Islamic religious and cultural identities.
4 units, Aut (Bashir, S)

RELIGST 223. Studying Islam: History, Methods, Debates—Islam as a subject of academic inquiry since the 19th century. Origins and critiques of major methodological perspectives in Islamic studies such as philology, religious studies, history, art history, and anthropology. Landmarks in the development of the field and the work of major scholars. Academic debates regarding unity versus diversity, orientalism, fundamentalism and Islamism, Sufism, and gender. Current trends in scholarship on medieval and modern Muslim societies. Prerequisite: course work in Islamic studies or methodology in religious studies.
4 units, Win (Bashir, S)

RELIGST 226/326. Philosophy and Kabbalah in Jewish Society: Middle Ages and Early Modern Period—(Graduate students register for 326.) Characteristics of religious philosophy from Saadia Gaon to Maimonides, Jewish opposition to and support of philosophy in the medieval Christian and Muslim world, texts from the early development of Kabbalah, the relationship between philosophy and Kabbalah, and conflicting views of Kabbalah from the 16th through 18th centuries.
5 units, Win (Malkiel, D)

RELIGST 227/327. The Qur'ân—(Graduate students register for 327.) Early history, themes, structure, chronology, and premodern interpretation. Relative chronology of passages.

5 units, Aut (Sadeki, B)

RELIGST 237. Jewish and Christian Rome, 1st to 6th Centuries—To what extent are Judaism and Christianity products of the Roman Empire, and shaped by its politics? Literature concerning Jewish and Christian perceptions of power, and archaeological and artistic traces of both religions in the imperial city of Rome. What roles did strategies of resistance and accommodation play in the formation of these religious communities' emerging identities? Possible optional field trip to Rome over Spring break. GER:DB-Hum

5 units, Win (Gregg, R; Fonrobert, C)

RELIGST 238. Christian Neo-Platonism, East and West—Christianity's shift to neo-Platonic Greek philosophical categories and its significance for contemporary spirituality. Readings from Plotinus, Proclus, Greek fathers such as Pseudo-Dionysus, and from Ambrose and Augustine.

4 units, Spr (Sheehan, T)

RELIGST 245. Religion, Reason, and Romanticism—(Same as HUMNTIES 196B.) The late 18th-century European cultural shift from rationalist to romantic modes of thought and sensibility. Debates about religion as catalysts for the new Zeitgeist. Readings include: the Jewish metaphysician, Mendelssohn; the dramatist, Lessing; the philosopher of language and history, Herder; the critical idealist, Kant; and the transcendental idealist, Fichte. GER:DB-Hum

5 units, Aut (Sockness, B)

RELIGST 247. Chinese Buddhist Texts—From the first millennium C.E., including sutra translations, prefaces, colophons, and biographies. Prerequisite: reading competence in Chinese.

4 units, Spr (Harrison, P)

RELIGST 250. Classics of Indian Buddhism—Texts in English translation including discourses (sutras), philosophical treatises, commentaries, didactic epistles, hymns, biographies, and narratives.

4 units, Spr (Harrison, P)

RELIGST 251/351. Readings in Indian Buddhist Texts—(Graduate students register for 351.) Introduction to Buddhist literature through reading original texts in Sanskrit. Prerequisite: Sanskrit.

1-5 units, not given this year

RELIGST 254. Recent Contributions to Buddhist Studies—May be repeated for credit.

4 units, Win (Harrison, P)

RELIGST 257/357. Readings in Daoist Texts—Readings from primary sources. Prerequisite: classical Chinese.

4 units, Spr (Pregadio, F)

RELIGST 258. Japanese Buddhist Texts—Readings in medieval Japanese Buddhist materials. May be repeated for credit. Prerequisite: background in Japanese or Chinese.

4 units, Win (Bielefeldt, C)

RELIGST 263. Judaism and the Body—Representations and discourses of the body in Jewish culture; theories of body and ritual. Case studies of circumcision, menstrual impurity, and intersexuality. Readings include classical texts in Jewish tradition and current discussions of these textual traditions. GER:DB-Hum, EC-Gender

4 units, not given this year

RELIGST 271A,B. Dante's Spiritual Vision—Mysticism, poetry, ethics, and theology in Dante's *Divine Comedy*. Supplementary readings from classical authors such as St. Augustine and St. Thomas, and from modern writers. Students may take 271A without B. GER:DB-Hum

4-5 units, not given this year

RELIGST 274/374. From Kant to Kierkegaard—(Graduate students register for 374.) The main currents of religious thought in Germany from Kant's critical philosophy to Kierkegaard's revolt against Hegelianism. Emphasis is on the theories of religion, the epistemological status of religious discourse, the role of history (especially the figure of Jesus), and the problem of alienation/reconciliation in seminal modern thinkers: Kant, Schleiermacher, Hegel, and Kierkegaard. GER:DB-Hum

3-5 units, not given this year

RELIGST 275/375. Kierkegaard and Religious Existentialism—(Graduate students register for 375.) Close reading of Kierkegaard's magnum opus, *Concluding Unscientific Postscript to Philosophical Fragments*, in its early 19th-century context. GER:DB-Hum

3-5 units, not given this year

RELIGST 278/378. God, the Self, and Heidegger—(Graduate students register for 378.) What would it mean to own one's own life without appeal to the supernatural? The death of God in 19th-century thought; the discovery of the existential self in Heidegger's philosophy; and his method for coming to grips with one's life. Prerequisite: consent of instructor. GER:DB-Hum

4 units, not given this year

RELIGST 279/379. Heidegger and the Holy—(Graduate students register for 379.) Heidegger's philosophy as opening a new door onto the possibility of experiencing the sacred after the collapse of traditional metaphysical theology. A close reading of *Being and Time* as an introduction to the question of the holy.

4 units, not given this year

RELIGST 280/380. Schleiermacher—(Graduate students register for 380.) Idealist philosopher, Moravian pietist, early German Romantic, cofounder of the University of Berlin, head preacher at Trinity Church, translator of Plato's works, Hegel's opponent, pioneer in modern hermeneutics, father of modern theology. Schleiermacher's controversial reconception of religion and theology in its philosophical context.

3-5 units, Spr (Sockness, B)

RELIGST 290. Majors Seminar—Theories of religion versus religions themselves: attempts to define the phenomenon of religion in anthropology, psychology, sociology, and cultural studies, such as Sigmund Freud, Karl Marx, Emile Durkheim, Mircea Eliade, Max Weber, and Clifford Geertz; critical perspectives on the study of religion, such as gender and postcolonialism. WIM

4 units, Win (Gelber, H)

RELIGST 297. Senior Essay/Honors Essay Research—Guided by faculty adviser. May be repeated for credit. Prerequisite: consent of instructor and department.

3-5 units, Aut, Win, Spr (Staff)

RELIGST 298. Senior Colloquium—For Religious Studies majors writing the senior essay or honors thesis. Students present work in progress, and read and respond to others. Approaches to research and writing in the humanities.

5 units, Spr (Pitkin, B)

GRADUATE SEMINARS, RESEARCH, AND TEACHING

RELIGST 304A,B. Theories and Methods—Required of graduate students in Religious Studies. Approaches to the study of religion. Prerequisite: consent of instructor.

4 units, **A:** *Aut (Yearley, L),* **B:** *alternate years, not given this year*

RELIGST 308. Medieval Japanese Buddhism—Japanese religion and culture, including Buddhism, Shinto, popular religion, and new religions, through the medium of film.

3-5 units, not given this year

RELIGST 312. Buddhist Studies Proseminar—Research methods and materials for the study of Buddhism. May be repeated for credit. Prerequisite: reading knowledge of Chinese or Japanese.
1-5 units, not given this year

RELIGST 321. The Talmud—Strategies of interpretation, debate, and law making. Historical contexts. Prerequisite: Hebrew.
4 units, Spr (Fonrobert, C)

RELIGST 350. Modern Western Religious Thought Proseminar—Research methods and materials. May be repeated for credit.
1-5 units, Aut (Sheehan, T)

RELIGST 370. Comparative Religious Ethics—The difference that the word religious makes in religious ethics and how it affects issues of genre. Theoretical analyses with examples from W. and E. Asia. Prerequisite: consent of instructor.
4 units, Win (Yearley, L)

RELIGST 389. Individual Work for Graduate Students—May be repeated for credit. Prerequisite: consent of instructor.
1-15 units, Aut, Win, Spr, Sum (Staff)

RELIGST 390. Teaching in Religious Studies—Required supervised internship for PhDs.
4 units, Aut, Win, Spr (Staff)

RELIGST 391. Pedagogy—Required of Ph.D. students. May be repeated for credit.
1 unit, Aut (Peskin, J)

RELIGST 392. Candidacy Essay—Prerequisite: consent of graduate director. May be repeated for credit.
1-15 units, Aut, Win, Spr (Staff)

RELIGST 395. Master of Arts Thesis
2-9 units, Aut, Win, Spr (Staff)

RELIGST 399. Recent Works in Religious Studies—Readings in secondary literature for Religious Studies doctoral students. May be repeated for credit.
1-2 units, Spr (Sockness, B)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CLASSGEN 18. Greek Mythology
3-5 units, Win (Martin, R; Jones, E)

ENGLISH 301B. Medieval Devotion
5 units, Aut (Summit, J)

POLISCI 149S. Islam and the West
5 units, Spr (Milani, A)

CENTER FOR RUSSIAN, EAST EUROPEAN AND EURASIAN STUDIES

Emeriti: Terence L. Emmons, Joseph N. Frank, Alex Inkeles, Joseph Van Campen, Henry Rowen
Director: Gabriella Safran (Slavic Languages and Literatures)
Academic Coordinator: Jack Kollmann
Professors: Lazar Fleishman (Slavic Languages and Literatures), Gregory D. Freidin (Slavic Languages and Literatures), David J. Holloway (History, Political Science), Nancy S. Kollmann (History), David Laitin (Political Science), Norman Naimark (History), Aron Rodrigue (History), Richard Schupbach (Slavic Languages and Literatures), Nancy B. Tuma (Sociology), Steven J. Zipperstein (History)
Associate Professors: Maria Gough (Art History), Monika Greenleaf (Slavic Languages and Literatures), Michael A. McFaul (Political Science), Gabriella Safran (Slavic Languages and Literatures), Amir Weiner (History)
Assistant Professors: Robert Crews (History), Pavle Levi (Film Studies), Bissera Pentcheva (Art History)
Senior Lecturers: Rima Greenhill (Slavic Languages and Literatures), Katherine Jolluck (History), Geoffrey Rothwell (Economics)
Lecturers: John Dunlop (International Policy Studies), Eugenia Khassina (Slavic Languages and Literatures), Alma Kunanbaeva (Anthropology), Marina Marcos (Slavic Languages and Literatures), Kathryn Stoner-Weiss (Political Science), Monica White (Slavic Languages and Literatures)
Courtesy Professors: Coit Blacker (Political Science)
Visiting Professor: Izaly Zemtsovsky (Music)
Acting Assistant Professor: Jovana Knezevic (History)
Affiliates: Michael B. Bernstam (Hoover Institution), Robert Conquest (Hoover Institution), John B. Dunlop (Hoover Institution), Bertrand Patenaude (Hoover Institution), Karen Rondestvedt (Stanford Libraries), Anatol Shmelev (Hoover Institution), Maciej Siekierski (Hoover Institution), Wojciech Zalewski (Stanford Libraries)

Center Offices: Encina West, Rm. 217
Mail Code: 94305-6045
Phone: (650) 723-3562
Web Site: http://CREEES.stanford.edu

Courses given by the Center for Russian, East European and Eurasian Studies have the subject code REES. For a complete list of subject codes, see Appendix.

The Center for Russian, East European and Eurasian Studies (CREEES) coordinates the University's teaching, research, and extracurricular activities related to the former Soviet Union and Eastern Europe, and administers two interdisciplinary academic programs: an undergraduate minor and an M.A. graduate degree program. Information on center programs and activities is available at http://CREEES.stanford.edu. CREEES and its degree programs are directed by the CREEES Steering Committee, composed of faculty members associated with the Center. The programs draw on the strengths of nationally recognized area faculty and research affiliates and significant library and archival collections at Stanford. The Center is a U.S. Department of Education Title VI National Resource Center for Russia and East Europe.

UNDERGRADUATE PROGRAMS

MINOR

The minor in Russian, East European and Eurasian Studies (REEES) is an interdisciplinary area studies program that allows the participating student significant opportunity to select REEES courses in various departments according to his or her interests.

REQUIREMENTS

1. Two core courses: one on Russia and one on Eastern Europe or Eurasia, to be chosen by the student from an annual list of qualifying courses issued by CREEES.
2. At least four additional REEES courses, totaling at least 20 units.
3. The student's courses, core and additional, must be distributed among at least three departments. In addition to REEES courses in the departments of History, Political Science, and Slavic Languages and Literatures, REEES courses in departments such as Anthropology, Economics, and Sociology, when offered, may qualify. The CREEES academic coordinator determines which courses qualify for the minor.
4. A capstone experience in REEES, including, but not limited to, one of the following:
   a) a departmental seminar course for advanced undergraduates
   b) directed reading and research with a Stanford faculty member or a CREEES-approved resident or visiting scholar
   c) participation in the Stanford Overseas Studies Program in Moscow.

Foreign Language—The REEES minor has no language requirement, but students are strongly encouraged to attain working competence in Russian or another relevant language. Courses at the third-year level or above in Russian or another language of the former Soviet Union or Eastern Europe (excluding German) may be counted towards the REEES minor, up to a maximum of 3 units per academic quarter, 9 units total.

Additional Information—The total number of courses applied to the REEES minor must be at least six, but the minor should total no more than 36 units. Courses counting towards the REEES minor may not be counted towards the student's major. Courses taken at Stanford overseas campuses (particularly the Moscow campus) may count towards the REEES minor, with the approval in each case of the CREEES academic coordinator; at least three courses for the minor must be taken in residence at Stanford.

Approval of CREEES Academic Coordinator—Students interested in pursuing the REEES minor should consult the CREEES academic coordinator. The minor is declared online using the Axess system. Students declaring the REEES minor must do so no later than three quarters prior to their intended quarter of degree conferral. Approval of minor declarations and certification of requirements are made by the academic coordinator.

Students pursuing the REEES minor work with the CREEES academic coordinator, who is responsible for determining that requirements for the minor are satisfied.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

To qualify for a coterminal M.A. degree in Russian, East European and Eurasian Studies, besides completing University requirements for the B.A. degree, a student must:

1. Submit a coterminal application for admission to the program no later than the quarter prior to the expected completion of the undergraduate degree, normally the Winter Quarter prior to Spring Quarter graduation. Students with advanced placement and transfer credit must apply at least four quarters before the expected master's degree conferral date. Applications and instructions may be obtained at http://registrar.stanford.edu/shared/publications.htm#Coterm. The deadline for all coterminal applications to the M.A. program in Russian, East European, and Eurasian Studies is January 8, 2008.
2. Include in the application a program which outlines, by quarter, the schedule of courses the student plans to complete toward the M.A. degree. The student should seek the advice of the CREEES academic coordinator in drafting this schedule. The application also should include: (a) a current Stanford transcript; (b) a one-page statement of purpose; and (c) two letters of recommendation from Stanford professors. Applicants must have a grade point average (GPA) of at least 3.0 (B). Coterminal applicants must take the general test of the Graduate Record Examination and have the results sent to Graduate Admissions, Office of the University Registrar.
3. Complete 15 full-time quarters or the equivalent, or three quarters in full-time residence after completing 180 units; and complete, in addition to the 180 units required for the bachelor's degree, a minimum of 48 units for the master's degree.

The same courses may not be counted to meet both undergraduate and graduate requirements, and no courses taken before the junior year may be used to meet the course requirements for the master's degree. Requirements for completion of the M.A. degree are summarized below; a more detailed description of the program and requirements is available from the center.

SLAVIC THEME HOUSE

Slavianskii Dom, at 650 Mayfield Avenue, is an undergraduate residence which houses 50 students and offers a wide variety of opportunities to expand knowledge, understanding, and appreciation of Russia, the former Soviet Union, and Eastern Europe.

OVERSEAS STUDIES PROGRAMS

Undergraduate students interested in the study of languages, history, culture and social organization of the countries of Russia, Eurasia, and Eastern Europe can apply to study at the Stanford centers in Moscow and Berlin. Participation in these programs is encouraged and easily integrated into the REEES minor. Information about these programs is available at http://osp.stanford.edu.

GRADUATE PROGRAMS

MASTER OF ARTS

CREEES offers a one-year intensive interdisciplinary master's degree program in Russian, East European and Eurasian Studies for students with a strong prior language and area studies background. The program structure allows students the flexibility to pursue their particular academic interests, while providing intellectual cohesion through a required core curriculum that addresses historical and contemporary processes of change in the former Soviet Union and Eastern Europe. This core curriculum consists of three core courses and REES 200, Core Seminar Series. The program may be taken separately or coterminally with a B.A. degree program. The interdisciplinary M.A. program typically serves three types of students:

1. Those who intend to pursue careers and/or advanced degrees in such fields as business, education, government, journalism, or law, and who wish to establish competence in Russian, East European and Eurasian studies.
2. Those who intend to apply to a Ph.D. program involving Russian, East European and Eurasian studies and who need to enhance their academic skills and credentials.
3. Those who are as yet undecided on a career but who wish to continue an interest in Russian, East European and Eurasian studies.

ADVISING

The advising structure is two-tiered: each M.A. candidate works with the CREEES academic coordinator who advises on the program of course work and monitors the student's progress toward completing the degree. Candidates are also assigned a faculty adviser from the Academic Council faculty, who provides intellectual and academic guidance.

ADMISSION

Applicants are encouraged to apply electronically; see http://gradadmissions.stanford.edu/ for a link to the electronic application and general information regarding graduate admission. In addition, prospective applicants are strongly encouraged to consult with the academic coordinator at CREEES regarding the application process.

To qualify for admission to the program, the following apply:

1. Applicants must have earned a B.A. or B.S. degree, or the equivalent.
2. Applicants must have completed at least three years of college-level Russian language study or the equivalent prior to beginning the program. Other languages of Eastern Europe or the former Soviet Union may be accepted on a case-by-case basis.

3. Applicants whose native language is not English are ordinarily expected to take the Test of English as a Foreign Language (TOEFL) and have the results sent to Graduate Admissions, Office of the University Registrar.
4. All applicants must take the General Test of the Graduate Record Examination and have the results sent to Graduate Admissions, Office of the University Registrar.

The deadline for submission of applications for admission and for financial aid is January 8, 2008. Admission is normally granted for Autumn Quarter, but requests for exceptions are considered.

The successful applicant generally demonstrates the following strengths: requisite foreign language study, significant course work in Russian, East European and Eurasian studies in multiple disciplines, outstanding grades in previous academic work, high GRE scores (particularly verbal and analytical writing), study or work experience in the region, strong letters of recommendation, and a persuasive statement of purpose explaining why and how the program fits the applicant's academic and career goals.

DEGREE REQUIREMENTS

Candidates for the M.A. degree must meet University requirements for an M.A. degree as described in the "Graduate Degrees" section of this bulletin.

The M.A. program in REEES can ordinarily be completed in one academic year by a well-prepared student; longer periods of study are permitted.

Requirements to complete the interdisciplinary M.A. degree are principally ones of distribution, with the exception of three required core courses and a core seminar, as described below. Each student, with the advice of the CREEES academic coordinator, selects courses according to the student's interests, needs, and goals.

All students in the M.A. REEES program must complete a minimum of 48 academic credit units within the following guidelines.

1. *Core courses:* students must complete three, one quarter core courses. Each year, four to six courses, typically from the History, Political Science, and Slavic Languages and Literatures departments, are designated as M.A. core courses; students may select three of these to meet the core course requirement. Courses selected as core courses examine subject areas of fundamental importance within modern Russian, East European and Eurasian Studies, and address questions of research, methodology, and current scholarship.
2. *Core seminar:* 200, Current Issues in Russian, East European and Eurasian Studies, is required of all students in the M.A. program for a total of three academic quarters. The goal of this course is to survey current methodological and substantive issues in Russian, East European and Eurasian studies, acquaint students with Stanford resources and faculty, and present professional development and career options.
3. *Interdisciplinary course work:* a minimum of five graduate courses in Russian, East European and Eurasian studies must be completed and distributed among at least three departments. All course work applied to the 48-unit minimum must deal primarily with Russian, Eurasian, or East European studies.
4. *Language study*: students in the program are expected to study Russian or another language of the former Soviet Union or Eastern Europe. Credit towards the 48-unit minimum (maximum 3 units per quarter, 9 units total) is allowed for advanced language work; in the case of Russian, "advanced" is defined as third-year Russian language instruction and above. Similar standards apply for other languages.
5. All course work qualifying for the 48-unit minimum (except REES 200) must have a letter grade of 'B' or higher. ('B-' does not count for degree credit, nor does 'S' or 'CR'.)
6. All courses counting towards the 48-unit minimum must be approved by the CREEES academic coordinator, who ensures that planned course work satisfies requirements towards the degree. The CREEES director and steering committee determine the requirements.

A description of the M.A. program is also available on the web at http://CREEES.stanford.edu/GraduatePrograms.html and by request from the Center for Russian, East European and Eurasian Studies.

FINANCIAL AID

Subject to funding, CREEES may have a limited number of Foreign Language and Area Studies (FLAS) fellowships for U.S. citizens or permanent residents. Additional financial aid may also be available from CREEES. Applicants in the M.A. program have priority in the annual FLAS competition; in recent years CREEES has also awarded FLAS fellowships in the Graduate School of Business, the School of Medicine, and the School of Law. Consult the CREEES academic coordinator for further information about the application and award process. Applications for FLAS fellowships can be obtained at http://CREEES.st anford.edu/FellowshipsGrants.html.

DOCTORAL PROGRAMS

Since the University does not offer a Ph.D. in Russian, East European and Eurasian Studies, students wishing to pursue a REEES-related doctoral program must apply to one of the departments offering a Ph.D. with an emphasis on Russia, Eurasia, or Eastern Europe, such as the departments of History, Political Science, or Slavic Languages and Literatures.

COURSES

REES 200. Current Issues in Russian, East European, and Eurasian Studies—Enrollment limited to REEES students. Scholars present analyses of methodologies, challenges, and current issues in the study of Russia, E. Europe, and Eurasia.
1 unit, Aut (Safran, G; Kollmann, J), Win, Spr (Dunlop, J; Kollmann, J)

REES 299. Directed Reading
1-12 units, Aut, Win, Spr (Staff)

COGNATE COURSES

The following courses deal at least in part with Russia, the former Soviet Union, or Eastern Europe. See the respective department listings for course descriptions. Additional relevant courses by resident or visiting faculty may be offered; for updated information, consult the quarterly *Time Schedule* or contact the Center for Russian, East European and Eurasian Studies. Students in the area studies M.A. program must have their course list approved each quarter by the academic coordinator prior to enrollment. For relevant language courses, see the "Language Center" section of this bulletin.

ARTHIST 446. The Russian and Soviet Avant Garde
5 units, Aut (Gough, M)

CASA 114/214. Minaret and Mahallah: Women, Music, and Islam in Central Eurasia
5 units, Spr (Kunanbaeva, A)

CASA 173/273. Nomads of Eurasia: Culture in Transition
4-5 units, Win (Kunanbaeva, A)

FILMSTUD 131/331. Politics and Aesthetics in East European Cinema
4 units, Aut (Levi, P)

HISTORY 23S. Living and Killing in the Ethnic Borderlands: Eastern Europe, 1914-48
5 units, Aut (Ward, K)

HISTORY 62N. The Atomic Bomb in Policy and History
5 units, Spr (Bernstein, B)

HISTORY 103E. History of Nuclear Weapons—(Same as POLISCI 116.)
5 units, Spr (Holloway, D)

HISTORY 123. Reform and Revolution in Modern Russia, 1856-2008
5 units, Spr (Patenaude, B)

HISTORY 125. 20th-Century Eastern Europe
5 units, Win (Jolluck, K)

HISTORY 137/337. The Holocaust
4-5 units, Spr (Felstiner, M)

HISTORY 204E/307E. Origins of Totalitarianism
4-5 units, Aut (Weiner, A)

HISTORY 221B. The Woman Question in Modern Russia
5 units, Aut (Jolluck, K)

HISTORY 221D/321D. Women's Activism in War and Peace
4-5 units, Spr (Jolluck, K)

HISTORY 226E. The Creation and Destruction of Yugoslavia
5 units, Aut (Knezevic, J)

HISTORY 226G/326G. Civilians and War in Modern Europe
4-5 units, Spr (Knezevic, J)

HISTORY 226H/326H. Nationalism in the Habsburg Empire, 1848-1918
4-5 units, Win (Knezevic, J)

HISTORY 227A/327A. The History of Genocide
4-5 units, Win (Naimark, N)

HISTORY 229/329. Poles and Jews
4-5 units, Win (Jolluck, K)

HISTORY 252/355. Decision Making in International Crises: The A-Bomb, the Korean War, and the Cuban Missile Crisis
4-5 units, Aut (Bernstein, B)

HISTORY 299X/399A. Design and Methodology for International Field Research
1 unit, Spr (Kollmann, N; Roberts, R)

HISTORY 424A. The Soviet Civilization
4-5 units, Win (Weiner, A)

HISTORY 424B. The Soviet Civilization
4-5 units, Spr (Weiner, A)

INTNLREL 114D. Democracy, Development, and the Rule of Law—(Same as IPS 230, POLISCI 114D/314D.)
5 units, Aut (Stoner-Weiss, K; McFaul, M)

INTNLREL 141A. Camera as Witness: International Human Rights Documentaries
5 units, Aut (Bojic, J)

INTNLREL 166. Russia and Islam
5 units, Win (Dunlop, J)

MS&E 193/193W/293. Technology and National Security
3 units, Aut (Perry, W; Hecker, S)

MUSIC 9A. Tchaikovsky, Stravinsky, Shostakovich, and Beyond: A History of Russian Music
3 units, Win (Zemtsovsky, I)

POLISCI 114S. International Security in a Changing World
5 units, Win (Sagan, S; Blacker, C)

POLISCI 314S. Decision Making in U.S. Foreign Policy—(Same as IPS 314S.)
5 units, Spr (Blacker, C)

POLISCI 318R. State and Nation Building in Central Asia
5 units, Spr (Lapidus, G)

POLISCI 340S. Political Economy of Post-Communism
5 units, Spr (McFaul, M.)

SLAVGEN 13N. Russia and the Russian Experience
3-4 units, Win (Schupbach, R)

SLAVGEN 77Q. Russia's Weird Classic: Nikolai Gogol
3-4 units, Aut (Fleishman, L)

SLAVGEN 110/210. The Gogol Bordello: Ukraine as a Meeting House of Cultures
3-5 units, Spr (Labov, J)

SLAVGEN 125/225. Martyrs, Monks, and Missionaries: An Introduction to Orthodox Sainthood
3-4 units, Aut (White, M)

SLAVGEN 145/245. Age of Experiment: From Pushkin to Gogol
3-4 units, Aut (Fleishman, L)

SLAVGEN 146/246. The Great Russian Novel: History and Transgression in Tolstoy and Dostoevsky
3-4 units, Win (Greenleaf, M)

SLAVGEN 148/248. The Age of Dissent: A Survey of Russian Literature and Culture, 1953 to the Present
4-5 units, Spr (Freidin, G)

SLAVGEN 150/250. Countercultures in Conversation: Russian and American Rock Music and Protest Poetry
3-4 units, Aut (Fleishman, E)

SLAVGEN 151/251. Dostoevsky and His Times—(Same as COMPLIT 119/219.)
4 units, Win (Frank, J)

SLAVGEN 169/269. Mermaids, the Firebird, and the Singing Tree: Russian Folklore and Its Theory
3-5 units, Spr (Zemtsovsky, I)

SLAVLIT 184/284. The History of the Russian Literary Language
4-5 units, Win (Schupbach, R)

SLAVLIT 188/288. From Alexander Blok to Joseph Brodsky: Russian Poetry of the 20th Century
3-4 units, Win (Fleishman, L)

SLAVLIT 200. Proseminar in Literary Theory and Study of Russian Literature
4 units, Aut (Freidin, G)

SLAVLIT 200A. Introduction to Library and Archival Research in Slavic Studies
2-3 units, Aut (Fleishman, L)

SLAVLIT 305. Russian Critical Traditions
4 units, Aut (Safran, G)

SCIENCE, TECHNOLOGY, AND SOCIETY

Emeriti: James Adams (Management Science and Engineering, Mechanical Engineering), Alex Inkeles (Sociology), Walter Vincenti (Aeronautics and Astronautics)

Director: Robert McGinn (Management Science and Engineering; Science, Technology, and Society)

Program Committee: Stephen Barley (Management Science and Engineering, on leave), Hank Greely (Law), Ursula K. Heise (English), Brad Osgood (Electrical Engineering), Eric Roberts (Computer Science), Scott Sagan (Political Science), Fred Turner (Communication, on leave)

Lecturers: Henry Lowood, Rebecca Slayton, Patrick Windham

Consulting Professor: Naushad Forbes (Science, Technology, and Society)

Affiliated Faculty and Staff: Stephen Barley (Management Science and Engineering, on leave), Barton Bernstein (History), Scott Bukatman (Art and Art History), Thomas Byers (Management Science and Engineering), Jean-Pierre Dupuy (French), Paula Findlen (History, on leave), Hank Greely (Law), Ursula K. Heise (English), Sarah Jain (Anthropology), Joseph Manning (Classics), Brad Osgood (Electrical Engineering), Robert Proctor (History), Jessica Riskin (History), Eric Roberts (Computer Science), Scott Sagan (Political Science), Londa Schiebinger (History), Michael Shanks (Classics, Anthropology), Fred Turner (Communication, on leave), Gavin Wright (Economics)

Mail Code: 94305-2120
Phone: (650) 723-2565
Web Site: http://sts.stanford.edu

Courses given in Science, Technology, and Society have the subject code STS. For a complete list of subject codes, see Appendix.

Technology and science are activities of central importance in contemporary life, intimately bound up with society's evolving character, problems, and potentials. If scientific and technological pursuits are to further enhance human well-being, they and their effects on society and the individual must be better understood by non-technical professionals and ordinary citizens as well as by engineers and scientists. Issues of professional ethics and social responsibility confront technical practitioners. At the same time, lawyers, public officials, civil servants, and business people are increasingly called upon to make decisions requiring a basic understanding of science and technology and their ethical, social, and environmental consequences. Ordinary citizens, moreover, are being asked with increasing frequency to pass judgment on controversial matters of public policy related to science and technology. These circumstances require education befitting the complex sociotechnical character of the contemporary era.

Science, Technology, and Society (STS) is an interdisciplinary program devoted to understanding the natures, consequences, and shaping of technological and scientific activities in modern and contemporary societies. Achieving this understanding requires critical analysis of the interplay of science and technology with human values and world views, political and economic forces, and cultural and environmental factors. Hence, students in STS courses study science and technology in society from a variety of perspectives in the humanities and social sciences. To provide a basic understanding of technology and science, STS majors are also required to achieve either literacy (B.A.) or a solid grasp of fundamentals (B.S.) in some area of engineering or science.

GENERAL INFORMATION

STS courses may be used, individually or in groups, for purposes such as:

1. To satisfy University General Education Requirements
2. To satisfy the Technology in Society Requirement of the School of Engineering
3. To comprise parts of student-designed concentrations required for majors in fields such as Human Biology and Public Policy
4. To satisfy the requirements of the STS Honors Program complementing any major (see below)
5. To satisfy requirements for majors in STS (see below)
6. To satisfy requirements for a minor in STS (see below)

STS courses are particularly valuable for undergraduates planning further study in graduate professional schools (for example, in business, education, engineering, law, journalism, or medicine) and for students wishing to relate the specialized knowledge of their major fields to broad technology and science-related aspects of modern society and culture.

The STS Program is a unit of the Center for the Interdisciplinary Study of Science and Technology (CISST). For further information about CISST see the "Academic Centers" section of this bulletin.

UNDERGRADUATE PROGRAMS

Degree programs in STS are interdisciplinary curricula devoted to understanding the nature and significance of technology and science in modern society. Majors analyze phenomena of science and technology in society from ethical, aesthetic, historical, economic, and sociological perspectives. In addition, students pursuing the B.A. degree study a technical field in sufficient depth to obtain a grasp of basic concepts and methods, and complete a structured concentration on a theme, issue, problem, or area of personal interest related to science and technology in society. Those seeking the B.S. degree complete at least 50 structured units in technology, science, and/or mathematics. The particular technical courses chosen reflect the student's special interest in science and technology in society. Specific requirements for the bachelor's degree in STS are as follows:

BACHELOR OF ARTS

1. *STS Core* (eight courses):
   - a) Interdisciplinary Foundational course: STS 101 or 101Q
   - b) Disciplinary Analyses (five courses with at least one in each category):
     - 1) philosophical/ethical perspectives: STS 110, 112, 114; PHIL 61
     - 2) historical perspectives: STS 120, 125, 128, 134, 141; CLASSGEN 133; ECON 116; HISTORY 208A, 232F
     - 3) social science perspectives: CASA 82, 132; COMM 120, 169; MS&E 181, 184, 185, 193; POLISCI 114S, 116
   - c) Advanced courses (one course in each category):
     - 1) disciplinary analysis: STS 210, 211, 221, 225, 234; CS 201; COMM 268; ECON 224, 226; HISTORY 232G, 243G, 244C; ME 314; MS&E 281
     - 2) senior colloquium: STS 200
2. *Technical Literacy* (five courses):
   - a) CS 105 or 106A or equivalent; and
   - b) A four-course sequence (minimum of 12 units) in one field of engineering or science (sample sequences available in the STS office); *or*
   - c) Four of the following Engineering Fundamentals courses: Engineering 10, 14, 15, 20, 25, 30, 31, 40, 50, 50M, 60, 62, 70A (see course descriptions in the "School of Engineering" section of this bulletin).
3. *Thematic Concentration* (minimum of 20 units, at least five courses, one each from among those designated on the appropriate concentration course list as foundational and advanced). Thematic concentrations are organized around an STS-related problem or area. The following thematic concentrations have been pre-certified as declarable fields of study on Axess: The Intersections of Technology and Science with Aesthetics; Development; History and Philosophy; Information and Society; Public Policy; Social Change; and Work and Organizations. These fields of study appear on the transcript but not on the diploma.

   Course lists for these thematic concentrations are available in the STS office. A student choosing one of the certified topics may include one or more courses not on the corresponding course list if they are germane to the concentration and meet the student's special interests.

   Alternatively, the student may choose to design a thematic concentration topic and course package subject to program approval. A self-designed thematic concentration is not declared on Axess.

Each thematic concentration, certified or self-designed, requires the signature of an appropriate faculty adviser. See the program director for details.

BACHELOR OF SCIENCE

The student pursuing the B.S. degree shall complete the STS Core and a structured package of at least 50 units of technical courses intended to enable students to understand socially significant technical phenomena in some field of engineering or science. Introductory courses in mathematics or physics (for example, MATH 19 or PHYSICS 19) are not normally counted as parts of this technical depth component.

The B.S. candidate follows one of two models in fulfilling the minimum 50-unit technical depth requirement:

1. *Focused Depth:* at least seven courses amounting to at least 25 units in a single field of science or engineering, with the remaining units (except for at most two stand-alone courses) grouped in sequences of at least three courses each in other fields of science or engineering. For example, a focused depth package might contain eight mechanical engineering, three physics, three mathematics, and three computer science courses, and one course each in electrical engineering and chemistry. At least four of the seven courses in the focused depth area must be advanced, that is, not normally taken in the first year of study in that field.
2. *Clustered Depth:* two or more clusters of at least five courses and 15 units each in different fields of science or engineering, with at most two stand-alone courses, and remaining courses, if any, in sequences of three or more courses. For example, a clustered depth package might contain five-course clusters in computer science, electrical engineering, and physics, three courses in civil engineering, and one course each in biology and chemical engineering. At least two courses in each cluster area must be advanced.

It is recommended that B.S. majors complete CS 106A or equivalent.

MINOR

Students planning careers in many technical and non-technical fields, including business, education, engineering, science, law, medicine, and public affairs, are faced with important STS issues in their professional practice. Therefore, a minor in STS is likely to prove practically valuable as well as intellectually stimulating.

Requirements—The STS minor requires successful completion of six courses satisfying the following requirements:

1. Foundational Course: STS 101 or 101Q
2. One disciplinary analysis course from each of the following categories:
   a) Philosophical/Ethical Perspectives: STS 110, 112, 114, 115; PHIL 61
   b) Historical Perspectives: STS 120, 125, 128, 134, 141, 144; CLASSGEN 133; ECON 116; HISTORY 208A, 232F
   c) Social Science Perspectives: CASA 82, 132; COMM 120, 169; ENGR 145; MS&E 181, 184, 185, 193; POLISCI 114S, 116; PUBLPOL 194
3. Two advanced courses, from one or two of the following categories, building on courses taken under requirements 1 and 2:
   a) Philosophical/Ethical Perspectives: STS 210, 211; CS 201; ME 314
   b) Historical Perspectives: STS 221, 225, 234; ECON 224, 226; HISTORY 232G, 243G, 244C
   c) Social Science Perspectives: STS 279; COMM 268; ECON 224, 226; MS&E 281
4. At least one of the courses taken under requirements 1 to 3 should incorporate a weekly, small group discussion.
5. With at most one exception, all courses taken to satisfy STS minor requirements must be taken for a letter grade where available. The exception cannot be STS 101 or 101Q.
6. The six courses taken under requirements 1-3 should be chosen so as to realize a measure of intellectual coherence and interrelatedness.

Note—Students wishing to use a course not listed above to satisfy one of the requirements for a minor in STS may petition to do so. For details, inquire at the STS office, Building 370, Room 109.

HONORS PROGRAM

STS offers a limited number of students an opportunity to achieve honors through in-depth study of the interaction of science and technology with society. The honors program is open to students majoring in any field (including STS). Students accepted for this program carry out an honors project, typically beginning in Spring Quarter of junior year and finishing by the end of senior year. Students who want their theses to be considered for a Firestone Award must submit them to STS by May 21; all theses must be submitted to STS by June 7. STS thesis projects entail writing an honors thesis, although occasionally students have also chosen to produce a technical artifact or carry out some other work that itself represents original thinking. When a project results in a work other than an essay, students must also submit an accompanying scholarly exegesis of the work in question.

ADMISSION

Application for admission to the STS honors program is typically made during the last quarter of the student's junior year. By the end of that quarter, interested students must have completed all courses required to satisfy honors requirements 1-5 listed below. Each applicant must also have submitted a formal proposal for her or his project to the STS Honors Committee, including the name of the primary thesis adviser. For proposal parameters, see the document *STS Honors Program*, available in the STS office. Students whose proposals are approved are encouraged to apply to attend Honors College in early September to get a running start on their theses. STS honors students are also encouraged to sign up for 1-5 units of credit per quarter in STS 195A,B,C for work on the honors project. While not required, doing so leaves the student sufficient time to finish the thesis in three quarters. Writing a senior honors thesis while simultaneously carrying a full academic load each quarter is a very difficult task to complete with distinction. STS majors pursuing honors take STS 200 for 2 units instead of 4 and do not write a research paper for this required course. However, failure to complete the thesis requires additional research work in STS 200.

REQUIREMENTS

For non-STS majors:

1. Foundational Course: STS 101 or 101Q
2. One Philosophical/Ethical Perspectives course: STS 110, 112, 114 115, 210, 211; CS 201; PHIL 61
3. One Historical Perspectives course: STS 120, 125/225, 128, 134/234, 141, 221, CLASSGEN 133; ECON 116, 224, 226; HISTORY 208A, 232F, 232G, 243G, 244C
4. One Social Science Perspectives course: STS 218, 279; CASA 82, 132; COMM 120, 169; ECON 224, 226; MS&E 181, 184, 185, 193, 281; POLISCI 114S, 116
5. Honors Seminar: STS 190 (typically taken in the spring quarter of the junior year)
6. Honors Project: an original critical essay (or investigative project with accompanying explanatory essay) on an STS topic of general importance. Past honors projects are on file in the STS office library.

For STS majors:

1. Completion of STS core.
2. Requirements 5 and 6 above.

To earn honors, the project must receive a grade of at least 'B' on the completed thesis. The student not majoring in STS must also achieve a grade point average (GPA) of at least 3.4 in the courses taken to satisfy requirements 1-5 above. In the case of STS majors, the student must compile a GPA of at least 3.4 in the entire STS core. If all these requirements are met, the designation "Honors Program in Science, Technology, and Society" is affixed to the student's permanent record and appears in the commencement program.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

See http://sts.stanford.edu for updated course scheduling information, course syllabi, faculty and staff information, and information about how to declare a major or a minor in STS.

INTRODUCTORY

STS 101. Science, Technology, and Contemporary Society—(Graduate students register for 201; same as ENGR 130.) Key social, cultural, and values issues raised by contemporary scientific and technological developments; distinctive features of science and engineering as sociotechnical activities; major influences of scientific and technological developments on 20th-century society, including transformations and problems of work, leisure, human values, the fine arts, and international relations; ethical conflicts in scientific and engineering practice; and the social shaping and management of contemporary science and technology. GER:DB-SocSci

4-5 units, Aut (McGinn, R)

STS 101Q. Technology in Contemporary Society—Stanford Introductory Seminar. Preference to sophomores. Introduction to the STS field. The natures of science and technology and their relationship, what is most distinctive about these forces today, and how they have transformed and been affected by contemporary society. Social, cultural, and ethical issues raised by recent scientific and technological developments. Case studies from areas such as information technology and biotechnology, with emphasis on the contemporary U.S. Unexpected influences of science and technology on contemporary society and how social forces shape scientific and technological enterprises and their products. Enrollment limited to 12. GER:DB-SocSci

4 units, Aut (McGinn, R)

PHILOSOPHICAL/ETHICAL PERSPECTIVES

STS 110. Ethics and Public Policy—(Same as MS&E 197, PUBLPOL 103B.) Ethical issues in science- and technology-related public policy conflicts. Focus is on complex, value-laden policy disputes. Topics: the nature of ethics and morality; rationales for liberty, justice, and human rights; and the use and abuse of these concepts in policy disputes. Case studies from biomedicine, environmental affairs, technical professions, communications, and international relations. GER:DB-Hum, EC-EthicReas, WIM

5 units, Win (McGinn, R)

STS 115. Ethical Issues in Engineering—(Same as ENGR 131.) Moral rights and responsibilities of engineers in relation to society, employers, colleagues, and clients; cost-benefit-risk analysis, safety, and informed consent; the ethics of whistle blowing; ethical conflicts of engineers as expert witnesses, consultants, and managers; ethical issues in engineering design, manufacturing, and operations; ethical issues arising from engineering work in foreign countries; and ethical implications of the social and environmental contexts of contemporary engineering. Case studies, guest practitioners, and field research. Limited enrollment. GER:DB-Hum

4 units, alternate years, not given this year

COGNATE COURSES—PHILOSOPHICAL/ETHICAL PERSPECTIVES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

PHIL 61. Science, Religion, and the Birth of Modern Philosophy—(Same as HPS 61.)

5 units, Win (Friedman, M)

HISTORICAL PERSPECTIVES

STS 128. Science and Technology in WW II and What Happened Afterward—(Same as EE 45.) The efforts of engineers, mathematicians, and scientists during WWII. The effect on the postwar world in areas such as information, communication, transportation, materials, and medicine. Science and engineering in the war effort, and what became of them after the war, drawn from: encryption and computation; radar, communication, and electronics; control and optimization; materials; drugs and medicine. GER:DB-EngrAppSci

3 units, Win (Osgood, B)

STS 134. History of the Senses—(Graduate students register for 234; same as HISTORY 241G/341G.) Technological, medical, philosophical, and scientific history of the five senses, drawing upon readings from antiquity to the present. How physiologists and philosophers have explained the functioning of the senses; how doctors have tampered with them both to help and to hinder; and how technologies including medical devices, scientific instruments, and tools of the arts have continually transformed the nature and experience of sensation. GER:DB-SocSci

4-5 units, not given this year

STS 144. Game Studies: Issues in Design, Technology, and Player Creativity—What can be learned about innovation from digital games? Digital game technologies, communities, and cultures. Topics include game design, open source ideas and modding, technology studies, player/consumer-driven innovation, fan culture, transgressive play, and collaborative co-creation drawn from virtual worlds and online games.

4 units, Spr (Lowood, H)

COGNATE COURSES—HISTORICAL PERSPECTIVES

ECON 116. American Economic History

5 units, Spr (Wright, G)

HISTORY 103E. History of Nuclear Weapons—(Same as POLISCI 116.)

5 units, Spr (Holloway, D)

HISTORY 208A/308A. Science and Law in History

4-5 units, Spr (Riskin, J)

HISTORY 232F/332F. The Scientific Revolution

4-5 units, Win (Riskin, J)

SOCIAL SCIENCE PERSPECTIVES

STS 160. Controversy and Closure: The Politics of Technical Expertise—What are the causes and consequences of global warming? Do birth control pills increase the risk of cancer? Was there prewar evidence of WMD in Iraq? How political institutions, culture, and technology shape techno-political advice and common assumptions about who counts as an expert.

4 units, Win (Slayton, R)

STS 165. Science and Engineering in the Security State—How defense research changes how scientists and engineers work. How the research projects of the Cold War shaped practices in disciplines including computing, physics, biology, medicine, environmental sciences, and social sciences. Challenges faced by scientists and engineers in the context of heavy defense spending.

4 units, not given this year

STS 170. Technology in Modern Security Discourse—Technology's central role in discussions of international security issues including nuclear proliferation or containment, ballistic missiles or anti-missiles, biological weapons or vaccines, and data mining or computer security. What uses can and should technology serve in diplomacy? Why are some weapons stigmatized while others are deemed acceptable? How does discourse itself become a weapon? The history of the technologies and the discourses about them.

4 units, not given this year

STS 176. Technology and Politics—The impact of politics, scientific advice, and government actors on new technologies; their effects on political life. How politics have shaped the development, use, and regulation of information, bio-, nano-, space-based weapons, nuclear power, and greenhouse gas technologies. How technologies such as television, the Internet, and large computer databases have affected democratic politics, freedom, privacy, equality, civil society, and political participation. Focus is on U.S. politics; attention to developments elsewhere.
5 units, Aut (Windham, P)

COGNATE COURSES—SOCIAL SCIENCE PERSPECTIVES

CASA 82/282. Medical Anthropology
4-5 units, Win (Kohrman, M)

CASA 132. Science, Technology, and Gender
3-5 units, not given this year

COMM 120/220. Digital Media in Society
4-5 units, not given this year

COMM 169/269. Computers and Interfaces
4-5 units, Win (Nass, C)

ENGR 145. High Technology Entrepreneurship
4 units, Aut (Gould, A; Kosnik, T), Win (Byers, T; Kosnik, T)

MS&E 181. Issues in Technology and Work for a Post-Industrial Economy
3 units, Spr (Nelson, A)

MS&E 193/193W/293. Technology and National Security
3 units, Aut (Perry, W; Hecker, S)

POLISCI 114S. International Security in a Changing World—(Same as IPS 241.)
5 units, Win (Sagan, S; Blacker, C)

PUBLPOL 194. Technology Policy
5 units, Win (Windham, P)

HONORS AND INDEPENDENT STUDY

STS 190. Honors Seminar—For juniors intending to pursue honors in STS or a related discipline. Goal is to identify a research problem and identify key components of honors research and thesis writing such as literature reviews, methodologies, theoretical frameworks, and writing standards.
4 units, Spr (Slayton, R)

STS 195A,B,C. Honors Research—For students in STS honors program. 195A for submission of proposal; 195B for continued study and writing; 195C for final work on project.
1-5 units, Aut, Win, Spr (Staff)

STS 199. Individual Work
1-5 units, Aut, Win, Spr (Staff)

ADVANCED UNDERGRADUATE AND GRADUATE

STS 200. Senior Colloquium—Analytical and theoretical texts treating the natures and interplay of science, technology, and society. Only STS majors writing senior honors theses may register for 2 units. Prerequisite: STS major with senior standing and four STS core courses, or consent of instructor.
2-4 units, Win (Dupuy, J), Spr (Heise, U)

PHILOSOPHICAL/ETHICAL PERSPECTIVES

STS 201. Science, Technology, and Contemporary Society—(Same as 101, ENGR 130; see 101.)
4-5 units, Aut (McGinn, R)

STS 210. Ethics, Science, and Technology—Ethical issues raised by advances in science and technology. Topics: biotechnology including agriculture and reproduction, the built environment, energy technologies, and information technology. Prerequisite: 110 or another course in ethics. Limited enrollment. GER:DB-Hum
4 units, Spr (McGinn, R), alternate years, not given next year

STS 211. Foundations of Nanoethics: Toward a Rapprochement between Europe and the U.S.—(Same as FRENGEN 258E.) Nanoethics as a new discipline that accompanies the rise of nanotechnology research in the U.S. and Europe. Differing approaches to the ethics of science and technology in the case of a fledgling technology.
3-5 units, alternate years, not given this year

COGNATE COURSES—PHILOSOPHICAL/ETHICAL PERSPECTIVES

CS 201. Computers, Ethics, and Social Responsibility
3-4 units, Win (Johnson, M)

ME 314. Good Products, Bad Products
3-4 units, Win (Beach, D)

HISTORICAL PERSPECTIVES

STS 221. The Politics and Ethics of Modern Science and Technology—(Same as HISTORY 257/347.) The WW II decision to build and use the atomic bomb. The controversy over the H-bomb. The Oppenheimer loyalty-security case and the relationship of scientist to the state. Medical experimentation on humans and pitfalls of technology. Relations among science, technology, and university. GER:DB-SocSci
4-5 units, not given this year

STS 234. History of the Senses—(Same as 134, HISTORY 241G/341G; see 134.)
4-5 units, not given this year

COGNATE COURSES—HISTORICAL PERSPECTIVES

ECON 224. Science, Technology, and Economic Growth
2-5 units, Win (David, P)

ECON 226. U.S. Economic History
2-5 units, Spr (Wright, G)

HISTORY 232G/332G. When Worlds Collide: The Trial of Galileo
4-5 units, not given this year

HISTORY 241F/341F. History of the Modern Fact
4-5 units, not given this year

HISTORY 243G/343G. Tobacco and Health in World History
4-5 units, Aut (Proctor, R)

HISTORY 244C/444C. The History of the Body in Science, Medicine, and Culture
4-5 units, not given this year

SOCIAL SCIENCE PERSPECTIVES

STS 279. Technology, Policy, and Management in Newly-Industrializing Countries—Technology as the key to development and prosperity. Building technological capability in newly industrializing countries at the national and firm levels. Government intervention, the concept of technology leader and follower environments, technology transfer from leader countries, indigenous technological capability, human capital, culture and innovation, the role of small firms and new enterprises. How innovation is different in technology followers, organizing for shop floor innovation, building an innovation culture, the role of R&D, design, and technology strategy in followers. Cases from Korea, India, Brazil, Singapore, and other NICs.
2-4 units, Spr (Forbes, N), offered occasionally

COGNATE COURSES—SOCIAL SCIENCE PERSPECTIVES

COMM 268/368. Experimental Research in Advanced User Interfaces
1-5 units, Win, Spr (Nass, C)

MS&E 184. Technology and Work
3 units, Aut (Bailey, D)

MS&E 185. Global Work
4 units, not given this year

MS&E 281. Management and Organization of Research and Development
3 units, Aut (Nelson, A)

INDEPENDENT STUDY

STS 299. Advanced Individual Work
1-5 units, Aut, Win, Spr (Staff)

OVERSEAS STUDIES

Courses approved for the Science, Technology, and Society major and taught overseas can be found in the "Overseas Studies" section of this bulletin, in the Overseas Studies office, or at http://osp.stanford.edu/.

FLORENCE

OSPFLOR 134F. Modernist Italian Cinema
5 units, Aut (Campani, E)

SLAVIC LANGUAGES AND LITERATURES

Emeriti: (Professors) Joseph Frank,* Joseph A. Van Campen
Chair: Gregory Freidin
Director of Graduate Studies: Lazar Fleishman
Director of Undergraduate Studies: Gabriella Safran
Professors: Lazar Fleishman, Gregory Freidin, Richard D. Schupbach
Associate Professors: Monika Greenleaf, Gabriella Safran
Senior Lecturer: Rima Greenhill
Lecturers: Eugenia Khassina, Monica White (Humanities Fellow)
Visiting Professor: Izaly Zemtsovsky

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* Recalled to active duty.

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Web Site: http://slavic.stanford.edu

Courses given in Slavic Languages and Literatures have the subject codes SLAVGEN, SLAVLANG, and SLAVLIT. For a complete list of subject codes, see Appendix.

Systematic study of Russian literature in this country developed against the backdrop of political tensions following the Bolshevik revolution in 1917. With the disintegration of the Soviet Union and the fall of Communism, new perspectives on the literatures and cultures of this region have opened up. The study of Russian and other Slavic languages continues to attract students seeking careers in diplomacy and teaching, but it now also offers gateways to a world of cultures responding to the post-socialist challenge. It also prepares students for careers in business, law, human rights, policy, and academia.

The study of Slavic and East European literatures, arts, and cinema draws upon culture studies, literary theory, and other humanistic disciplines. Formerly invisible topics of study include smaller ethnic groups, gender, Eastern Orthodoxy and literature, and interactions between Slavs and Islam and Buddhism.

Slavic studies students make use of Stanford's faculty and library resources, as well as the Center for Russian, East European and Eurasian Studies and the Hoover Institution and its Slavic and East European collections. Undergraduates are invited to study at Stanford's Moscow campus.

The department's graduate and undergraduate teaching and advising emphasize language mastery; students are encouraged to reach out to other disciplines and turn unexpected corners in their own research.

The department accepts candidates for the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The Department of Slavic Languages and Literatures (Slavic) offers two fields of study for undergraduate majors: Russian Language and Literature; and Russian Language, Culture, and History. These fields of study are declared on Axess and appear on the transcript but not on the diploma. The department also offers a degree option in Russian and Philosophy. This option is not declared on Axess and does not appear on the transcript or the diploma.

Writing in the Major—Undergraduates are required by the University to pass at least one writing-intensive course in their field of concentration in order to graduate. Majors in any Slavic track may satisfy the writing requirement by passing SLAVGEN 146.

RUSSIAN LANGUAGE AND LITERATURE

The Russian Language and Literature field of study is designed for those students who desire to gain command of the Russian language and to study the nation's literary tradition. Emphasis is placed on the linguistic and philological study of literature, as well as the history of Russian literature and related media in the broader context of Russian culture. Students may explore historically related literary traditions (for example, English, French, German), as well as other related fields. The Russian Language and Literature field of study also welcomes students with an interest in Russian and Slavic linguistics.

Prerequisites—Completion of SLAVLANG 51, 52, 53, or the equivalent, as determined by the results of the department placement examination.

REQUIREMENTS

Candidates for the B.A. degree with a Russian Language and Literature field of study must complete an additional 52 units according to the following distribution:

Russian Language—A minimum of 12 units from: SLAVLANG 111, 112, 113, 177, 178, 179, 181, 182, 183.

Russian Literature—The 16-unit core literature sequence consisting of: SLAVGEN 145, 146, 147 or 148; SLAVLIT 187 or 188.

Electives—Students must take 24 units of electives embracing at least two of the following categories: (1) Russian language or linguistics; (2) Russian literature; and (3) historically related literatures. These courses are chosen in consultation with the undergraduate director. With department permission, work in related academic fields may be applied toward the degree requirements. Students who have completed IHUM 28A,B, Poetic Justice: Order and Imagination in Russian Culture, with a grade of 'B' or better may count these 10 units towards elective courses required for the major in Russian Languages and Literature or the major in Russian Language, Culture, and History.

Majors who concentrate in Russian Language and Literature must earn a grade point average (GPA) of 2.0 (C) or better in order to receive credit toward the major.

RUSSIAN LANGUAGE, CULTURE, AND HISTORY

The Russian Language, Culture, and History field of study is for students who would like to obtain command of the Russian language and to pursue a broad, interdisciplinary study of Russian literature and other expressive media including film, as well as cultural traditions and institutions. Emphasis is placed on the relation of the Russian literary tradition to disciplines that have enriched the historical understanding of Russian literature: primarily history, but also anthropology, communications, political science, and sociology.

Prerequisites—Completion of SLAVLANG 51, 52, 53, or the equivalent, as determined by the results of the department placement examination.

REQUIREMENTS

Candidates for the B.A. degree with a Russian Language, Culture, and History field of study must complete an additional 52 units according to the following distribution.

Russian Language—A minimum of 12 units from: SLAVLANG 111, 112, 113, 177, 178, 179, 181, 182, 183.

19th-Century Russian Literature and History—A minimum of 8 units chosen from the following courses or the equivalent; students must choose one course from Slavic and one course from History.

SLAVGEN 145, 146
HISTORY 120B

20th-Century Russian Literature and History—A minimum of 8 units chosen from the following or the equivalent; students must choose one course from Slavic and one course from History.

SLAVGEN 147 or 148
HISTORY 120C

Electives—In order to complete the basic degree requirements, students must take 24 additional units of course work embracing at least two of the following categories: (1) Russian language; (2) Russian literature; and (3) Russian history. These courses are chosen in consultation with the undergraduate director. With department permission, work in related academic fields (for example, anthropology, communications, political science, religion, sociology) may apply toward the degree requirements.

Majors in the Russian Language, Culture, and History field of study must earn a GPA of 2.0 (C) or better in order to receive credit toward the major.

RUSSIAN AND PHILOSOPHY

The Russian and Philosophy option offers students the opportunity to gain a command of the Russian language and literary tradition, while gaining a background in philosophical thought, broadly construed. They take courses alongside students in other departments participating in the program in Philosophical and Literary Thought, with administrative staff in the DLCL. This option is not declared on Axess.

Prerequisites—Completion of SLAVLANG 51, 52, 53, or the equivalent, as determined by the results of the department placement examination.

REQUIREMENTS

Candidates for the B.A. degree with a concentration in Russian and Philosophy must complete an additional 67 units according to the following distribution:

Russian Language—A minimum of 12 units selected from: SLAVLANG 111, 112, 113, 177, 178, 179, 181, 182, 183.

Russian Literature—A minimum of 16 units of Russian literature, including the following:

1. SLAVGEN 145 and 146
2. SLAVGEN 147 or 148
3. SLAVLIT 187 or 188

Electives—At least 12 units of electives in Russian language and literature, selected in consultation with the undergraduate director.

Philosophy and Literature Gateway Course (4 units)—SLAVGEN 181 (same as PHIL 81).

Philosophy Writing in the Major (5 units)—PHIL 80; prerequisite: introductory philosophy course.

Philosophy Core—12 units, including the following:

1. *Value Theory:* a course in the PHIL 170 series
2. *Theories of Mind, Language, Action:* a course in the PHIL 180 series
3. *History of Philosophy:* a course from the PHIL 100-139 series

Related Course—An upper-division course of special relevance to philosophy and literature. A list of approved courses is available from the program director.

Capstone Seminar—this year's capstone seminars are COMPLIT 154/GERLIT 154, Heidegger on Hölderlin, and PHIL 173A, Aesthetics: Metaphor across the Arts. One of these courses must be taken in the student's senior year.

Majors who concentrate in Russian and Philosophy must earn a grade point average (GPA) of 2.0 (C) or better in order to receive credit toward the major. Courses in other departments may not, in general, be counted toward the Russian language, Russian literature, and elective requirements, but may be counted toward the other requirements.

DIGITAL HUMANITIES MODULE

The Slavic department, in collaboration with the Humanities Lab, also offers a digital humanities module that can be combined with any of the department's major programs. Students who are interested in digital humanities should contact the department's Director of Undergraduate Studies who facilitates coordination with the Humanities Lab. Students planning to combine the Russian major and the digital humanities module must fulfill the following requirements in addition to the general Russian major requirements:

1. CS 105 or equivalent
2. Participate in the Humanities Lab gateway core seminar, HUMNTIES 198J/ENGLISH 153H, Digital Humanities: Literature and Technology (5 units)
3. Complete the HUMNTIES 201, Digital Humanities Practicum (2-5 units), in the junior year
4. Complete one digital project, in lieu of the course's main writing requirement, in a course offered in the department under the supervision of the course instructor and humanities lab adviser. This should usually be done in an upper-division course.

Students are encouraged to enroll in DLCL 99, Multimedia Course Lab, when working on the digital course project. For more information on the Digital Humanities Lab, see http://shl.stanford.edu.

MINORS

The Department of Slavic Languages and Literatures offers three undergraduate minor options in Slavic Languages and Literature.

The minor is designed for students who, while pursuing a major in another program, seek a comprehensive introduction to Russian culture, whether through (1) Russian language courses, or (2) a combination of minimal proficiency in Russian and courses in the history of Russian culture, or (3) courses on Russian literature in translation and, depending on the student's interest, other forms of the country's cultural expression and social institutions. Students seeking a Slavic minor are encouraged to take advantage of the Bing Overseas Studies Program in Moscow. Students who have chosen one of the minor programs in Russian may use 5 units of IHUM credit towards their electives.

RUSSIAN LANGUAGE

Prerequisites—The minor option in Russian Language requires completion of SLAVLANG 51, 52, 53, or a demonstrated equivalent competence, as determined by the departmental Russian language placement examination.

Requirements—Candidates for the B.A. degree with a minor option in Russian Language must complete 24 units of Russian language and literature courses according to the following distribution: 12 to 15 units selected from SLAVLANG 111, 112, 113, 177, 178, 179, 181, 182, 183; the remaining 9-12 units should be chosen from SLAVGEN 145, 146, 147, 148, SLAVLIT 187, 188, other monograph courses offered by the department, or, with the approval of the department's undergraduate adviser, in history, politics, linguistics, or other relevant programs.

RUSSIAN LANGUAGE, LITERATURE, AND CULTURE

Prerequisites—The minor option in Russian Language, Literature, and Culture requires completion of SLAVLANG 1, 2, 3, or the equivalent, as determined by the departmental Russian language placement examination.

Requirements—Candidates for the B.A. degree with the minor option in Russian Language, Literature, and Culture must complete 28 units according to the following distribution:

1. A minimum of 16 units of courses on literature and culture selected from the following Slavic Languages and Literatures courses: two quarters in the SLAVGEN 145, 146, 147, 148 sequence, Russian Literature in English Translation, or one quarter in the SLAVGEN 145, 146, 147, 148 sequence and one quarter in the SLAVLIT 187, 188 sequence, Russian Poetry (prerequisite: second-year Russian); and at least one monograph course focusing on a single writer.

2. 12 units of elective courses either in the Department of Slavic Languages and Literatures or, with the approval of the Slavic department's undergraduate adviser, in History, Linguistics, Political Science, or other relevant programs.

RUSSIAN CULTURE

Candidates for the B.A. degree with the minor option in Russian Culture must complete 36 units according to the following distribution: a minimum of 20 units of courses on literature and culture selected from the following Slavic Languages and Literatures courses: three quarters in the SLAVGEN 145, 146, 147, 148 sequence, Russian Literature in English Translation, and two monograph courses focusing on a single writer. In addition, one course in Russian history is selected from HISTORY 120B or 120C. No knowledge of Russian is required.

Electives—11 units of elective courses either in the Department of Slavic Languages and Literatures or, with the approval of the Slavic department's undergraduate adviser, in Art, History, Linguistics, Political Science, or other relevant programs.

The deadline for minor declarations in all options is no later than the last day of the third quarter before degree conferral.

MINOR IN LITERATURE AND MINOR IN MODERN LANGUAGES

The Division of Literatures, Cultures, and Languages offers two undergraduate minor programs, the minor in Literature and the minor in Modern Languages. These minors draw on literature and language courses offered in this and other literature departments. See the "Literatures, Cultures, and Languages" section of this bulletin for further details about these minors and their requirements.

HONORS PROGRAM

Majors in any track or option with a grade point average (GPA) of 3.3 (B+) or better in their major courses are eligible to participate in the department's honors program. Prospective honors students may enroll for 2 units of credit in SLAVLIT 189B in Spring Quarter of the junior year to conduct preliminary research and draft an honors proposal. In addition to the program requirements above, students must also complete the following:

1. Majors who propose a senior project in literature must take a course in literary or cultural theory; this requirement may be fulfilled by enrollment in DLCL 189 or, with approval of the thesis adviser, in an advanced course related to the area of the student's expected research. Students concentrating in Russian Language, Culture, and History, and pursuing a project in cultural history must take a course in literary or cultural theory, a graduate seminar in the area of their topic, or DLCL 189, a 5-unit seminar that focuses on researching and writing the honors thesis. DLCL 189 is taken in Autumn Quarter of the senior year. Students concentrating in Russian Language and Literature who propose a senior project in Russian language select their course in consultation with the Director of Undergraduate Studies.
2. SLAVLIT 189A, taken for 5 units of credit while composing the thesis during Winter Quarter. Students who did not enroll in a 189B course in the junior year may enroll in SLAVLIT 189B in Spring Quarter of the senior year while revising the thesis, if approved by the thesis adviser.

To qualify for honors, the candidate must receive a grade of 'B' or better on the thesis or project completed during this period. A total of 10-12 units may be awarded for completion of honors course work, independent study, and the finished thesis.

SLAVIC THEME HOUSE

Slavianskii Dom, at 650 Mayfield Avenue, is an undergraduate residence that offers opportunities for students to expand their knowledge, understanding, and appreciation of Russia, Eastern Europe, and Eurasia.

COTERMINAL BACHELOR'S AND MASTER'S PROGRAM

The department allows a limited number of undergraduates to work for coterminal B.A. and M.A. degrees in Slavic Languages and Literatures with a concentration on Russian. In addition to University requirements for the B.A. degree, the student must:

1. Submit an application for admission by January 31 of the senior year. Applicants must meet the same general standards as those seeking admission to the M.A. program. Applicants must submit: an application for admission; a written statement of purpose; a transcript; and three letters of recommendation, at least two of which should be from members of the Department of Slavic Languages and Literatures faculty.
2. Meet all requirements for both the B.A. and M.A. degrees. Applicants must complete 15 full-time quarters (or the equivalent), or three full-time quarters after completing 180 units, for a total of 225 units. During the senior year they may, with the consent of the instructors, register for as many as two graduate courses. In the final year of study, they must complete at least three graduate-level courses.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

MASTER OF ARTS

University requirements for the M.A. degree are discussed in the "Graduate Degrees" section of this bulletin.

Admission—The requirements for admission to the master's degree program in Russian are:

1. A B.A. (or its equivalent) from an accredited college or university.
2. A command of the Russian language sufficient to permit the student to do satisfactory graduate work in an area of specialization.
3. A familiarity with Russian literature sufficient to permit the student to perform adequately in courses at the graduate level.

The applicant's previous academic training in Russian language and literature normally serves as an indication of competence. Accordingly, the department does not ordinarily consider applications from students who have not had at least three years of college Russian and some undergraduate training in Russian literature of the 19th and 20th centuries.

Before registering for the first quarter's work in the department, entering graduate students are required to take placement examinations in Russian. Students who fail to perform satisfactorily on such examinations must register for remedial courses in the areas in which they are deficient. Course work in third-year Russian and below carries no credit toward either the M.A. or the Ph.D. degree.

Course Requirements—Candidates for the M.A. who are not also candidates for the Ph.D. should plan course work that ensures adequate preparation for the M.A. final examination at the end of the third quarter of work. Ph.D. candidates should attempt to include as many of the department's basic course offerings as possible in the first-year program to ensure sufficient time to complete the M.A. thesis during the fifth quarter of registration. In any case, course work should be planned in consultation with the graduate adviser, whose approval of the overall course load is required.

Candidates for the M.A. must complete a program of 45 units, of which 36 units must be selected from courses given by the department. The other 9 units may, with approval of the candidate's adviser, be selected from courses in related fields. Of the 36 units in the department, a minimum of 9 may be in language and a minimum of 9 in literature. The remaining 18 units may be distributed in accordance with the needs and interests of the student, and with the advice and approval of the department adviser.

No credit toward the M.A. degree is allowed for first- or second-year courses in non-Slavic languages required for the Ph.D. degree.

The M.A. Thesis—A requirement for candidates for a Ph.D., the M.A. thesis represents a complete article-length research paper (6-9,000 words) that, in both form and substance, qualifies for submission to English-language professional publications in the Slavic field. The M.A. thesis must be submitted to the thesis adviser no later than the fifth quarter and approved no later than the sixth quarter of registration.

Final Examination—Students not enrolled in the Ph.D. program may either submit an M.A. thesis or take a final examination. In the latter case, regardless of the area of specialization, the student must demonstrate in a written examination: (1) command of the phonology, morphology, syntax, and lexicology of contemporary Standard Russian sufficient to teach beginning and intermediate courses at the college level; (2) an ability to read contemporary Standard Russian sufficient to assist students studying contemporary Russian poetry or literary prose; and (3) sufficient familiarity with Russian literature of either the 19th or 20th century to successfully handle survey courses dealing with the chosen period of specialization.

The examination should be taken at the end of the final quarter of required course work.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are discussed in the “Graduate Degrees” section of this bulletin.

Students enrolled in the Ph.D. program in Slavic Languages and Literatures are expected to fulfill the following requirements:

1. *Minor or Related Fields:* during the course of study, students must develop substantial expertise in a field contiguous to the area of specialization. A candidate may elect to present a full minor or, in consultation with the graduate adviser, develop a special program in a related field.
    - a) *Related Field:* a student is required to complete a sequence of basic courses (12 units) in a chosen discipline outside the Department of Slavic Languages and Literatures. The choice of patterns is one of the following:
        - 1) a sequence of three courses in one West European literature, selected in consultation with the adviser, or
        - 2) three basic courses in comparative literature chosen in consultation with the graduate adviser and the Department of Comparative Literature or the Department of German Studies
        - 3) a sequences of three courses in another department, selected in consultation with the advisor.
    - b) *Minor:* students electing a minor should take six graduate courses in that department with a minimum of 20 units at the graduate level, according to the minor requirements established by that department. Students considering minors should consult with their adviser, the chair of Slavic Languages and Literatures, and the chair of the minor department. Students who wish to enroll in the Graduate Program in the Humanities should apply there.
2. *Admission to Candidacy:* candidates should read carefully the general regulations governing the degree, as described in the “Graduate Degrees” section of this bulletin. No student is accepted as a candidate until the equivalent of the M.A. degree requirements, including the M.A. thesis described above, are completed. Admission to candidacy is determined early in the sixth quarter of graduate studies. The candidate by that time must have demonstrated commitment to graduate studies by completion of a minimum of 60 quarter units of credit with a grade point average (GPA) of 3.3 (B+) or better, and submission of a complete draft of an M.A. thesis. Failure to do so results in termination of enrollment for the Ph.D. The terminated student may, at the discretion of the faculty, be given the opportunity to take the M.A. written examinations. If successful, the student is then awarded the M.A. degree.
3. *Proficiency Test:* administered for all entering graduate students, this test determines whether the student’s knowledge of Russian language and literature falls below the department’s standard. Students who fail to meet the standard in this test are asked to complete appropriate courses in the first year of graduate study.
4. *Course Requirements:* before qualifying for the department oral and written examinations, a Ph.D. candidate is expected to accumulate at least 72 quarter units of credit for courses taken while in graduate school. No less than half of this course work (36 units) must be done in the Department of Slavic Languages and Literatures, including at least 24 units of credit for seminar-level courses. Entering graduate students must enroll in SLAVLIT 200.
5. *Foreign Languages:* a candidate must demonstrate reading knowledge of French or German, plus another language useful for the student’s area of concentration, by passing written examinations, or receiving a grade of ‘A-’ or better in a class.
6. *Examinations:* a candidate must pass the departmental general qualifying examinations, which has written and oral parts. The written part covers the history of Russian literature from the medieval period through the twentieth century. The departmental oral exam part follows shortly after completion of the comprehensive exams. The student makes a 20-minute presentation of a scholarly paper, possibly the master’s thesis. Each examiner questions the student on the presentation and related topics. Following the departmental examinations, a candidate must pass a University oral examination, which is a defense of a dissertation proposal covering content relevant to the area of study, rationale for the proposed investigation, and strategy to be employed in the research.

Continuation—Continuation in the Ph.D. program is contingent on: for first-year students, a high quality of performance in course work (decided by department evaluation); for second-year students, an M.A. thesis, which should be completed no later than the end of the second quarter of the second year.

Course Work, Breadth Requirements, and Overall Scheduling—

1. Candidates for the Ph.D. degree are allowed as much freedom as possible in the selection of course work to suit their individual program of study. However, candidates are held responsible for all of the areas covered by the general examinations, regardless of whether they have registered for the department’s offerings in a given field. For this reason, it is strongly recommended that before taking Ph.D. examinations, students complete seminar-level work directly related to the following broad areas:
    - a) Russian poetry
    - b) the Russian novel
    - c) 20th-century Russian literature
    - d) 19th-century Russian literature (the Age of Pushkin and after)
    - e) 18th-century Russian literature (the early 1700s to the Age of Pushkin)
    - f) Medieval Russian literature
    - g) a monograph course on a major Russian author
    - h) theory of literature

    The department’s general qualifying examinations must be taken by the end of the first quarter of the third year of study; they may be taken during the second year if the student and the adviser feel this is appropriate. During the two quarters following the general qualifying examinations, the student should be concerned primarily with preparation for the departmental and the University oral examinations, which should take place no later than the end of the third quarter of the third year. The fourth and fifth years should be devoted to research and writing leading to completion of the Ph.D. dissertation.
2. Students possessing the equivalent of the Stanford M.A. are normally expected to adhere to the schedule for the second, third, and fourth years of work outlined under item 1 above.
3. Students in the Ph.D. program are required to do five quarters of teaching, including three quarters of first-year Russian and one quarter of literature as a teaching assistant to a faculty member, usually for one of the survey courses in translation: SLAVGEN 145, 146, 147, 148. Students are required to take a one quarter TA training course, APPLLING 201, during their second year.

Non-Slavic Language Requirements—Credit toward either the M.A. or the Ph.D. degrees is not given for first- or second-year courses in non-Slavic languages. It is assumed that, on entering the program, the student has a reading knowledge of either German or French. The reading examination in German or French must be passed by the end of the first year of study. The reading examination in the second language of choice must be passed by the end of the second year of study. Both language examinations must be passed before the candidate takes the University oral examination, that is, before the end of the third year.

JOINT PH.D. IN SLAVIC LANGUAGES AND LITERATURES AND HUMANITIES

The Department of Slavic Languages and Literatures participates in the Graduate Program in Humanities leading to the joint Ph.D. degree in Slavic Languages and Literatures and Humanities. For a description of that program, see the "Interdisciplinary Studies in Humanities" section of this bulletin.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements. (AU) indicates that the course is subject to the University activity unit limitation (8 unit maximum).

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Classics, Comparative Literature, English, French and Italian, German Studies, and Spanish and Portuguese, in the Program in Modern Thought and Literature, and in the Division of Literatures, Cultures, and Languages.

RUSSIAN LANGUAGE COURSES

The following courses in Russian language instruction represent a typical sequence for three years of Russian language study. Majors and prospective majors should consult the requirements for a B.A. in Russian above. For descriptions, other information, and additional courses including special emphasis, intensive, and summer courses, and for other Slavic languages under the SPECLANG subject code, see the "Language Center" section of this bulletin.

SLAVLANG 1,2,3. First-Year Russian
5 units, **1:** *Aut,* **2:** *Win,* **3:** *Spr (Staff)*

SLAVLANG 51,52,53. Second-Year Russian
5 units, **51:** *Aut,* **52:** *Win,* **53:** *Spr (Khassina, E)*

SLAVLANG 111,112,113. Third-Year Russian
4 units, **111:** *Aut,* **112:** *Win,* **113:** *Spr (Staff)*

GENERAL

This curriculum covers topics of general interest. Courses are open to all students and have no prerequisites. Some courses may be taken for graduate credit. Additional work in the original language may be arranged with individual instructors. The courses:

1. introduce students to the major authors and texts in the Russian literary and cultural tradition,
2. offer broad conceptual frameworks for understanding the material covered, and
3. demonstrate the dynamic interaction between cultural texts and a variety of contexts (literary, intellectual, and sociopolitical).

SLAVGEN 13N. Russia and the Russian Experience—Stanford Introductory Seminar. Preference to freshmen. The political and cultural history of Russia and the Russians: prominent persons, prominent events, and how they shape current attitudes and society. Short works by Russian authors. GER:DB-Hum
3-4 units, Win (Schupbach, R)

SLAVGEN 77Q. Russia's Weird Classic: Nikolai Gogol—Stanford Introductory Seminar. Preference to sophomores. The work and life of Nikolai Gogol, the eccentric founder of Fantastic Realism. The relationship between romanticism and realism in Russian literature, and between popular Ukranian culture and high Russian and W. European traditions in Gogol's oeuvre. The impact of his work on 20th-century modernist literature, music, and art, including Nabokov, literature of the absurd, Shostakovich, Meyerhold, and Chagall. GER:DB-Hum
3-4 units, Aut (Fleishman, L)

SLAVGEN 110/210. The Gogol Bordello: Ukraine as a Meeting House of Cultures—The cohabitation of authors and cultural geography in multiethnic Ukraine. Comparison of Ukrainian texts, images of Ukraine and Ukrainians by their Polish, Jewish, German, and Russian cohabitants. Possible authors include: Andrukhovych, Aleichem, Babel, Celan, Franko, Gogol, Lewycka, Mickiewicz, Shevchenko, Pushkin, Schulz, Ukraina, and Zabuzhko.
3-5 units, Spr (Labov, J)

SLAVGEN 122/222. Yiddish Story—The humor, drama, anger, and artistry of modern of European and American Yiddish writers including Sholem Aleichem, I. L. Peretz, Isaac Bashevis Singer, Chaim Grade, and Yankev Glatshteyn. In English. GER:DB-Hum, EC-GlobalCom
5 units, not given this year

SLAVGEN 123/223. The Yiddish Novel—How Yiddish novels reveal changes in modern Jewish life and literature in Europe and the U.S. The influences of folklore, traditional Jewish culture, and European literature. Works by Isaac and Joshua Singer, Joseph Opatoshu, Der Nister, Chava Rosenfarb, Sholem Asch, and David Bergelson. Readings in English; optional sessions for close readings in Yiddish. GER:DB-Hum
3-4 units, not given this year

SLAVGEN 125/225. Martyrs, Monks, and Missionaries: An Introduction to Orthodox Sainthood—The Christian cult of saints in Russian religious culture from earliest times; its Byzantine forms and flowering in medieval Rus and the Balkans. The roots of Russian veneration of holy people in the early Christian and Byzantine worlds from which it borrowed, adapted, and reinterpreted many traditions. Primary sources in including hagiography and icons.
3-4 units, Aut (White, M)

SLAVGEN 127/227. Poetess: The Grammar of the Self when the Poet is a Woman—(Same as COMPLIT 128/228.) Seminar. Lyrical works by women poets from the U.S., Russia, E. Europe, and Germany (Dickinson, Moore, Brooks and the Harlem Renaissance, Bishop, Akhmatova, Tsvetaeva, Sachs, Plath, Cisneros, Angelou, Graham, Howe, and Szymborska.) Theoretical and practical issues: breaking and entering the male preserve of high poetry; the interaction of written and oral, political, and performative modes of expression; representations of the feminine body and experience in the visual arts; and the development of a female lineage and modes of poetic legitimation, association, and inspiration. GER:DB-Hum, EC-Gender
4 units, not given this year

SLAVGEN 145/245. Age of Experiment: From Pushkin to Gogol—The Russian leap into European culture after the Napoleonic Wars and the formative period of Russian literature. Readings seen as local literary developments and contemporary European trends including Pushkin's *Eugene Onegin, The Belkin Tales,* and *The Captain's Daughter;* Lermontov's *Hero of Our Time;* and Gogol's *Petersburg Tales* and *Dead Souls.* GER:DB-Hum, EC-GlobalCom
3-4 units, Aut (Fleishman, L)

SLAVGEN 146/246. The Great Russian Novel: History and Transgression in Tolstoy and Dostoevsky—Tolstoy's *War and Peace,* Dostoevsky's *Demons,* and Turgenev's *Fathers and Sons,* written in the decade following the emancipation of the serfs and the great legal reforms, ask how much one person can change history for good or ill. Chekhov's *Ward Number Six* as an example of the deformation and adaptation of this tradition at the end of the age of realism. Historical and philosophical context and literary-critical techniques. GER:DB-Hum, EC-GlobalCom, WIM
3-4 units, Win (Greenleaf, M)

SLAVGEN 147/247. The Age of War and Revolution: A Survey of Russian Literature and Culture, 1900-1950s—First of two-part sequence. Russian modernism and the avant garde. The Russian Revolution, the era of the NEP, Soviet civilization, and the literature of opposition following Stalin's death. Texts in English translation. GER:DB-Hum, EC-GlobalCom
4 units, not given this year

SLAVGEN 148/248. The Age of Dissent: A Survey of Russian Literature and Culture, 1953 to the Present—From the death of Stalin to post-communist Russia. Literature of the thaw and de-Stalinization, official and unofficial literature of dissent, *samizdat*, village and urban prose, literature of the new emigration, late Soviet underground, *sots-art*, *perestroika*, and post-communist literature and culture. Texts in English translation. For graduate credit for research paper, register for 399. GER:DB-Hum, EC-GlobalCom

4-5 units, Spr (Freidin, G)

SLAVGEN 150/250. Countercultures in Conversation: Russian and American Rock Music and Protest Poetry—(Same as SLAVGEN 250.) Non-conformist protest movements in contemporary Russian poetry; historical and cultural context; and comparison with similar processes in American social and cultural life. Sources include Russian and American poetry, songs, and DVDs. Fourth unit for readings in Russian.

3-4 units, Aut (Fleishman, E)

SLAVGEN 151/251. Dostoevsky and His Times—(Same as COMPLIT 119/219.) Open to juniors, seniors, and graduate students. Major works in English translation with reference to related developments in Russian and European culture, literary criticism, and intellectual history. GER:DB-Hum

4 units, Win (Frank, J)

SLAVGEN 155/255. Anton Chekhov and the Turn of the Century—Chekhov's art in its Russian literary, historical, philosophical, and political contexts. Short stories and major plays; supplemental readings for graduate students from Chekhov's letters and works by his friends and contemporaries, such as Leskov, Tolstoy, Korolenko, and Gorky. GER:DB-Hum

4 units, not given this year

SLAVGEN 156/256. Nabokov and Modernism—(Same as COMPLIT 115/215.) Nabokov's stories, novels, and a film script in the context of: modernist writers such as Bergson, Proust, and Joyce; media including painting, film, and photography; and philosophical thought. Critical approaches that elude the author's control. Readings include *Bend Sinister*, *Lolita*, *Pale Fire*, *Speak Memory*, and *Ada*. GER:DB-Hum

3-5 units, not given this year

SLAVGEN 163. Gender in Postwar Russian Culture—(Same as SLAVGEN 263.) Issues of femininity and masculinity in Russian literature, film, and popular culture from the 40s to the present. Readings include fiction, memoirs, poetry, drama, and theoretical works in gender studies. GER:EC-Gender

3-4 units, not given this year

SLAVGEN 165/265. Poetry, Painting, and Music of the Russian Avant Garde—Interrelationships between poetry and other arts in Russia, 1905-30. The pursuit of synthesis of arts and the modernist agenda of life creation and immortality. Parallel developments in literature, painting, and music, and style and poetics. Russian modernist poetry in the context of changes in the language of visual arts and music. Women poets and artists. Native sources and Western influences; non-Russian elements and transnational tendencies. The impact of scientific discoveries and technological inventions on artistic experimentation.

3-4 units, Spr (Fleishman, L)

SLAVGEN 169/269. Mermaids, the Firebird, and the Singing Tree: Russian Folklore and Its Theory—Russian culture through its oral folklore and music. Theory, current data and its interpretation, how scholars collect and understand traditional oral poetry, and the lessons of folklore. GER:DB-Hum

3-5 units, Spr (Zemtsovsky, I)

SLAVGEN 181. Philosophy and Literature—Required gateway course for Philosophical and Literary Thought; crosslisted in departments sponsoring the Philosophy and Literature track: majors should register in their home department; non-majors may register in any sponsoring department. Introduction to major problems at the intersection of philosophy and literature. Issues may include authorship, selfhood, truth and fiction, the importance of literary form to philosophical works, and the ethical significance of literary works. Texts include philosophical analyses of literature, works of imaginative literature, and works of both philosophical and literary significance. Authors may include Plato, Montaigne, Nietzsche, Borges, Beckett, Barthes, Foucault, Nussbaum, Walton, Nehamas, Pavel, and Pippin. GER:DB-Hum

4 units, Win (Anderson, L; Landy, J)

ADVANCED UNDERGRADUATE AND GRADUATE

SLAVLIT 129/229. Poetry as System: Introduction to Theory and Practice of Russian Verse—The history and theory of Russian versification from the 17th to the 20th century. Prerequisite: reading knowledge of Russian. GER:DB-Hum

4 units, not given this year

SLAVLIT 179/279. Literature from Old Rus' and Medieval Russia—From earliest times through the 17th century. The development of literary and historical genres, and links among literature and art, architecture, and religious culture. Readings in English; graduate students read in original.

4 units, not given this year

SLAVLIT 184/284. The History of the Russian Literary Language—Major structural and semantic changes from the 10th to the 19th centuries. Recommended: 211, 212.

4-5 units, Win (Schupbach, R)

SLAVLIT 187/287. Russian Poetry of the 18th and 19th Centuries—Required of majors in Russian language and literature; open to undergraduates who have completed three years of Russian, and to graduate students. The major poetic styles of the 19th century as they intersected with late classicism, the romantic movement, and the realist and post-realist traditions. Representative poems by Lomonosov, Derzhavin, Zhukovskii, Pushkin, Baratynskii, Lermontov, Tiutchev, Nekrasov, Fet, Soloviev. Lectures/discussions in Russian.

3 units, not given this year

SLAVLIT 188/288. From Alexander Blok to Joseph Brodsky: Russian Poetry of the 20th Century—Required of majors in Russian literature. Developments in 20th-century Russian poetry including symbolism, acmeism, futurism, and literature of the absurd. Emphasis is on close readings of individual poems. Discussions in Russian.

3-4 units, Win (Fleishman, L)

SLAVLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.

5 units, Win (Staff)

SLAVLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.

2 units, Aut (Staff)

SLAVLIT 199. Individual Work for Undergraduates—Open to Russian majors or students working on special projects. May be repeated for credit. Prerequisite: consent of instructor.

1-5 units, Aut, Win, Spr, Sum (Staff)

SLAVLIT 200. Proseminar in Literary Theory and Study of Russian Literature—Required for graduate students and honors undergraduates in Slavic; first-year Slavic graduate students must enroll during their first quarter. Introduction to graduate study in Russian literature and culture: profession, discipline, and approaches to the study of literature and culture. Theoretical readings, practical exercises in the analysis of verse and narrative, and recent monographs on Russian literature.

4 units, Aut (Freidin, G)

SLAVLIT 200A. Introduction to Library and Archival Research in Slavic Studies—Required of first-year Slavic graduate students. Major Western and Slavic language sources and search methodologies pertaining to Russian and E. European area studies. Tailored to students' research interests.

2-3 units, Aut (Fleishman, L)

SLAVLIT 200B. Proseminar in Russian Literary Theory—Corequisite: 305.
1 unit, not given this year

SLAVLIT 203. Academic Russian—How to read and analyze secondary sources, formulate arguments, and present intellectual work in Russian. In Russian. Prerequisite: four years of Russian or equivalent.
3 units, not given this year

SLAVLIT 211. Introduction to Old Church Slavic—The first written language of the Slavic people. Grammar. Primarily a skills course, with attention to the historical context of Old Church Slavic.
3 units, not given this year

SLAVLIT 212. Old Russian and Old Church Slavic—Continuation of 211. Readings in additional canonical Old Church Slavic texts, following the Church Slavic tradition as it develops in early Rus (Kiev, Novgorod). Selections from the *Primary Chronicle, Boris and Gleb,* and *The Life of Theodosius*.
3 units, not given this year

SLAVLIT 215. Russian Poetry after Brodsky—The Bronze Age of Russian poetry in the 70s-80s as a time of enthusiasm for poetic diction and achievement, attempts to reclaim connections with Russian and European traditions, and avant garde experimentation. The new metaphysics, the problem of the poet's self, new forms, and the limitations of the poetic domain. Poets include Leonid Aronzon, Victor Krivulin, Elena Shvartz, Ivan Zhdanov, Petr Cheigin, Gennadii Aigui, and Leonid Gubanov. Readings in Russian. Undergraduates require consent of instructor.
3-4 units, not given this year

SLAVLIT 225. Readings in Russian Realism—Open to graduate students and advanced undergraduates. Russian realist and naturalist prose emerged in a historical context that fostered specific ideas about the function and form of the literary word. Readings from Turgenev, Goncharov, Leskov, Saltykov-Shchedrin, Dostoevsky, Garshin, Tolstoy, Chekhov, Gorky, Bunin. Discussions in English.
4 units, not given this year

SLAVLIT 227. Boris Pasternak and the Poetry of the Russian Avant Garde—The works of Pasternak and his contemporaries Vladimir Mayakovsky and Marina Tsvetaeva; cultural context and the features of Russian avant garde poetics. Readings in Russian.
3-4 units, not given this year

SLAVLIT 269. Pushkin: Tying and Untying the Threads of the Golden Age—Graduate seminar. The formation of a simultaneously imperial and Enlightenment culture under Catherine the Great, and how Pushkin and his contemporaries realized its potentials and contradictions. Literary texts in light of other verbal discourses and artistic media; the field of 18th-century and imperial studies in Russia. Undergraduates require consent of instructor.
3 units, not given this year

SLAVLIT 271. *Poema*: Russia's Long Narrative Poem—Russian long narrative poems of the 19th and 20th centuries in literary and historical context.
3-4 units, Win (Fleishman, L)

SLAVLIT 272. Osip Mandelstam and the Modernist Paradigm—His poetry, prose, cultural criticism as an expression of Russian modernism in contexts including: symbolism, acmeism, and the avant garde; NEP culture; and Stalinism. Mandelstam's legacy in art and Russian postmodernism. Myth of the poet. The cultural paradigm of Soviet civilization. Knowledge of Russian desirable but not necessary. See http://www.stanford.edu/class/slavic272.
2-4 units, not given this year

SLAVLIT 299. Individual Work for Graduate Students—For graduate students in Slavic working on theses or engaged in special work. Prerequisite: written consent of instructor.
1-12 units, Aut, Win, Spr, Sum (Staff)

SLAVLIT 305. Russian Critical Traditions—The Russian intelligentsia invested its literature with esthetic and ethical value, and developed critical apparatuses that have inspired Western approaches to text. Readings in theorists from the 19th-20th centuries including positivists and formalists. Possible topics: 19th-century radicals, futurist manifestos, formalists, Freudian and Marxist models, Bakhtin, and the Tartu semioticians. Readings in English. Prerequisite: some familiarity with the Russian canon.
4 units, Aut (Safran, G)

SLAVLIT 310. Civilizing Process: Paradigms of Society and Culture in Modern Russian Literature and Film—Texts representing theoretical models of society and culture in confrontation with works of Russian fiction and film. Emphasis is on Norbert Elias's civilizing process and related theories. Topics: body and desire (Freud, Bakhtin); manners and civilizing process (Elias, Cuddihy, Lotman); symbolic forms, ritual, and systems (Geertz, Zorin); identities and practices (de Certeau, Bourdieu); subcultures (Hebdidge). Authors include Mayakovsky, Babel, Mandelstam, Bulgakov, Platonov, Zoshchenko, Erofeev, Pelevin, Trifonov, and Petrushevskaia; film makers: Mamin and Rogozhkin. Recommended: knowledge of Russian.
2-4 units, not given this year

SLAVLIT 399. Advanced Research Seminar in Russian Literature—Follow-up to 200- or 300-series seminars, as needed. May be repeated for credit.
2-4 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

Slavic majors are advised to consult the "Literatures, Cultures, and Languages" section of this bulletin for additional offerings. See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the Director of Undergraduate Studies to discuss applicability of these courses to a major or minor program.

DLCL 189. Honors Thesis Seminar
5 units, Aut (Surwillo, L)

OVERSEAS STUDIES

Courses approved for the Slavic Languages and Literatures major and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

SOCIOLOGY

Emeriti: (Professors) Joseph Berger, Bernard P. Cohen, Sanford M. Dornbusch, Alex Inkeles, Seymour M. Lipset, James G. March, John W. Meyer, W. Richard Scott, Morris Zelditch Jr.
Chair: Karen Cook
Professors: Lawrence Bobo, Karen Cook, Paula England, Mark Granovetter, David Grusky, Michael T. Hannan, Douglas McAdam, Susan Olzak, Cecilia Ridgeway, Gi-Wook Shin, C. Matthew Snipp, Nancy B. Tuma, Andrew Walder, Xueguang Zhou
Assistant Professors: Henning Hillmann, Monica McDermott, Michael Rosenfeld, Rebecca L. Sandefur
Associate Professor (Teaching): Donald Barr
Courtesy Professors: Anthony Bryk, Glenn Carroll, Michele Landis Dauber, Larry Diamond, Clifford J. Nass, Walter Powell, Francisco Ramirez
Courtesy Associate Professors: Sean Reardon, Daniel McFarland, Jesper Sorensen
Lecturers: Alexandra Gerbasi, Gili Drori
Consulting Professors: George Bohrnstedt, Patricia Chang, Ruth Cronkite
Consulting Associate Professor: Annemette Sorensen
Visiting Associate Professors: Eva-Maria Meyersson Milgrom, Patricia Thornton

Department Offices: Building 120, Room 160
Mail Code: 94305-2047
Phone: (650) 723-3956
Web Site: http://sociology.stanford.edu/

Courses given in Sociology have the subject code SOC. For a complete list of subject codes, see Appendix.

Sociology seeks to understand all aspects of human social behavior, including the behavior of individuals as well as the social dynamics of small groups, large organizations, communities, institutions, and entire societies. Sociologists are typically motivated both by the desire to better understand the principles of social life and by the conviction that understanding these principles may aid in the formulation of enlightened and effective social policy. Sociology provides an intellectual background for students considering careers in the professions or business. Students may pursue degrees in sociology at the bachelor's, master's, or doctoral levels. The department organizes its courses by fields of study to assist students in tailoring their education and research to their academic interests and career goals.

FIELDS OF STUDY

Organizations, Business, and the Economy—Focus is on the arrangements which societies construct for the provision of material goods or services. A formal organization which provides goods or services for profit and sells them through a market is called a business, and the economic system is capitalism. Social needs are also met through government and not-for-profit organizations, such as garden clubs, hospitals, prisons, and the Red Cross; some private and social needs are met outside of organizations, such as health care provided by family members and exchange of favors among friends. Courses stress the factors that determine whether needs that people define are met through markets or non-market allocation, through organizations, or by other means. They also investigate the environmental and technical factors that shape organization structure, the determinants of how efficiently organizations operate, and the interpersonal processes that shape individual behavior within organizations. Careers related to this field include management and administration in business or public settings, management consulting and analysis, and legal studies related to corporations, organizations, and business.

Race and Ethnic Relations—Focus is on issues surrounding the emergence, persistence, and dynamics of conflict and cooperation among race and ethnic groups in the United States and elsewhere. Course topics include racial identity, sources of prejudice and hostility, emergence of minority rights movements, indigenous peoples' movements, ethnic genocide, ethnic collective violence, and cooperation among groups.

Social Movements, Comparative Politics, and Social Change—Focus is on the emergence, reproduction, and change of political systems and institutions, especially on why and how different political systems and social movements appear in different times and places, and how differences in political regimes and economic systems influence attempts to change these systems. The origins and significance of national and transnational social movements, transition to democracy, including revolution, nationalism, and other forms of collective action, in creating and sustaining these changes analyzed across countries and over time. Careers that are relevant to this field include law, public policy, government service, nonprofit and international nongovernmental organizations, business organizations (especially those with international interests), consulting, and managerial jobs.

Social Psychology and Interpersonal Processes—Focus is on the social organization of individual identity, beliefs, and behavior, and upon social structures and processes which emerge in and define interpersonal interactions. Processes studied include social acceptance and competition for prestige and status, the generation of power differences, the development of intimacy bonds, the formation of expectation states which govern performance in task oriented groups, and social pressures to constrain deviance. Foundation courses emphasize the effect of social processes on individual behavior and the analysis of group processes. This field provides training for careers with a significant interpersonal component, including advertising and marketing, business, education, law, management, medicine and health, or social work.

Social Stratification and Inequality—Focus is on forms of social inequality, including fields such as: the shape and nature of social inequalities; competition for power; allocation of privilege; production and reproduction of social cleavages; and consequences of class, race, and gender for outcomes such as attitudes, political behavior, and lifestyles. Many courses emphasize changes in the structure of social inequalities over time, and the processes which produce similarities or differences in stratification across nations. Topics include educational inequality, employment history, gender differences, income distributions, poverty, race, and ethnic relations, social mobility, and status attainment. Careers related to this field include administration, advertising, education, foreign service, journalism, industrial relations, law, management consulting, market research, public policy, and social service.

UNDERGRADUATE PROGRAMS

The departments offers two options leading to the B.A. degree: the general Sociology major and the Sociology major with a field of study. The general major consists of a core curriculum plus elective courses intended to provide breadth of exposure to the variety of areas encompassed by sociology. The major with a field of study consists of a core curriculum plus a concentrated set of courses in one specialized area of sociology.

To graduate with a B.A. in Sociology, students must complete a minimum of 65 units of course work in the major. Units applied to the major must be taken for a letter grade (except for SOC 190-193) and a grade point average (GPA) of 2.0 (C) or better must be achieved. Related course work from other departments may fulfill part of this requirement; such work must be pre-approved by the Sociology student services office and a faculty adviser and may not exceed 15 units.

CORE CURRICULUM FOR ALL MAJORS

Students are required to complete a minimum of 45 units of core and foundation course work as detailed below.

CORE COURSES REQUIRED FOR THE MAJOR

The following core courses (30 units) are required of majors. It is recommended that students complete SOC 181B, SOC 180A, and SOC 180B in this order.

1. SOC 1. Introduction to Sociology. Students should take this course early in their program.
2. SOC 170. Classics of Modern Social Theory.
3. SOC 181B. Sociological Methods: Statistics, or another introductory statistics course such as STATS 60, PSYCH 10, or equivalent.
4. SOC 180A. Foundations of Social Research

5. SOC 180B. Evaluation of Evidence
6. SOC 200. Junior/Senior Seminar for Majors. It is recommended that students take this course in Spring Quarter of the junior year or Autumn Quarter of the senior year. This course fulfills the Writing in the Major (WIM) requirement. Students considering honors are encouraged to enroll in SOC 202, Preparation for Honors Thesis, in the junior year; see "Honors Program" below.

FOUNDATION COURSES REQUIRED FOR THE MAJOR

In addition to core courses, students pursuing the B.A. in Sociology must complete at least three foundation courses (15 units). To ensure breadth of course work, each foundation course must represent a different field of study. For detailed information about Sociology concentration areas, see section on Fields of study (above). Foundation courses, classified by field of study, are as follows:

1. Organizations, Business, and the Economy: SOC 114 or 160
2. Race and Ethnic Relations: SOC 145 or 147A or 148
3. Social Movements, Comparative Politics, and Social Change: SOC 110 or 118 or 130
4. Social Psychology and Interpersonal Processes: SOC 120 or 121
5. Social Stratification and Inequality: SOC 140

GENERAL SOCIOLOGY MAJOR

To declare a major in Sociology, students must email the Sociology student services office once they have declared in Axess; see http://sociology.stanford.edu for contact information. It is recommended that new majors schedule a meeting with their assigned faculty adviser promptly after declaring the major.

In addition to the 45 units required in core and foundation course work, students pursuing the general Sociology major must complete 20 elective units of Sociology course work. Students may choose their elective courses according to personal interest; however, students are encouraged to complete some course work at the 200-level. Sociology majors are encouraged to participate in directed research or undertake independent research with Sociology faculty. Students who wish to engage in more in-depth study in a specific area may do so by declaring a field of study.

SOCIOLOGY MAJOR WITH FIELD OF STUDY

The Sociology major with a field of study allows students to pursue a more focused program in one of five fields of study. To complete the requirements for the B.A. degree in Sociology with a field of study, a student must complete all core and foundation course work requirements for the major plus 20 units of course work in the chosen field of study. At least one foundation course must be in the declared field of study (see above) and students are encouraged to take as many foundation courses within their field of study as possible. Sociology courses are listed by field of study in this bulletin. Fields of study are declared on Axess; students must also submit a Field of Study Declaration form to the Sociology student services office by the end of the first quarter of the senior year. Interested students should contact the Sociology student services office for additional information or to request a concentration declaration form. Fields of study are noted on the transcript; they do not appear on the diploma.

MINOR

Students must complete a minimum of 35 units in Sociology for the minor. Courses must be taken for a letter grade, and a minimum grade point average (GPA) of 2.0 (C) must be achieved. Students are encouraged to complete a course in sociological theory, such as SOC 170, and to obtain exposure to one of the fields of study. Students who wish to declare a minor in Sociology must do so no later than the deadline for their application to graduate.

Course requirements for a minor in Sociology are as follows:

	Units
SOC 1. Introduction to Sociology	5
SOC 180A. Foundations of Social Research, *and/or* SOC 180B. Evaluation of Evidence	5
Two foundation courses; see foundation courses required for the major above	10
Additional course work in the department (100- or 200-level courses)	15
Total course work required	35

HONORS PROGRAM

Sociology majors who wish to complete an independent scholarly project under the direction of a faculty member are encouraged to apply for admission to the department's honors program. Admission to the program requires a grade point average (GPA) of 3.5 or higher in courses taken within the major, and an overall GPA of 3.3 (B+) or higher in all undergraduate course work. Applicants are required to identify a Sociology faculty member to advise on the research and writing of the essay. With the approval of the director of the undergraduate studies committee, students may work with faculty advisers in other departments.

The honors project is typically initiated when a student enrolls in SOC 202, Preparation for Honors Thesis, or SOC 200, Junior/Senior Seminar. Students undertaking an honors project are encouraged to enroll in SOC 202 or 200 in the junior year. Students begin designing their honors project in connection with this seminar and in consultation with the seminar leader. If the student is admitted to the program, the honors project is completed during the senior year.

To apply to the honors program, students must complete the application form available from the Sociology student services office or from the department's web site. This form requires the faculty adviser's endorsement, a brief description of the proposed project, and a copy of the student's unofficial undergraduate transcript. Applicants must submit the completed application to the Sociology student services office no later than the fourth quarter before graduation, typically Spring Quarter of the junior year.

Honors students may earn up to 12 independent study units for work leading to completion of the required honors thesis, excluding units associated with the Junior/Senior Seminar. Completion of honors in Sociology requires: (1) completion of all requirements for the major; and (2) completion of a thesis of honors quality (a grade of 'A-' or higher). The thesis is due on or before the beginning of the End-Quarter period in the student's final quarter before graduating. If the thesis adviser is a faculty member outside the department, the thesis must be submitted to both that sponsor and to the Sociology student services office, who coordinates appointment of a departmental reader to evaluate the paper. Both the honors adviser and the reader must agree that the paper merits honors. In every case, two copies of the final paper must be submitted; one is retained by the department and becomes a part of the department's permanent collection. If a grade of 'A-' is not earned, the thesis credit counts toward meeting the standard major requirements.

GRADUATE PROGRAMS

MASTER OF ARTS

The Department of Sociology offers an M.A. degree only to students concurrently enrolled at Stanford. General University requirements for the master's degree are described in the "Graduate Degrees" section of this bulletin. The department does not have a terminal M.A. program for external applicants.

COTERMINAL M.A.

Stanford undergraduates, regardless of undergraduate major, who wish to pursue an M.A. in Sociology may apply for the coterminal master's program. The coterminal M.A. in Sociology is a flexible, self-designed program. Most students complete their M.A. in a fifth year at Stanford; occasionally students are able to complete their B.A. and coterminal M.A. in the fourth year. Typically, undergraduates apply in Autumn or Winter Quarter of their senior year.

Application and admission—Undergraduates must be admitted to the program and enrolled as a graduate student for at least one quarter prior to their B.A. conferral. A cumulative GPA of at least 3.5 in previous undergraduate work is required for admission. It is recommended that applicants have completed at least one Sociology course at the 100 level with a grade of 'B' or better. GRE test scores are not required. The department accepts applications the last day of classes each quarter. For the 2007-08 academic year, quarterly application deadlines are: Autumn, December 7; Winter, March 14; Spring, June 4; Summer, August 14. All application materials are submitted directly to the Sociology graduate student services office. Most applicants choose a field of study to focus their sociological studies; see "Fields of Study" above. To apply for admission to the Sociology coterminal M.A. program, students should submit the coterminal application and the following: (1) a 2-3 page statement of purpose stating the applicant's field of study; (2) a preliminary program proposal that specifies at least 45 units of course work relevant to the degree program with at least 35 units in Sociology; (3) a current unofficial undergraduate transcript; and (4) two letters of recommendation from Stanford faculty familiar with the student's academic work. The department does not fund coterminal M.A. students.

Program requirements—Coterminal M.A. students are required to take 45 units of course work during their graduate career; 35 of these units must be in Sociology courses. All units for the coterminal M.A. must be taken at or above the 100 level; advanced-level course work is encouraged and a minimum of 20 units must be taken at the 200 level. Students with a field of study must complete 20 units of course work in the field of study, including at least one foundation course from their field of study; see "Core Curriculum for Majors" above. Sociology courses are listed by field of study in this bulletin. Students who want to take courses outside the department must seek prior approval from the Sociology student services office; coterminal master's students are limited to 10 units from outside of the department. Students may transfer a maximum of 10 units from their undergraduate career; to be eligible for transfer, courses must have been taken in the two quarters preceding admission to the M.A. program. All units applied to the coterminal master's degree must be taken for a letter grade and an overall grade point average (GPA) of 3.0 (B) or better is required for the degree. Because research methods are an important component of graduate training in the social sciences, coterminal students are encouraged to take SOC 180A, Foundations of Social Research, and 180B, Evaluation of Evidence, in sequence when possible. These methods courses provide skills for research opportunities within the department and in academic or professional careers. Coterminal M.A. students should meet with their assigned faculty adviser upon acceptance to the program.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/pdf/CotermApplic.pdf.

M.A. FOR CURRENT GRADUATE STUDENTS

The M.A. degree in Sociology is available to current Ph.D. candidates in Sociology and to students in advanced degree programs (Ph.D., J.D., M.D.) from other Stanford departments and schools. Sociology Ph.D.s typically receive their M.A. in their second or third year of graduate study. Students must complete a minimum of 45 units of Sociology course work with a grade point average (GPA) of 3.0 (B) or better. All 45 units must be taken in courses taught by Sociology faculty and must be taken for a letter grade if possible. Research and directed reading courses are acceptable, but are limited to 15 units and must be approved in advance. Interested students should contact the Sociology student services office for additional information and approval of programs. University regulations pertaining to the M.A. are listed in the "Graduate Degrees" section of this bulletin. Students are not expected to choose a field of study, but may do so if desired. No thesis is required. While formal application to the M.A. program is not required, applicants from outside of the Sociology department must submit: (1) a completed Graduate Authorization Petition form (available from the Office of the University Registrar); (2) a completed Program Proposal for an M.A. form (available from the Office of the University Registrar); and (3) a short statement of purpose to the Sociology student services office.

DOCTOR OF PHILOSOPHY

The Ph.D. curriculum and degree requirements are designed to provide students with the knowledge and skills to become proficient scholars and teachers. Doctoral students in the department must take required courses for a letter grade if available and are expected to earn a grade of 'B+' in each course. Any grade of 'B' or below is considered to be less than satisfactory.

Students must complete the following department requirements for the Ph.D. degree in Sociology:

1. Students must enroll in SOC 305, Graduate Proseminar, in Autumn Quarter of the first year; the course provides an introduction and orientation to the field of sociology, and the department and faculty. One unit of credit is given for this course; grading is on a satisfactory/no credit basis.
2. Students must complete three quarters of research experience, working under the supervision of one or more faculty members, including regular, emeritus, and affiliated faculty. The experience may involve paid work as a research assistant (RA), or unpaid work as a research apprentice. With prior approval, this requirement may be met through work on research projects conducted outside the department or University. It is recommended that students complete their research requirements early in their graduate program; the requirement must be completed by the end of the fourth year of residency.
3. Students must complete three quarters of teaching apprenticeship in departmental courses, or in other courses by approval. Work as either a teaching assistant (TA) under the supervision of a faculty member or as a teaching fellow (TF) fulfills this requirement. Students are required to take SOC 300, Workshop: Teaching Development, in Spring Quarter of the first year. In addition, students are encouraged to take advantage of department and University teacher training programs. Students for whom English is a second language are expected to acquire sufficient facility in English to be an effective teacher.
4. Students must complete four broad survey courses to demonstrate command of a range of sociological literatures. Each year the department specifies which courses meet this requirement, and undertakes to ensure that an adequate selection of such courses is offered. A list of courses that fulfill this requirement is listed in the requirements section below. Students should consult with their adviser to ensure that the combination of courses chosen to meet this requirement exhibits sufficient breadth. This requirement is normally completed by the end of the second year of residency and must be met by the end of the third year of residency.
5. Students must take one course in classical sociological theory (SOC 370A or B, or equivalent), and one course on the development of theory and research design (SOC 372 or equivalent). It is recommended that students complete SOC 370A and B, although only one of these courses is formally required.
6. Students must complete the series of required research methods courses listed in the requirements section below. Students with little background in statistics are encouraged to take SOC 281B or equivalent.
7. Beginning in year two, doctoral students are required to enroll in at least one workshop each quarter. Due to unit constraints, students may petition the Sociology student services office to attend a workshop without enrolling; such attendance is not noted on the transcript.
8. Students must complete a paper in the second year of residency on any sociological topic; it may address theoretical, empirical, or methodological issues. The paper is expected to reflect original work and is considered an important piece of evidence in the decision to advance to candidacy. A two-person committee that includes the primary adviser evaluates the paper. Although the reading committee is usually comprised of two regular faculty members in the department, emeritus and affiliated faculty may also serve as readers. The two readers of the second-year paper committee provide a review that speaks to: (1) whether the paper is publishable; and (2) what types of revisions, insofar as the paper is publishable, the student should pursue to ready the paper for publication. These comments are shared with the Director of Graduate Studies. Additionally, the committee meets with the student in June of the second year to discuss these reviews. To ensure that students are making adequate progress on their paper, students are required to provide a first draft of the paper to readers by April 1. The final deadline for paper submission is May 15. This deadline applies to students who entered the department in 2006-07 and later.
9. Students are required to present at least two papers at a major professional meeting in their first five years of graduate study.

10. Students must prepare a dissertation prospectus and pass the University oral examination. The oral exam is intended to evaluate the dissertation prospectus or a partial draft of the dissertation and to assess the student's knowledge of the theory and research in the area in which the project intends to contribute. This requirement must be completed by December 1 of the fourth year of residency.
11. Each student must complete a doctoral dissertation. At the choice of the student, and in consultation with the adviser, the dissertation requirement may be met either by submitting the standard book-style document or by submitting three independent papers. The latter papers may address the same topic, but should be written as stand-alone, single-authored papers in standard journal format. None of these papers may overlap substantially with the second-year paper or with one another. The main criterion in judging substantial overlap is whether any standard journal, such as *The American Journal of Sociology*, would regard the papers as too similar to publish both. The dissertation must be submitted to all committee members at least 30 days in advance of the filing deadline. Assessment of satisfactory completion is determined by the student's doctoral committee members. Students are invited to present their dissertation findings at an informal department colloquium.

The faculty is responsible for providing students with timely and constructive feedback on their progress toward the Ph.D. In order to evaluate student progress and to identify potential problem areas, the department's faculty reviews the academic progress of each first-year student at the beginning of Winter and Spring quarters and again at the end of the academic year. The first two reviews are primarily intended to identify developing problems that could impede progress. In most cases, students are simply given constructive feedback, but if more serious concerns warrant, a student may be placed on probation with specific guidelines for addressing the problems detected. The review at the end of Spring Quarter is more thorough; each student's performance during the first year is reviewed and discussed. Possible outcomes of the spring review include: (1) continuation of the student in good standing, or (2) placing the student on probation, with specific guidelines for the period of probation and the steps to be taken in order to be returned to good standing. For students on probation at this point (or at any other subsequent points), possible outcomes of a review include: (1) restoration to good standing; (2) continued probation, again with guidelines for necessary remedial steps; or (3) termination from the program. Students leaving the program at the end of the first year are usually allowed to complete the requirements to receive an M.A. degree, if this does not involve additional residence or financial support. All students are given feedback from their advisers at the end of their first year of graduate work, helping them to identify areas of strengths and potential weakness.

At the end of the second year of residency, the faculty again review the progress of all doctoral students in the program. Students who are performing well, as indicated by their course work, teaching and research apprenticeship performance, and second-year paper, are advanced to candidacy. This step implies that the student has demonstrated the relevant qualities required for successful completion of the Ph.D. Future evaluations are based on the satisfactory completion of specific remaining department and University requirements. Students who are still on probation at this stage may be (1) advanced to candidacy; (2) retained on probation with specification of the steps still required to be removed from this status; or (3) terminated from the program.

At any point during the degree program, evidence that a student is performing at a less than satisfactory level may be cause for a formal academic review of that student.

REQUIREMENTS

SURVEY COURSES

Students must complete four courses from an approved list. This list is updated and circulated to students at the start of each academic year. *Note:* class offerings rotate; not all approved survey courses are offered every year. The following courses typically fulfill the survey course requirement:

308. Social Demography
310. Political Sociology
314. Economic Sociology
316. Historical and Comparative Sociology
318. Social Movements and Collective Action
320. Foundations of Social Psychology
322. Social Interaction, Social Structure, and Social Exchange
340. Social Stratification
342B. Gender and Social Structure
345. Comparative Race and Ethnic Relations
360. Foundations of Organizational Sociology
363A. Seminar on Organizational Theory

RESEARCH METHODS

The following course requirements apply to students who entered the Ph.D program in 2005-06 or later. Students are also expected to complete one elective from a list of approved courses that is updated and circulated at the start of each academic year. Students are required to enroll in 384, Sociology Methodology IV: New Models and Methods, in their first or second year of the program; this course is offered in alternate years.

281B. Statistics (not required but recommended for students with little statistical background)
381. Sociological Methodology I: Introduction
382. Sociological Methodology II: The General Linear Model
383. Sociological Methodology III: Advanced Models for Discrete Outcomes
384. Sociology Methodology IV: New Models and Methods
385A. Research Practicum I
385B. Research Practicum II

The following course requirements apply to students who entered the Ph.D program in 2004-05 or earlier.

281B. Statistics (recommended for students with little statistical background)
381A. Sociological Methodology I: Computer Assisted Data Analysis
382. Sociological Methodology II: The General Linear Model
383. Sociological Methodology III: Advanced Models for Discrete Outcomes
388. Advanced Models for Analysis of Tabular Arrays
  or 389. Mixed Method Research Design

THEORY

370A. Sociological Theory: Social Structure, Inequality, and Conflict
  or 370B. Sociological Theory: Social Interaction and Group Processes
372. Theoretical Analysis and Design

Students must complete additional course work sufficient to prepare them to write their second-year paper.

PH.D. MINOR

Sociology offers a minor for currently enrolled doctoral students in other Stanford departments and schools. Students must complete a minimum of 30 graduate-level units with a grade point average (GPA) of 3.0 (B) or better. All 30 units for the minor are to be in courses taught by Sociology faculty with the following exception: 5 units may be taken in a statistics or methods course taught in another department. All units must be taken for a letter grade. Research and directed reading courses are acceptable, but are limited to 15 units and must be approved in advance. The program must be approved by a Sociology adviser and filed with the Sociology student services office. While there is not a formal application process, candidates must submit a short statement of purpose (2 pages), and a completed Application for Ph.D Minor, available from the Office of the University Registrar) to the Sociology student services office. The Application for Ph.D. Minor must have all Sociology or other courses to be applied to the minor listed including course number, units, and final grades.

JOINT PROGRAMS WITH THE SCHOOL OF LAW

The School of Law and Department of Sociology conduct joint programs leading to either a combined J.D. degree with an M.A. degree in Sociology or to a combined J.D. degree with a Ph.D. in Sociology.

Law students interested in pursuing an M.A. in Sociology apply for admission to the Department of Sociology during the first year of Law school. Once admitted to the Department of Sociology, the student must complete standard departmental master's degree requirements as specified in this bulletin. Applications for the joint J.D./M.A. degree program must be approved by both the department and the Law school. Faculty advisers from each program participate in the planning and supervising of the student's academic program.

The J.D./Ph.D. degree program is designed for students who wish to prepare themselves for research or teaching careers in areas relating to both legal and sociological concerns. Students interested in the joint degree program must be admitted to both the School of Law and the Department of Sociology. Interest in the joint degree program must be noted on each of the student's applications. Alternatively, an enrolled student in either the Law School or the Sociology department may apply to the other program, preferably during their first year of study.

Upon admission, students are assigned a joint program faculty adviser who assists the student in planning an appropriate program and ensuring that all requirements for both degrees are satisfied. The faculty adviser serves in this capacity during the student's course of study regardless of whether the student is enrolled in the School of Law or the Sociology department.

J.D./Ph.D. students may elect to begin their course of study in either the School of Law or the Department of Sociology. Students must be enrolled full-time in the Law school for the first year of Law school, and must enroll full time in the graduate school for the first year of the sociology program. After that time, enrollment may be in the graduate school or the Law school, and students may choose courses from either program regardless of where enrolled. Students must satisfy the requirements for both the J.D. and the Ph.D. degrees. Up to 54 semester (81 quarter) hours of approved courses may be counted toward both degrees, but no more than 24 semester (36 quarter) hours of courses that originate outside the Law school may count toward the Law degree. To the extent that courses under this joint degree program originate outside of the Law school but count toward the Law degree, the Law school credits permitted under Section 17(1) of the Law School Regulations for cross-registration in other schools or departments of Stanford University are reduced on a unit-per-unit basis, but not below zero. Students must complete the equivalent of 183 quarter units to complete both degrees. Tuition and financial aid arrangements normally are through the school in which the student is currently enrolled.

For more information, see the Sociology web site at http://sociology.stanford.edu/, and the Law School web site on the J.D./Ph.D. at http://www.law.stanford.edu/program/degrees/joint/sociology/.

COURSES

Courses are open to all students without prerequisites, unless indicated. Courses numbered below 100 are introductory courses intended for undergraduates. Courses numbered 100 - 202 are undergraduate-level courses. Courses numbered 203-299 are open to advanced undergraduates and graduate students. Courses numbered 300 and above are normally offered to matriculated doctoral students only.

OPEN TO ALL STUDENTS

INTRODUCTORY

SOC 1. Introduction to Sociology—Concepts, methods, and theoretical orientations. Sociological imagination illustrated by recent theory and research. Possible topics: the persistence of class cleavages; ethnic, racial, and gender inequalities; religious beliefs and the process of secularization; functions and dysfunctions of educational institutions; criminology and social deviance; social movements and social protest; production and reproduction of culture; rise of organizational society. GER:DB-SocSci

5 units, Aut (McAdam, D), Spr (Snipp, C)

SOC 15N. The Transformation of Socialist Societies—Stanford Introductory Seminar. Preference to freshmen. The impact of societal organization on the lives of ordinary people in socialist societies and in the new societies arising through the processes of political, economic, and social transformation. Do the concepts of democratization and marketization suffice to characterize ongoing changes? Enrollment limited to 16. GER: DB-SocSci, EC-GlobalCom

3 units, Win (Tuma, N)

SOC 22N. The Roots of Social Protest—Stanford Introductory Seminar. Preference to freshmen. The conditions under which social protest occurs and the emergence, success, and viability of contemporary social movements. Examples include women's civil rights, ecology, and antiwar and anti-globalization movements in the U.S. and elsewhere. Sociological theories to explain the timing, location, and causes of mobilization; how researchers evaluate these theories. Comparison of tactics, trajectories, and outcomes. Enrollment limited to 16. GER: DB-SocSci. EC-GlobalCul

3 units, Aut (Olzak, S)

SOC 45Q. Understanding Race and Ethnicity in American Society—Stanford Introductory Seminar. Preference to sophomores. A brief historical overview of race in America, race and violence, race and socioeconomic wellbeing, and the future of race relations in America. Enrollment limited to 16. GER:DB-SocSci

5 units, Aut (Snipp, C)

SOC 46N. Race, Ethnic, and National Identities: Imagined Communities—Stanford Introductory Seminar. Preference to freshmen. How new identities are created and legitimated. What does it mean to try on a different identity? National groups and ethnic groups are so large that one individual can know only an infinitesimal fraction of other group members. What explains the seeming coherence of groups? If identities are a product of the imagination, why are people willing to fight and die for them? Enrollment limited to 16. GER:DB-SocSci

3 units, Spr (Rosenfeld, M)

SOC 103A. Tutoring: Seeing a Child through Literacy—(Same as EDUC 103A.) For undergraduates to engage in the real world of teaching; required of all STEP elementary credential candidates. Focus is on teaching struggling young readers. The role of instruction in literacy development; supervised tutoring of a child; seeing the worlds of school, print, and learning through the eyes of a child. Ravenswood Reads tutors encouraged to enroll.

4 units, Aut (England, P; Juel, C)

SOCIAL MOVEMENTS, COMPARATIVE POLITICS, AND SOCIAL CHANGE

SOC 109. Sociology of Terrorism—(Graduate students register for 209.) Multidisciplinary, including psychology, sociology, political science, economics. Comparison of terrorist organizations and movements across institutions, places, and times; their motives, tactics, financing, and organization. Guest lecturers. Sources include movies, novels, and research literature.

5 units, Spr (Meyersson Milgrom, E)

SOC 110. Politics and Society—(Graduate students register for 210.) Themes of political sociology, conceptions of power and state structures throughout history, the origins and expansion of the modern state, linkages between state and society, impact of the modern world system on national policies, internal distribution of power and authority, structure of political group formation and individual participation in modern states, and future trends of politics and society in a globalized world. Emphasis is on developing conceptual understandings of state, society, and politics in the modern world. GER:DB-SocSci

5 units, Aut (Beck, C)

SOC 111. State and Society in Korea—(Graduate students register for 211.) 20th-century Korea from a comparative historical perspective. Colonialism, nationalism, development, state-society relations, democratization, and globalization with reference to the Korean experience. GER:DB-SocSci, EC-GlobalCom

5 units, alternate years, not given this year

SOC 116. Understanding Social Changes in China: A Global Perspective—(Graduate students register for 216; same as EASTASN 116/216.) Since 1949. Mao's accession to power. Deng Xiaoping's economic reforms that started the transformation of Chinese society. New policies to address increasing social problems and rapid urbanization. Employment and labor market reform, urban housing, urban health care, and pension reform. Focus is on changing patterns of social structures and groups, family and marriage, education, and social welfare programs.

5 units, Win (Quiang, L)

SOC 117A. China Under Mao—(Graduate students register for 217A.) The transformation of Chinese society from the 1949 revolution to the eve of China's reforms in 1978: the creation of a socialist economy, the reorganization of rural society and urban workplaces, the emergence of new inequalities of power and opportunity, and the new forms of social conflict during Mao's Cultural Revolution of 1966-69 and its aftermath. GER: DB-SocSci, EC-GlobalCom
5 units, Aut (Walder, A)

SOC 118. Social Movements and Collective Action—(Graduate students register for 218.) Why social movements arise, who participates in them, the obstacles they face, the tactics they choose, and how to gauge movement success or failure. Theory and empirical research. Application of concepts and methods to social movements such as civil rights, environmental justice, antiglobalization, and anti-war. GER:DB-SocSci
5 units, not given this year

SOC 130. Education and Society—(Graduate students register for 230; same as EDUC 220C.) The effects of schools and schooling on individuals, the stratification system, and society. Education as socializing individuals and as legitimizing social institutions. The social and individual factors affecting the expansion of schooling, individual educational attainment, and the organizational structure of schooling. GER:DB-SocSci
4-5 units, Aut (Ramirez, F)

SOC 136. Sociology of Law—(Graduate students register for 236; same as LAW 538.) Major issues and debates. Topics include: historical perspectives on the origins of law; rationality and legal sanctions; normative decision making and morality; cognitive decision making; crime and deviance; the law in action versus the law on the books; organizational responses to law in the context of labor and employment; the roles of lawyers, judges, and juries; and law and social change emphasizing the American civil rights movement. GER:DB-SocSci
3-5 units, Aut (Dauber, M)

SOC 138. American Indians in Comparative Historical Perspective—(Graduate students register for 238.) Demographic, political, and economic processes and events that shaped relations between Euro-Americans and American Indians, 1600-1890. How the intersection of these processes affected the outcome of conflicts between these two groups, and how this conflict was decisive in determining the social position of American Indians in the late 19th century and the evolution of the doctrine of tribal sovereignty.
5 units, Win (Snipp, C)

SOC 139. American Indians in Contemporary Society—(Graduate students register for 239.) The social position of American Indians in contemporary American society, 1890 to the present. The demographic resurgence of American Indians, changes in social and economic status, ethnic identification and political mobilization, and institutions such as tribal governments and the Bureau of Indian Affairs. Recommended: 138 or a course in American history. GER:EC-AmerCul
5 units, Spr (Snipp, C)

SOC 143. Prejudice, Racism, and Social Change—(Graduate students register for 243.) Ethno-racial attitudes and beliefs in the U.S. since 1965. Conflict including urban riots and cooperation including interracial dating, marriage, and mixed-race identity. Changes in racial prejudice and racism and their influence in domains of life such as jobs, housing, political power, and everyday interactions.
5 units, not given this year

SOC 144. Race and Crime in America—(Graduate students register for 244.) Theories of involvement in crime and deviance emphasizing youth gangs, poverty, the impact of racial residential segregation on involvement in crime, and the impact of high rates of incarceration. The role of the media in fostering fear of crime and racial stereotypes. Public policy questions such as post-incarceration disenfranchisement and reintegration.
5 units, not given this year

SOC 147A. Comparative Ethnic Conflict—(Graduate students register for 247A.) Causes and consequences of racial and ethnic conflict, including nationalist movements, ethnic genocide, civil war, ethnic separatism, politics, indigenous peoples' movements, and minority rights' movements around the world. GER:DB-SocSci, EC-GlobalCom
5 units, Win (Olzak, S)

SOCIAL PSYCHOLOGY AND INTERPERSONAL PROCESSES

SOC 120. Interpersonal Relations—(Graduate students register for 220.) Forming ties, developing norms, status, conformity, deviance, social exchange, power, and coalition formation; important traditions of research have developed from the basic theories of these processes. Emphasis is on understanding basic theories and drawing out their implications for change in a broad range of situations, families, work groups, and friendship groups. GER:DB-SocSci
5 units, Aut (Ridgeway, C)

SOC 121. The Individual in Social Structure: Foundations in Sociological Social Psychology—(Graduate students register for 221.) Dynamics of the relationship between the individual and social structure, the relationship between the individual and immediate social context, and relationships between individuals. Focus is on the dominant theoretical perspectives in sociological social psychology: social structure and personality, structural social psychology, and symbolic interactionism. GER:DB-SocSci
5 units, Spr (Chin, L)

SOC 123. Sex and Love in Modern Society—(Graduate students register for 223.) Social influences on private intimate relations involving romantic love and sexuality. Topics include the sexual revolution, contraception, dating, hook-ups, cohabitation, sexual orientation, and changing cultural meanings of marriage, gender, and romantic love. GER:DB-SocSci, EC-Gender
3-5 units, Aut (England, P)

SOC 125A. Understanding Religion in a Global Context—(Graduate students register for 225A.) American and western scholarly thought about religion from social and sociological perspectives. Challenges to assumptions in the 21st century. A framework for understanding issues such as global religious movements, religious nationalism, secular nationalism, and violence as a means to religious ends. Topics include American religious history, contemporary American religions, legal and social interpretations of freedom of religion, definitions of religious rights across the global culture, and strategic responses by policymakers. GER:DB-SocSci
5 units, Spr (Chang, P)

SOC 126. Introduction to Social Networks—(Graduate students register for 226.) Theory, methods, and research. Concepts such as density, homogeneity, and centrality; applications to substantive areas. The impact of social network structure on individuals and groups in areas such as communities, neighborhoods, families, work life, and innovations. GER:DB-SocSci
5 units, Aut (Hillmann, H)

SOC 127. Bargaining, Power, and Influence in Social Interaction—(Graduate students register for 227.) Research and theoretical work on bargaining, social influence, and issues of power and justice in social settings such as teams, work groups, and organizations. Theoretical approaches to the exercise of power and influence in social groups and related issues in social interaction such as the promotion of cooperation, effects of competition and conflict, negotiation, and intergroup relations. Enrollment limited to 40. GER:DB-SocSci
5 units, not given this year

SOC 155. The Changing American Family—(Graduate students register for 255.) Family change from historical, social, demographic, and legal perspectives. Extramarital cohabitation, divorce, later marriage, interracial marriage, and same-sex cohabitation. The emergence of same-sex marriage as a political issue. Are recent changes in the American family really as dramatic as they seem? Theories about what causes family systems to change. GER:DB-SocSci, EC-AmerCul

5 units, Spr (Rosenfeld, M)

SOCIAL STRATIFICATION AND INEQUALITY

SOC 135. Poverty, Inequality, and Social Policy in the United States—(Graduate students register for 235.) Causes and consequences. Effects of antipoverty policies, and debates over effective social policies. Focus is on how poverty and inequality are experienced by families, children, and communities. Topics include welfare reform and labor market policies, education, and community-based antipoverty strategies. GER:DB-SocSci

5 units, Win (Wimer, C)

SOC 138. American Indians in Comparative Historical Perspective—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.

5 units, Win (Snipp, C)

SOC 139. American Indians in Contemporary Society—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.

5 units, Spr (Snipp, C)

SOC 140. Introduction to Social Stratification—(Graduate students register for 240.) The main classical and modern explanations of the causes of social, economic, and political inequality. Issues include: power; processes that create and maintain inequality; the central axes of inequality in contemporary societies (race, ethnicity, class, and gender); the consequences of inequality for individuals and groups; and how social policy can mitigate and exacerbate inequality. Cases include technologically simple groups, the Indian caste system, and the modern U.S. GER:DB-SocSci

5 units, Win (Sandefur, R)

SOC 141. Controversies about Inequality—(Graduate students register for 241.) Debate format involving Stanford and guest faculty. Forms of inequality including racial, ethnic, and gender stratification; possible policy interventions. Topics such as welfare reform, immigration policy, affirmative action, discrimination in labor markets, sources of income inequality, the duty of rich nations to help poor nations, and causes of gender inequality. GER:DB-SocSci

5 units, Spr (Grusky, D)

SOC 141B. Race, Ethnicity, Religion, and Health—(Graduate students register for 241B.) Differences in health status and access to care. Current research.

5 units, Spr (Gonzalez, M)

SOC 142. Sociology of Gender—(Graduate students register for 242.) Gender inequality in contemporary American society and how it is maintained. The social and relative nature of knowledge and the problems this poses for understanding sex differences and gendered behavior in society. Analytical levels of explanation for gender inequalities: socialization, interaction processes, and socioeconomic processes; arguments and evidence for each approach. The social consequences of gender inequality such as the feminization of poverty, and problems of interpersonal relations. GER:EC-Gender

3-5 units, Win (Ridgeway, C)

SOC 143. Prejudice, Racism, and Social Change—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.

5 units, not given this year

SOC 144. Race and Crime in America—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.

5 units, not given this year

SOC 147A. Comparative Ethnic Conflict—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.

5 units, Win (Olzak, S)

SOC 147B. Introduction to African and African American Studies—(Graduate students register for 247B; same as AFRICAAM 105.) Interdisciplinary. Central themes in African American culture and history related to race as a definitive American phenomenon. Possible topics: African survivals and interpretations of slavery in the New World, contrasting interpretations of the Black family, African American literature, and art. Possible readings: Frederick Douglass, Harriet Jacobs, Booker T. Washington, W.E.B. DuBois, Richard Wright, Maya Angelou, James Baldwin, Malcolm X, Alice Walker, and bell hooks. Focus may vary each year. GER:DB-Hum, EC-AmerCul

5 units, Spr (Staff)

SOC 149. The Urban Underclass—(Graduate students register for 249; same as URBANST 112.) Recent research and theory on the urban underclass, including evidence on the concentration of African Americans in urban ghettos, and the debate surrounding the causes of poverty in urban settings. Ethnic/racial conflict, residential segregation, and changes in the family structure of the urban poor. GER:DB-SocSci, EC-AmerCul

5 units, Aut (Rosenfeld, M)

SOC 149X. Urban Politics—(Graduate students register for 249X; same as POLISCI 121, URBANST 111.) The major actors, institutions, processes, and policies of sub-state government in the U.S., emphasizing city general-purpose governments through a comparative examination of historical and contemporary politics. Issues related to federalism, representation, voting, race, poverty, housing, and finances. Prerequisite: POLISCI 2 or consent of instructor. GER:DB-SocSci

5 units, Aut (Bischoff, K)

SOC 165G. American Dreams: Mexican Americans, Immigration since 1964, and the Middle Class—(Same as CHICANST 165G, CSRE 165G.) How does the Mexican American population stand in relation to the attainment of middle-class status? Topics include immigration, religion, political participation, the labor market, marriage, and pan-ethnic identification. Introduction to sociological methodology. Final project.

5 units, Win (Gonzalez, M)

ORGANIZATIONS, BUSINESS, AND THE ECONOMY

SOC 114. Economic Sociology—(Graduate students register for 214.) The sociological approach to production, distribution, consumption, and markets, emphasizing the impact of norms, power, social structure, and institutions on the economy. Comparison of classic and contemporary approaches to the economy among the social science disciplines. Topics: consumption, labor markets, organization of professions such as law and medicine, the economic role of informal networks, industrial organization, including the structure and history of the computer and popular music industries, business alliances, capitalism in non-Western societies, and the transition from state socialism in E. Europe and China. GER:DB-SocSci

5 units, Aut (Granovetter, M)

SOC 115. Topics in Economic Sociology—(Graduate students register for 215.) Discussion of topics initially explored in 114/214, with emphasis on countries and cultures outside N. America. Possible topics: families and ethnic groups in the economy, corporate governance and control, corporate strategy, relations among firms in industrial districts and business groups, the impact of national institutions and cultures on economic outcomes, transitions from state socialism and the role of the state in economic development. Possible case studies: the U.S., Germany, Italy, Britain, France, Brazil, Korea, India, Japan, and China. Prerequisite: 114/214 or 314. GER:DB-SocSci

5 units, Win (Granovetter, M)

SOC 126. Introduction to Social Networks—For description, see "Social Psychology and Interpersonal Processes" subsection above.
5 units, Aut (Hillmann, H)

SOC 160. Formal Organizations—(Graduate students register for 260.) The roles of formal organizations in production processes, market transactions, and social movements; and as sources of income and ladders of mobility. Relationships of modern organizations to environments and internal structures and processes. Concepts, models, and tools for analyzing organizational phenomena in contemporary societies. Sources include the literature and case studies. GER:DB-SocSci
5 units, Win (Zhou, X)

SOC 161. The Social Science of Entrepreneurship—(Graduate students register for 261.) Who is likely to become an entrepreneur and where is entrepreneurship likely to occur? Classic and contemporary theory and research. Interaction with expert practitioners in creating entrepreneurial opportunities including venture and corporate capitalists. The role of culture, markets, hierarchies, and networks. Market creation and change, and factors that affect success of new organizations. Field projects on entrepreneurial environments such as technology licensing offices, entrepreneurial development organizations, venture capital firms, and corporate venturing groups. GER:DB-SocSci
5 units, Spr (Thornton, P)

SOC 167A. Asia-Pacific Transformation—(Graduate students register for 267A.) Post-WW II transformation in the Asia-Pacific region, with focus on the ascent of Japan, the development of newly industrialized capitalist countries (S. Korea and Taiwan), the emergence of socialist states (China and N. Korea), and the changing relationship between the U.S. and these countries. GER:DB-SocSci, EC-GlobalCom
5 units, Win (Shin, G)

SOC 175. Global Cities and the Transnational Economy—(Graduate students register for 275; same as URBANST 175.) How key cities command and coordinate the global economy. Why a division of labor exists amongst a global hierarchy of cities. How economic globalization creates a need for sophisticated information analysis and decision making capabilities. Why corporate headquarters and advanced services are concentrated in a handful of cities. Cluster-oriented development strategies. Case studies. Concepts, theories, and tools from economic sociology and regional economics.
5 units, Spr (Choi, J)

RACE AND ETHNIC RELATIONS

SOC 109. Sociology of Terrorism—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.
5 units, Spr (Meyersson Milgrom, E)

SOC 138. American Indians in Comparative Historical Perspective—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.
5 units, Win (Snipp, C)

SOC 139. American Indians in Contemporary Society—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.
5 units, Spr (Snipp, C)

SOC 141B. Race, Ethnicity, Religion, and Health—For description, see "Social Stratification and Inequality" subsection above.
5 units, Spr (Gonzalez, M)

SOC 143. Prejudice, Racism, and Social Change—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.
5 units, not given this year

SOC 144. Race and Crime in America—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.
5 units, not given this year

SOC 145. Race and Ethnic Relations—(Graduate students register for 245.) Race and ethnic relations in the U.S. and elsewhere. The processes that render ethnic and racial boundary markers, such as skin color, language, and culture, salient in interaction situations. Why only some groups become targets of ethnic attacks. The social dynamics of ethnic hostility and ethnic/racial protest movements. GER:EC-AmerCul
5 units, not given this year

SOC 147A. Comparative Ethnic Conflict—For description, see "Social Movements, Comparative Politics, and Social Change" subsection above.
5 units, Win (Olzak, S)

SOC 147B. Introduction to African and African American Studies—For description, see "Social Stratification and Inequaltiy" subsection above.
5 units, Aut (Staff)

SOC 165G. American Dreams: Mexican Americans, Immigration since 1964, and the Middle Class—For description, see "Social Stratification and Inequaltiy" subsection above.
5 units, Win (Gonzalez, M)

SOCIOLOGICAL THEORY

SOC 170. Classics of Modern Social Theory—(Graduate students register for 270). Contributions of Marx, Weber, and Durkheim to contemporary sociology. Topics: the problem of social order and the nature of social conflict; capitalism and bureaucracy; the relationship between social structure and politics; the social sources of religion and political ideology; and the evolution of modern societies. Examples from contemporary research illustrate the impact of these traditions. GER:DB-SocSci
5 units, Win (McDermott, M)

RESEARCH METHODS

SOC 180A. Foundations of Social Research—(Graduate students register for 280A.) Formulating a research question, developing hypotheses, probability and non-probability sampling, developing valid and reliable measures, qualitative and quantitative data, choosing research design and data collection methods, challenges of making causal inference, and criteria for evaluating the quality of social research. How social research is done, rather than application of different methods. Limited enrollment; preference to Sociology and Urban Studies majors, and Sociology coterms.
5 units, Aut (Sorensen, A)

SOC 180B. Evaluation of Evidence—(Graduate students register for 280B.) Methods for analyzing and evaluating data in sociological research: comparative historical methods, ethnographic observation, quantitative analysis of survey data, experimentation, and simulation. Emphasis is on application of these methods through small data analysis projects. Limited enrollment; preference to Sociology and Urban Studies majors, and Sociology coterms.
5 units, Win (Hillmann, H)

SOC 181B. Sociological Methods: Statistics—(Graduate students register for 281B.) Statistical methods of relevance to sociology: contingency tables, correlation, and regression. GER:DB-Math
5 units, not given this year

SOC 200. Junior/Senior Seminar for Majors—Capstone course in which sociological problems are framed, linked to theories, and answers pursued through research designs. WIM
5 units, Aut (McDermott, M), Spr (Gerbasi, A)

SOC 201. Preparation for Senior Project—(Same as URBANST 201.) First part of capstone experience for Urban Studies majors pursuing an internship-based research project or honors thesis. Individually arranged internship beginning in Winter Quarter, 8 hours per week. Prospective students must consult with internship coordinator early in Autumn Quarter to plan placement. Reflections and assignments culminate in a research proposal, which may submitted for funding. Internship normally continues in Spring Quarter; research proposed in the final assignment may be carried out in Spring or Summer Quarter; consent required for Autumn Quarter research. Corequisite: URBANST 201A.
5 units, Win (Kahan, M)

SOC 202. Preparation for Honors Thesis—(Same as URBANST 202.) Primarily for juniors in Sociology or Urban Studies; sophomores who plan to be off-campus Winter Quarter of their junior year may register with consent of instructor. First part of capstone experience for Urban Studies majors pursuing a non-internship based research project or honors thesis. Urban Studies majors enrolling in 202 rather than 201 must arrange an alternative way of fulfilling the internship requirement. Students write a research prospectus and grant proposal, which may be submitted for funding. Research proposal in final assignment may be carried out in Spring or Summer Quarter; consent required for Autumn Quarter research.
5 units, Win (McAdam, D)

INDIVIDUALIZED LEARNING EXPERIENCES, PRIMARILY FOR UNDERGRADUATE MAJORS

SOC 190. Undergraduate Individual Study—Prior arrangement required.
1-5 units, Aut, Win, Spr, Sum (Staff)

SOC 191. Undergraduate Directed Research—Project of student's choice under supervision of a faculty member. Prior arrangement required.
1-5 units, Aut, Win, Spr, Sum (Staff)

SOC 192. Undergraduate Research Apprenticeship—Work in an apprentice-like relationship with faculty on an on-going research project. Prior arrangement required.
1-5 units, Aut, Win, Spr, Sum (Staff)

SOC 193. Undergraduate Teaching Apprenticeship—Prior arrangement required.
1-5 units, Aut, Win, Spr, Sum (Staff)

SOC 196. Senior Thesis—Work on an honors thesis project under faculty supervision (see description of honors program). Must be arranged early in the year of graduation or before.
1-15 units, Aut, Win, Spr, Sum (Staff)

FOR ADVANCED/COTERMINAL UNDERGRADUATES AND MASTER'S STUDENTS

SOCIAL MOVEMENTS , COMPARATIVE POLITICS, AND SOCIAL CHANGE

SOC 203. The Transnational Workplace—(Graduate students register for 303.) Experiential one-month workshop: October 24-November 24. Challenges posed by multicultural, transnational work environments. The structure of the multinational modern firm, transnational human resource practices, management profiles, and cultural intelligence. Students cooperate with graduate students in other universities worldwide to create virtual work teams and compose the final assignment for the seminar.
5 units, Aut (Drori, G)

SOC 209. Sociology of Terrorism—(For graduate students; see 109.)
5 units, Spr (Meyersson Milgrom, E)

SOC 210. Politics and Society—(For graduate students; see 110.)
5 units, Aut (Staff)

SOC 211. State and Society in Korea—(For graduate students; see 111.)
5 units, alternate years, not given this year

SOC 216. Understanding Social Changes in China: A Global Perspective —(For graduate students; see 116.)
5 units, Win (Quiang, L)

SOC 217A. China Under Mao—(For graduate students; see 117A)
5 units, Aut (Walder, A)

SOC 217B. Chinese Society and Politics—(Ph.D. students register for 317B.) Seminar. Major social trends with implications for China's political and economic future. Topics include inequality, social change, corruption, and rural and urban conflict. Final paper on a topic of the student's choosing. Limited enrollment. GER:DB-SocSci, EC-GlobalCom
3-5 units, Spr (Walder, A)

SOC 218. Social Movements and Collective Action—(For graduate students; see 118.)
5 units, not given this year

SOC 230. Education and Society—(For graduate students; see 130; same as EDUC 220C.)
4-5 units, Aut (Ramirez, F)

SOC 231. World, Societal, and Educational Change: Comparative Perspectives—(Same as EDUC 136/306D.) Theoretical perspectives and empirical studies on the structural and cultural sources of educational expansion and differentiation, and on the cultural and structural consequences of educational institutionalization. Research topics: education and nation building; education, mobility, and equality; education, international organizations, and world culture.
4-5 units, Win (Drori, G)

SOC 236. Sociology of Law—(For graduate students; see 136; same as LAW 538.)
3-5 units, Aut (Dauber, M)

SOC 238. American Indians in Comparative Historical Perspective—(For graduate students; see 138.)
5 units, Win (Snipp, C)

SOC 239. American Indians in Contemporary Society—(For graduate students; see 139.)
5 units, Spr (Snipp, C)

SOC 247A. Comparative Ethnic Conflict—(For graduate students; see 147A.)
5 units, Win (Olzak, S)

SOC 257. Causal Inference in Quantitative Educational and Social Science Research—(Same as EDUC 257C.) Quantitative methods to make causal inferences in the absence of randomized experiment including the use of natural and quasi-experiments, instrumental variables, regression discontinuity, matching estimators, longitudinal methods, fixed effects estimators, and selection modeling. Assumptions implicit in these approaches, and appropriateness in research situations. Students develop research proposals relying on these methods. Prerequisites: exposure to quantitative research methods; multivariate regression.
3-5 units, Spr (Reardon, S)

SOCIAL PSYCHOLOGY AND INTERPERSONAL PROCESSES

SOC 220. Interpersonal Relations—(For graduate students; see 120.)
5 units, Aut (Ridgeway, C)

SOC 221. The Individual in Social Structure: Foundations in Sociological Social Psychology—(For graduate students; see 121.)
5 units, Spr (Chin, L)

SOC 223. Sex and Love in Modern Society—(For graduate students; see 123.)
3-5 units, Aut (England, P)

SOC 225A. Understanding Religion in a Global Context—(For graduate students; see 125A.)
5 units, Spr (Chang, P)

SOC 226. Introduction to Social Networks—(For graduate students; see 126.)
5 units, Aut (Hillmann, H)

SOC 227. Bargaining, Power, and Influence in Social Interaction—(For graduate students; see 127.)
5 units, not given this year

SOC 255. The Changing American Family—(For graduate students; see 155.)
5 units, Spr (Rosenfeld, M)

SOCIAL STRATIFICATION AND INEQUALITY

SOC 235. Poverty, Inequality, and Social Policy in the United States—(For graduate students; see 135.)
5 units, Win (Wimer, C)

SOC 238. American Indians in Comparative Historical Perspective—(For graduate students; see 138 in "Social Movements, Comparative Politics, and Social Change" subsection above.)
5 units, Win (Snipp, C)

SOC 239. American Indians in Contemporary Society—(For graduate students; see 139 in "Social Movements, Comparative Politics, and Social Change" subsection above.)
5 units, Spr (Snipp, C)

SOC 240. Introduction to Social Stratification—(For graduate students; see 140.)
5 units, Win (Sandefur, R)

SOC 241. Controversies about Inequality—(For graduate students; see 141.)
5 units, Spr (Grusky, D)

SOC 241B. Race, Ethnicity, Religion, and Health—(For graduate students; see 141B.)
5 units, Spr (Gonzalez, M)

SOC 242. Sociology of Gender—(For graduate students; see 142.)
3-5 units, Win (Ridgeway, C)

SOC 243. Prejudice, Racism, and Social Change—(For graduate students; see 143.)
5 units, not given this year

SOC 244. Race and Crime in America—(For graduate students; see 144.)
5 units, not given this year

SOC 247A. Comparative Ethnic Conflict—(For graduate students; see 147A.)
5 units, Win (Olzak, S)

SOC 247B. Introduction to African and African American Studies—(For graduate students; see 147B; same as AFRICAAM 105.)
5 units, Spr (Staff)

SOC 249. The Urban Underclass—(For graduate students; see 149; same as URBANST 112.)
5 units, Aut (Rosenfeld, M)

SOC 249X. Urban Politics—(For graduate students; see 149X; same as POLISCI 121, URBANST 111.)
5 units, Aut (Bischoff, K)

ORGANIZATIONS, BUSINESS, AND THE ECONOMY

SOC 214. Economic Sociology—(For graduate students; see 114.)
5 units, Aut (Granovetter, M), offered once only

SOC 215. Topics in Economic Sociology—(For graduate students; see 115.)
5 units, Win (Granovetter, M)

SOC 216B. Global Projects: An Institutional Perspective—(Same as CEE 245B.) The multifaceted challenges of global projects that involve participants from multiple societal systems through the lens of institutional theory. Sources include sociology, economics, development and engineering literatures.
1-2 units, not given this year

SOC 260. Formal Organizations—(For graduate students; see 160.)
5 units, Win (Zhou, X)

SOC 261. The Social Science of Entrepreneurship—(For graduate students; see 161.)
5 units, Spr (Thornton, P)

SOC 262. Organization and Environment—(Ph.D. students register for 362; same as OB 672.) Leading sociological approaches to analyzing relations of organizations and environments emphasizing dynamics. Theoretical formulations, research designs, and results of empirical studies.
4 units, Aut (Carroll, G)

SOC 267A. Asia-Pacific Transformation—(For graduate students; see 167A.)
5 units, Win (Shin, G)

SOC 275. Global Cities and the Transnational Economy—(For graduate students; see 175.)
5 units, Spr (Choi, J)

SOC 277. Comparing Institutional Forms: Public, Private, and Nonprofit—(Same as EDUC 377, GSBGEN 346.) Seminar. For students interested in the nonprofit sector, and those in the joint Business and Education program. The missions, functions, and capabilities of nonprofit, public, and private organizations. Focus is on sectors with significant competition among institutional forms, including health care, social services, the arts, and education. Sources include scholarly articles, cases, and historical materials. Advanced undergraduates and coterms require consent of instructor.
4 units, Spr (Powell, W)

RACE AND ETHNIC RELATIONS

SOC 209. Sociology of Terrorism—(For graduate students; see 109.)
5 units, Spr (Meyersson Milgrom, E)

SOC 238. American Indians in Comparative Historical Perspective—(For graduate students; see 138.)
5 units, Win (Snipp, C)

SOC 239. American Indians in Contemporary Society—(For graduate students; see 139.)
5 units, Spr (Snipp, C)

SOC 241B. Race, Ethnicity, Religion, and Health—(For graduate students; see 141B.)
5 units, Spr (Gonzalez, M)

SOC 244. Race and Crime in America—(For graduate students; see 144.)
5 units, not given this year

SOC 245. Race and Ethnic Relations—(For graduate students; see 145.)
5 units, not given this year

SOC 247A. Comparative Ethnic Conflict—(For graduate students; see 147A.)
5 units, Win (Olzak, S)

SOCIOLOGICAL THEORY

SOC 270. Classics of Modern Social Theory—(For graduate students; see 170.)
5 units, Win (McDermott, M)

RESEARCH METHODS

SOC 274A,B,C. Research Workshop: Philanthropy and Civil Society—(Ph.D. students register for 374A,B,C; same as EDUC 374A,B,C.) Open to Ph.D. students, coterms, and undergraduates writing honors theses. Activities and institutions that define civil society, emphasizing the interactions between funding sources and nonprofit organizations. May be repeated for credit.
A: *1-3 units, Aut (Powell, W)*
B: *2-3 units, Win (Powell, W)*
C: *2-3 units, Spr (Powell, W)*

SOC 257. Causal Inference in Quantitative Educational and Social Science Research—(Same as EDUC 257C.) Quantitative methods to make causal inferences in the absence of randomized experiment including the use of natural and quasi-experiments, instrumental variables, regression discontinuity, matching estimators, longitudinal methods, fixed effects estimators, and selection modeling. Assumptions implicit in these approaches, and appropriateness in research situations. Students develop research proposals relying on these methods. Prerequisites: exposure to quantitative research methods; multivariate regression.

3-5 units, Spr (Reardon, S)

SOC 280A. Foundations of Social Research—(For graduate students; see 180A.)

5 units, Aut (Sorensen, A)

SOC 280B. Evaluation of Evidence—(For graduate students; see 180B.)

5 units, Win (Hillmann, H)

SOC 281B. Sociological Methods: Statistics—(For graduate students; see 181B.)

5 units, not given this year

PRIMARILY FOR DOCTORAL STUDENTS

300-level courses are limited to matriculated doctoral students; other students require consent of instructor.

GENERAL

SOC 300. Workshop: Teaching Development—For first-year Sociology doctoral students only. The principles for becoming an effective instructor, adviser, and mentor to undergraduates. Topics: ethics, course organization and syllabus development, test construction and grading, conflict resolution, common classroom problems, and University policies related to matters such as sexual harassment. Technologies and other topics related to making effective presentations, and campus resources to improve classroom performance. Roundtable discussions with faculty and advanced graduate students known for teaching excellence. Students may be asked to give a demonstration lecture.

2 units, Spr (Simmons, A)

SOC 305. Graduate Proseminar—For first-year Sociology doctoral students only. Introduction and orientation to the field of Sociology.

1 unit, Aut (Grusky, D)

PH.D. WORKSHOPS

SOC 311A,B,C. Workshop: Comparative Studies of Educational and Political Systems—(Same as EDUC 387A,B,C.) Analysis of quantitative and longitudinal data on national educational systems and political structures. May be repeated for credit. Prerequisite: consent of instructor. (SSPEP/ICE)

1-5 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ramirez, F; Meyer, J)*

SOC 312. Workshop: Political Sociology, Social Movements, and Collective Action—Faculty and student presentations of ongoing research on topics including: social movement and organizations, and the relationship between them; democracy movements; legislative and policy outcomes; and collective action tactics, strategies, and trajectories. May be repeated for credit.

1-5 units, Aut, Win, Spr (Walder, A; Olzak, S; McAdam, D; Shin, G; Hillmann, H)

SOC 321. Workshop: Social Psychology and Social Structure—(Same as EDUC 317.) Current theories and research agendas, recent publications, and presentations of ongoing research by faculty and students. May be repeated for credit. Prerequisite: consent of instructor.

1-5 units, Aut, Win, Spr (Cook, K; McFarland, D; Ridgeway, C)

SOC 338. Workshop: Sociology of Law—(Same as LAW 581.) Required for joint degree J.D./Ph.D. students in Sociology in the first three years of program; open to Ph.D. students in Sociology and related disciplines. Empirical, sociological study of law and legal institutions. Topics such as the relation of law to inequality and stratification, social movements, organizations and institutions, political sociology and state development, and the social construction of disputes and dispute resolution processes. Research presentations. Career development issues. May be repeated for credit.

1-5 units, Win (Dauber, M; Friedman, L; Sandefur, R)

SOC 341. Workshop: Inequality—Causes, consequences, and structure of inequality; how inequality results from and shapes social classes, occupations, professions, and other aspects of the economy. Research presentations by students, faculty, and guest speakers. Discussion of controversies, theories, and recent writings. May be repeated for credit. Prerequisite: doctoral student status.

1-5 units, Aut, Win, Spr (Grusky, D; Granovetter, M; Sandefur, R)

SOC 346. Workshop: Ethnography—Restricted to doctoral students. Student research employing ethnographic methods. May be repeated for credit. Prerequisite: consent of instructor.

1-5 units, Aut, Win, Spr (McDermott, M)

SOC 368. Workshop: China Social Science—(Same as POLISCI 348R.) For Ph.D. students in the social sciences and history. Research on contemporary society and politics in the People's Republic of China. May be repeated for credit. Prerequisite: consent of instructor.

1-5 units, Aut, Win, Spr (Walder, A; Zhou, X; Oi, J)

SOC 374A,B,C. Research Workshop: Philanthropy and Civil Society—(For Ph.D. students; see 274A,B,C; same as EDUC 374A,B,C.)

A: *1-3 units, Aut (Powell, W)*
B: *2-3 units, Win (Powell, W)*
C: *2-3 units, Spr (Powell, W)*

SOCIAL MOVEMENTS, COMPARATIVE POLITICS, AND SOCIAL CHANGE

SOC 257. Causal Inference in Quantitative Educational and Social Science Research—(Same as EDUC 257C.) Quantitative methods to make causal inferences in the absence of randomized experiment including the use of natural and quasi-experiments, instrumental variables, regression discontinuity, matching estimators, longitudinal methods, fixed effects estimators, and selection modeling. Assumptions implicit in these approaches, and appropriateness in research situations. Students develop research proposals relying on these methods. Prerequisites: exposure to quantitative research methods; multivariate regression.

3-5 units, Spr (Reardon, S)

SOC 303. The Transnational Workplace—(For graduate students; see 203.)

5 units, Aut (Drori, G)

SOC 309. Nations and Nationalism—The nation as a form of collective identity in the modern era. Major works in the study of nations and nationalism from comparative perspectives with focus on Europe and E. Asia.

4-5 units, not given this year

SOC 310. Political Sociology—Theory and research on the relationship between social structure and politics. Social foundations of political order, the generation and transformation of ideologies and political identities, social origins of revolutionary movements, and social consequences of political revolution. Prerequisite: doctoral student.

4-5 units, not given this year

SOC 311A,B,C. Workshop: Comparative Studies of Educational and Political Systems—For description, see "Ph.D. Workshops" subsection above.

1-5 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Ramirez, F; Meyer, J)*

SOC 312. Workshop: Political Sociology, Social Movements, and Collective Action—For description, see "Ph.D. Workshops" subsection above.

1-5 units, Aut, Win, Spr (Walder, A; Olzak, S; McAdam, D; Shin, G; Hillmann, H)

SOC 316. Historical and Comparative Sociology—Theory and research on macro-historical changes of sociological significance such as the rise of capitalism, the causes and consequences of revolutions, and the formation of the modern nation state and global world system. Methodological issues in historical and comparative sociology.
3-5 units, Win (Shin, G)

SOC 317B. Chinese Society and Politics—(For Ph.D. students; see 217B.)
3-5 units, Spr (Walder, A)

SOC 318. Social Movements and Collective Action—Topics: causes, dynamics, and outcomes of social movements; organizational dimensions of collective action; and causes and consequences of individual activism.
3-5 units, Win (McAdam, D)

SOC 338. Workshop: Sociology of Law—For description, see "Ph.D. Workshops" subsection above.
1-5 units, Win (Dauber, M; Friedman, L; Sandefur, R)

SOC 368. Workshop: China Social Science—For description, see "Ph.D. Workshops" subsection above.
1-5 units, Aut, Win, Spr (Walder, A; Zhou, X; Oi, J)

SOCIAL PSYCHOLOGY AND INTERPERSONAL PROCESSES

SOC 320. Foundations of Social Psychology—Major theoretical perspectives, and their assumptions and problems, in interpersonal processes and social psychology. Techniques of investigation and methodological issues. Perspectives: symbolic interaction, social structure and personality, and cognitive and group processes.
3-5 units, Aut (Ridgeway, C)

SOC 321. Workshop: Social Psychology and Social Structure—For description, see "Ph.D. Workshops" subsection above.
1-5 units, Aut, Win, Spr (Cook, K; McFarland, D; Ridgeway, C)

SOC 322. Social Interaction, Social Structure, and Social Exchange—Current theory and research on topics such as social cognition and identity, group processes, bargaining and negotiation, social justice, social dilemmas and exchange, and networks and collective action. The social exchange approach.
4-5 units, not given this year

SOC 323. Sociology of the Family—Sociological research on changing family forms. Topics include courtship, marriage, fertility, divorce, conflict, relationship skills and satisfaction, gender patterns, power relations within the family, and class and race differences in patterns.
3-5 units, not given this year

SOC 324. Social Networks—How the study of social networks contributes to sociological research. Application of core concepts to patterns of relations among actors, including connectivity and clusters, duality of categories and networks, centrality and power, balance and transitivity, structural equivalence, and blockmodels. Friendship and kinship networks, diffusion of ideas and infectious diseases, brokerage in markets and organizations, and patronage and political influence in historical contexts.
3-5 units, Win (Hillmann, H)

SOC 327. Frontiers of Social Psychology—Advanced topics, current developments, theory, and empirical research. Possible topics include social identity processes, status beliefs and processes, social exchange, affect and social cohesion, legitimacy, social difference and inequality, norms, and social dilemmas.
4-5 units, not given this year

SOC 342B. Gender and Social Structure—The role of gender in structuring contemporary life. Social forces affecting gender at the psychological, interactional, and structural levels. Gender inequality in labor markets, education, the household, and other institutions. Theories and research literature.
3-5 units, Spr (England, P)

SOC 361. Social Psychology of Organizations—(Same as OB 671.) Social psychological theories and research relevant to organizational behavior. Current research topics; theories to micro-organizational behavior. Topics include models of attribution, choice and decision making, intergroup behavior, stereotyping, and social influence. Prerequisites: Ph.D student; graduate-level social psychology course.
4 units, Win (Lowery, B)

SOC 364. Perspectives on the Social Psychology of Organizations—(Same as OB 673.) Social psychological and sociological research. How theories and methods change as levels of analysis change; focus is on the meso (intermediate between micro and macro) level of analysis. Topics vary from year to year, but may include: organizational learning or routines; power; emotions in organizations; diversity and demography; organizational identity and legitimacy; culture; contagion and diffusion. Theory development processes. Prerequisite: Ph.D student.
4 units, Win (Flynn, F)

SOCIAL STRATIFICATION AND INEQUALITY

SOC 340. Social Stratification—Classical and contemporary approaches to the unequal distribution of goods, status, and power. Modern analytic models of the effects of social contact, cultural capital, family background, and luck in producing inequality. The role of education in stratification. The causes and consequences of inequality by race and gender. The structure of social classes, status groupings, and prestige hierarchies in various societies. Labor markets and their role in inequality. The implications of inequality for individual lifestyles. The rise of the new class, the underclass, and other emerging forms of stratification. Prerequisite: Ph.D. student or consent of instructor.
3-5 units, not given this year

SOC 341. Workshop: Inequality—For description, see "Ph.D. Workshops" subsection above.
1-5 units, Aut, Win, Spr (Grusky, D; Granovetter, M; Sandefur, R)

ORGANIZATIONS, BUSINESS, AND THE ECONOMY

SOC 314. Economic Sociology—Classical and contemporary literature covering the sociological approach to markets and the economy, and comparing it to other disciplines. Topics: consumption, labor, professions, industrial organization, and the varieties of capitalism; historical and comparative perspectives on market and non-market provision of goods and services, and on transitions among economic systems. The relative impact of culture, institutions, norms, social networks, technology, and material conditions. Prerequisite: doctoral student status or consent of instructor.
3-5 units, Aut (Granovetter, M)

SOC 314A. Social Norms and Corruption in the Economy—Seminar. Comparison of the impact on economic activity of self-interest to that of actors' views of what is socially and morally appropriate. The place of social norms in the economy; their origin, nature, content, enforcement, and consequences. Determinants of corruption, a pervasive phenomenon usually explained by incentives but where norms also play an important role. Prerequisite: doctoral student status or consent of instructor.
3-5 units, offered occasionally

SOC 318A. Historical Methods—Methodological problems in social science history and their solutions. Discrete methodological themes through key works in historical sociology, economic history, and related fields. Topics include path dependence, periodization, the nature of historical events and event sequences, narrative explanation and general theory, microhistory, uses of prosopography and network analysis in historical research, spatial and temporal effects, and the idea of the longue durée.
3-5 units, not given this year

SOC 341. Workshop: Inequality—For description, see "Ph.D. Workshops" subsection above.
1-5 units, Aut, Win, Spr (Grusky, D; Granovetter, M; Sandefur, R)

SOC 361. Social Psychology of Organizations—For description, see "Social Psychology and Interpersonal Processes" subsection above.
4 units, Win (Lowery, B)

SOC 362. Organization and Environment—(For graduate students; see 262; same as OB 672.)
4 units, Aut (Carroll, G)

SOC 363. Social and Political Processes in Organizations—(Same as OB 676.) Cognition, attitudes, and behavior in organizations. Social psychological and sociological research at the meso, or intermediate between micro and macro, level of analysis. Topics vary from year to year, but may include: organizational learning and decision making; power and conflict; emotions in organizations; mobility and stratification; gender inequality and discrimination; networks; organizational justice and legitimacy; and cultural perspectives on organizations. Prerequisite: Ph.D student.
4 units, Win (Sorensen, J)

SOC 363A. Seminar on Organizational Theory—(Same as EDUC 375A.) The social science literature on organizations assessed through consideration of the major theoretical traditions and lines of research predominant in the field.
5 units, Aut (Powell, W)

SOC 363B. Seminar on Organizations: Institutional Analysis—(Same as EDUC 375B.) Seminar. Key lines of inquiry on organizational change, emphasizing network, institutional, and evolutionary arguments.
3-5 units, Spr (Powell, W)

SOC 364. Perspectives on the Social Psychology of Organizations—For description, see "Social Psychology and Interpersonal Processes" subsection above.
4 units, Win (Flynn, F)

SOC 366. Organizational Behavior and Analysis—(Same as EDUC 288.) Principles of organizational behavior and analysis; theories of group and individual behavior; organizational culture; and applications to school organization and design. Case studies.
4 units, Aut (Drori, G)

SOC 366A. Organizational Ecology—(Same as OB 601.) Theoretical and methodological. Emphasis is on dynamics at the interface between organizational populations and their audiences.
4 units, Win (Hannan, M)

SOC 367. Institutional Analysis of Organizations—Reading and research on the nature, origins, and effects of the modern institutional system. Emphasis is on the effects of institutional systems on organizational structure.
3-5 units, Aut (Scott, W)

SOC 369. Network Analysis—(Same as EDUC 316.) The educational applications of social network analysis. Introduction to social network theory, methods, and research applications in sociology. Network concepts of interactionist (balance, cohesion, centrality) and structuralist (structural equivalence, roles, duality) traditions are defined and applied to topics in small groups, social movements, organizations, communities. Applications to data on schools and classrooms. (SSPEP)
4-5 units, Aut (McFarland, D)

SOC 376. Perspectives on Organization and Environment—(Same as OB 674.) Workshop. Topics may include ideas and theories of networks, learning, competition, status, and decision making.
4 units, Win (Rao, H)

SOC 377. Comparing Institutional Forms: Public, Private, and Nonprofit—(Same as 277, EDUC 377, GSBGEN 346; ; see 277.)
4 units, Spr (Powell, W)

RACE AND ETHNIC RELATIONS

SOC 342A. Race and Ethnic Relations—Presentations of current work by faculty, students, and guest speakers. Recent publications and contemporary issues. May be repeated for credit. Prerequisite: consent of instructor.
1-5 units, not given this year

SOC 345. Seminar in Comparative Race and Ethnic Relations—Restricted to Ph.D. students. Factors that create, maintain, and diminish the salience of race and ethnic boundaries. Theoretical debates about the emergence, persistence, and change in racial and ethnic boundaries, nationalism and sovereignty, and mobilization. Empirical evidence on race and ethnic tensions, conflict, and warfare. Relationships among democracy, immigration, and diversity.
3-5 units, not given this year

SOC 346. Workshop: Ethnography—For description, see "Ph.D. Workshops" subsection above.
1-5 units, Aut, Win, Spr (McDermott, M)

SOCIOLOGICAL THEORY

SOC 370A. Sociological Theory: Social Structure, Inequality, and Conflict—Restricted to doctoral students.The traditions of structural analysis derived from the work of Marx, Weber, and related thinkers. Antecedent ideas in foundational works are traced through contemporary theory and research on political conflict, social stratification, formal organization, and the economy.
3-5 units, Aut (Olzak, S)

SOC 370B. Social Interaction and Group Process—Theoretical strategies for the study of interaction, group, and network processes, including rational choice and exchange theory, the theory of action, symbolic interactionism, formal sociology, and social phenomenology. Antecedent ideas in foundational works and contemporary programs of theoretical research.
3-5 units, Spr (Zelditch, M), alternate years, not given next year

SOC 372. Theoretical Analysis and Design—Theoretical analysis and the logical elements of design, including the systematic analysis of the logical structure of arguments, the relationship of arguments to more encompassing theoretical or metatheoretical assumptions, the derivation of logical implications from arguments, assessments of theoretically significant problems or gaps in knowledge.
3-5 units, Aut (Zelditch, M)

RESEARCH METHODS

SOC 374A,B,C. Research Workshop: Philanthropy and Civil Society—(For Ph.D. students; see 274A,B,C; same as EDUC 374A,B,C.)
A: *1-3 units, Aut (Powell, W)*
B: *2-3 units, Win (Powell, W)*
C: *2-3 units, Spr (Powell, W)*

SOC 380. Qualitative Methods—Priority to Sociology doctoral students. Emphasis is on observational and interview-based research. Limited enrollment.
3-5 units, Win (McDermott, M)

SOC 381. Sociological Methodology I: Introduction—Preference to Sociology students. Basic math and statistics. Types of variables, how to recode and transform variables, and how to manage different types of data sets. Introduction to statistical packages and programming.
2-3 units, Aut (Aven, B; McClintock, E)

SOC 382. Sociological Methodology II: The General Linear Model—Preference to Sociology students. The general linear model for discrete and continuous variables. Introduction to model selection, the principles of estimation, assessment of fit, and modeling diagnostics. Limited enrollment. Prerequisites: 281A,B, or equivalents.
3-6 units, Win (Tuma, N)

SOC 383. Sociological Methodology III: Advanced Models for Discrete Outcomes—Required for Ph.D. in Sociology; preference to Sociology students. The rationale for and interpretation of static and dynamic models for the analysis of discrete variables. Prerequisites: 281A,B and 382, or equivalents.
4-5 units, Spr (Zhou, X)

SOC 384. New Models and Methods in the Social Sciences—Preference to Sociology doctoral students. Two-week intensive course. Emphasis is on applications. Topics may include network models, multilevel models, latent class models, mixed methods, new qualitative methods, growth models, geostatistical tools, survey-based experiments, new methods for estimating causal effects, web-based surveys, advanced discrete choice models, and diffusion models.
2-5 units, Sum (Grusky, D) alternate years, not given next year

SOC 385A,B. Research Practicum—Workshop on research methods. Ongoing student research, methodological problems, and possible solutions.
1-2 units, **A:** *Win,* **B:** *Spr (Zhou, X)*

SOC 388. Log-Linear Models—Analysis of categorical data with log-linear and negative binomial models. Measures of fit and hypothesis testing.
3-5 units, Aut (Rosenfeld, M)

SOC 389. Mixed Method Research Design and Analysis—Research designs that incorporate qualitative and quantitative analyses in a single project. The tension between thinking case-wise and variable-wise; how the focus on relationships between variables that is the hallmark of the quantitative approach can be brought into qualitative work.
3-5 units, not given this year

GRADUATE INDIVIDUAL STUDY

SOC 390. Graduate Individual Study—May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

SOC 391. Graduate Directed Research—May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

SOC 392. Research Apprenticeship—May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

SOC 393. Teaching Apprenticeship
1-15 units, Aut, Win, Spr, Sum (Staff)

SOC 395. Research Internship—Graduate students integrate internship work into their academic program. Students register in the quarter following internship work and complete a research report outlining their work activity, problems investigated, key results, and follow-up projects they expect to perform. Meets requirements for Curricular Practical Training for students on F-1 visas. Work completed cannot be counted toward the departmental research assistantship requirement.
1-10 units, Aut, Win, Spr (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the Sociology student services office for applicability of these courses to a major or minor program.

COMM 169/269. Computers and Interfaces
4-5 units, Win (Nass, C)

EDUC 378X. Seminar on Social Change Processes and Organizations
3-4 units, Spr (Meyerson, D)

FEMST 260/360. Seminar in Women's Health: Women and Disabilities
5 units, Spr (Krieger, S)

HUMBIO 120A. American Health Policy
3 units, Spr (Heller, G)

LAW 229. Race and the Law
3 units, Win (Banks, R)

POLISCI 147. Comparative Democratic Development
5 units, Win (Diamond, L)

POLISCI 148/348. Chinese Politics: The Transformation and the Era of Reform
5 units, Spr (Oi, J)

PSYCH 10. Introduction to Statistical Methods: Precalculus—(Same as STATS 60/160.)
5 units, Aut (Thomas, E), Win (Walther, G), Spr, Sum (Staff)

PUBLPOL 168. Global Organizations: Managing Diversity
5 units, Win (Meyersson Milgrom, E)

STATS 60. Introduction to Statistical Methods: Precalculus
5 units, Aut (Thomas, E), Win (Walther, G), Spr, Sum (Staff)

URBANST 132. Concepts and Analytic Skills for the Social Sector
4 units, Win (Kieschnick, M)

OVERSEAS STUDIES

Sociology courses that are taught overseas are listed on the Bing Overseas Studies website http://osp.stanford.edu/ or in the "Overseas Studies" section of this bulletin. Students interested in applying OSP courses to their degree may do so with prior approval. Contact the Sociology student services office for further information.

BERLIN

OSPBER 66. Theory from the Bleachers: Reading German Sports and Culture
3 units, Win (Junghanns, W)

FLORENCE

OSPFLOR 79. Migrations and Migrants: The Sociology of a New Phenomenon
5 units, Aut (Allam, K)

OXFORD

OSPOXFRD 117W. Social Change in Modern Britain
4 units, Spr (Palmer, A)

PARIS

OSPPARIS 22. Immigration in France
4-5 units, Aut (Strudel, S)

SANTIAGO

OSPSANTG 111. Social Heterogeneity in Latin America
5 units, Aut (Valdés, T)

CENTER FOR SPACE SCIENCE AND ASTROPHYSICS

Emeriti: (Professors) Ronald N. Bracewell, Robert Cannon, I-Dee Chang, Daniel B. DeBra, W.Gary Ernst (Geological and Environment Sciences), Von R. Eshleman, Robert A. Helliwell, Ronald J. P. Lyon, Laurence A. Manning, Bradford W. Parkinson, J. David Powell, Peter A. Sturrock, G. Leonard Tyler (Electrical Engineering), Robert V. Wagoner, Alan T. Waterman; *(Professors, Research)* Donald L. Carpenter, Aldo V. daRosa, Antony Fraser-Smith, Henry T. Howard

Director: Robert V. Wagoner

Associate Directors: Umran S. Inan, Roger W. Romani, Philip H. Scherrer

Professors: Roger Blandford (Physics, SLAC), Elliot Bloom (SLAC), Lambertus Hesselink (Electrical Engineering), Umran S. Inan (Electrical Engineering), Steven Kahn (Physics, SLAC), Tune Kame (SLAC), Peter F. Michelson (Physics), Vahé Petrosian (Physics), Roger W. Romani (Physics), Norman H. Sleep (Geophysics)

Associate Professors: Tom Abel (Physics, SLAC), Sarah Church (Physics), Bruce B. Lusignan (Electrical Engineering, emeritus), Guenther Walther (Statistics), Howard Zebker (Electrical Engineering, Geophysics)

Assistant Professors: Steve Allen (Physics, SLAC), Stefan Funk (Physics, SLAC), Chao-Lin Kuo (Physics, SLAC), Risa Wechler (Physics, SLAC)

Professors (Research): C-W. Francis Everitt (HEPL), Philip H. Scherrer (Physics)

Consulting Professors: Alan M. Title, Martin Walt (Electrical Engineering)

SLAC Staff Physicist: Grzegorz Madejski

Center Offices: Varian, Room 316
Mail Code: 94305-4060
Phone: (650) 723-1439
Email: danav@stanford.edu
Web Site: http://www.stanford.edu/group/CSSA/

The center is an interdepartmental organization coordinating research in space science and astrophysics. Its members are drawn from the Department of Geological and Environmental Sciences in the School of Earth Sciences; the departments of Aeronautics and Astronautics, Electrical Engineering, and Mechanical Engineering in the School of Engineering; the departments of Applied Physics, Physics, and Statistics in the School of Humanities and Sciences; the W. W. Hansen Experimental Physics Laboratory; and the Stanford Linear Accelerator Center. Its membership also includes all faculty and appropriate staff at the Kavli Institute for Particle Astrophysics and Cosmology, located at SLAC and the Physics department.

Research now in progress covers a wide array of investigations and is approached in a variety of ways, including experiments flown on rockets, satellites, and space probes; ground-based observations made from the Hobby-Eberly Telescope, the Wilcox Solar Observatory, and from national observatories; and theoretical research including computer modeling. Topics currently being studied include cosmology, gamma-ray astronomy, gravitation theory and experiments, including gravitational waves (LIGO, LISA), guidance and control, high-energy astrophysics, ionospheric and magnetospheric physics, microwave and infrared astronomy, planetary sciences, solar physics, solar-terrestrial phenomena, theoretical astrophysics, x-ray astronomy, and the study of life in the universe. Some of these projects involve opportunities for collaboration with scientists at the Lockheed-Martin Research the NASA/Ames Research Center, and the SETI Institute.

Stanford is a member of the Universities Space Research Association, a consortium of universities which operates the Lunar Science Institute in Houston, Texas; the University Corporation for Atmospheric Research in Boulder, Colorado; and the San Diego Supercomputing Consortium.

Stanford is the lead institution for the GLAST gamma-ray observatory, Gravity Probe B, and the Solar Oscillations Investigation on the Solar and Heliospheric Observatory spacecraft (SOHO). Stanford is also a member of the Hobby-Eberly Telescope Consortium which operates a 10-meter telescope at the McDonald Observatory of the University of Texas. Members are also involved in the design of the Large Synoptic Survey Telescope (LSST).

The facilities of the center are available to any interested and qualified student, who must be admitted by and registered in a department. The departments of Aeronautics and Astronautics, Applied Physics, Electrical Engineering, Mechanical Engineering, and Physics offer opportunities leading to an M.S. or Ph.D. degree for work in space science or astrophysics. The center also offers opportunities to undergraduates who may, for instance, participate in research projects in their junior or senior years, on a part-time basis during the school year or on a full-time basis during the summer. The Astronomy Course Program operates a small student observatory where students may gain practical experience in astronomical observing.

Further information is available from the director.

SPANISH AND PORTUGUESE

Emeriti: (Professors) Bernard Gicovate, Mary Pratt, Isabel Magaña Schevill, Sylvia Wynter; *(Professor, Teaching)* María-Paz Haro
Chair: Joan Ramon Resina
Director of Graduate Studies: Michael Predmore
Director of Undergraduate Studies: Lisa Surwillo
Professors: Michael P. Predmore, Joan Ramon Resina, Jorge Ruffinelli, Guadalupe Valdés, Yvonne Yarbro-Bejarano
Assistant Professor: Lisa Surwillo
Senior Lecturers: Susan Cashion (by courtesy), Irene Corso, Lyris Wiedemann
Courtesy Professors: John Felstiner, Roland Greene, Hans U. Gumbrecht, Ramón Saldívar
Courtesy Associate Professors: James A. Fox, Paula Moya
Visiting Professor: Luiz Costa Lima
Director of Iberian Studies Program: Joan Ramon Resina
Spanish Language Program Coordinator: Alice Miano
Portuguese Language Program Coordinator: Lyris Wiedemann
Catalan Language Program Coordinator: Joan Molitoris

Department Offices: Building 260, Room 214
Mail Code: 94305-2014
Phone: (650) 723-4977
Email: span-port@stanford.edu
Web Site: http://span-port.stanford.edu

Courses given in Spanish and Portuguese have the subject codes SPANLIT and PORTLIT. For courses in Catalan, Portuguese, and Spanish language instruction with the subject codes CATLANG, PORTLANG and SPANLANG, see the "Language Center" section of this bulletin. For a complete list of subject codes, see Appendix.

The department is committed to four main educational purposes: (1) to provide students with expert training in the Spanish, Portuguese, and Catalan languages at all levels and to enable them to develop their skills in these languages according to their goals and interests; (2) to acquaint students with the literatures and cultures of the Iberian Peninsula from the Middle Ages to the present, of the Spanish and Portuguese speaking countries of Latin America, and of the Spanish-speaking communities of the United States; (3) to prepare undergraduates for advanced study in those areas and/or in language education; and (4) to provide doctoral students with advanced training as research scholars and teachers, in preparation for careers as university teachers or in related roles.

The faculty represent a broad range of interests and approaches. In general, the department's programs are characterized by: (1) a commitment to undergraduate and graduate teaching at the highest intellectual level; (2) a strong interdisciplinary focus that combines the study of literature with that of other forms of cultural expression; (3) a large scope including Iberian, Latin American, and U.S. Latino/Chicano fields; and (4) language study tailored to a range of intellectual goals and native and non-native experience with the Spanish, Portuguese, and Catalan languages.

The department works with the Freeman Spogli Institute for International Studies, the Mediterranean Studies and Iberian Studies programs, the Center for Latin American Studies, Comparative Studies in Race and Ethnicity, El Centro Chicano, and several overseas programs in Spain and Latin America. It makes extensive use of the resources of the language laboratory and the Language Center. The University library maintains world class collections in Latin American and Iberian Studies and one of the largest research archives in the country in Chicano history and literature. The Hoover Library is a valuable resource for research topics in Iberian and Latin American intellectual history; it holds one of the largest and most important collections of Spanish Civil War materials in the world. Department faculty teach in the School of Education, Comparative Studies in Race and Ethnicity, Drama, Feminist Studies, Film Studies, Introduction to the Humanities Program, and Modern Thought and Literature. The department houses the Ginebre Serra Visiting Chair in Catalan Studies, and hosts visiting faculty from the Iberian Peninsula and Latin America on a regular basis.

UNDERGRADUATE PROGRAMS

BACHELOR OF ARTS

The major in Spanish is designed to acquaint students with the diversity of literary and cultural traditions from the Iberian Peninsula and Spanish- and Portuguese-speaking Latin America. Optional courses permit students to develop a concentration in an area of interest, or to enhance their knowledge of the areas they come to know through the core courses. Students are normally expected to declare the major during the sophomore year, but it is possible to declare during the junior year as well.

The major in Spanish requires 56 units of course work. Courses must be taken for a letter grade and a maximum of 20 units of course work from abroad may be applied towards the major. At the discretion of the Director of Undergraduate Studies, up to 10 units of course work from outside the department, clearly related to the study of literature and culture in the areas and traditions taught by the department, may be counted towards the degree.

The core courses (requirements 1, 2, and 3 below) may not be taken abroad. Exceptional cases for any of these requirements must be referred to the Director of Undergraduate Studies who, in consultation with the chair, makes a final decision.

PREREQUISITES

Students planning to declare the major must have complete the second-year sequence of Spanish language courses through SPANLANG 13, or equivalent. SPANLANG 101 is recommended.

GENERAL COURSE REQUIREMENTS

1. Two Writing in the Major (WIM) courses are required and these are prerequisites for every subsequent course in the major; concurrent enrollment is allowed.
    a) SPANLANG 102 (5 units)
    b) SPANLIT 120 (3 units)
2. Core courses in literature. Students are required to take:
    a) SPANLIT 157. Introduction to Medieval and Early Modern Iberian Literatures
    b) SPANLIT 136. Introduction to Modern Iberian Literature
    c) SPANLIT 161. Introduction to Modern Latin American Literature
3. Core course in culture, history, and civilization. Choose at least one:
    a) SPANLIT 130. Cultural Perspectives in Iberia
    b) SPANLIT 131. Cultural Perspectives in Latin America
4. A senior seminar, SPANLIT 278 or 278A. Topics vary. Two options are offered per year.
5. Up to two courses of introductory language classes may be applied towards the major, such as CATLANG 1A and 2A or PORTLANG 1A and 2A. This is recommended but not required.
6. Any additional 100- or 200-level Spanish or Portuguese literature courses above 103 to complete the required 56 units. One course above 103 and one core course, or consent of the instructor, are prerequisites for 200-level courses. When choosing courses, students are encouraged to consult the Director of Undergraduate Studies who makes recommendations about a course of study related to the student's academic interests. IHUM courses taught at least partially by a faculty member of the department may count towards these electives.

Course work for the major is grouped under the following tracks, from which students may choose the courses necessary to complete the required units.

1. *Iberian Studies*—This tack is designed for students who want to acquire a command of the major languages and literatures of the Iberian Peninsula, Spanish, Portuguese, and Catalan, against the background of 1,000 years of cultural history and the societies where these languages arose. Emphasis is on the study of language, literature, and film to gain knowledge of a complex society and its cultural traditions.
2. *Latin American Studies (including Brazil)*—This track includes the study of oral and textual aesthetic production of indigenous peoples and the intellectual and literary productions of the periods that followed the conquest: colonial, and the 18th, 19th, and 20th centuries in the Spanish- and Portuguese-speaking countries of the Latin American continent.

3. *U.S. Latino/Chicano Studies*—This track offers students the opportunity to study the cultural productions of the people of Mexican and Latin American origin living in the United States. Emphasis is on language, literature, performance, visual art, and film in sociohistorical context.
4. *Language in the Spanish-speaking World*—This track is designed for students who want to acquire advanced linguistic competence in the Spanish-speaking world through the areas of second language or dialect acquisition, Spanish dialectology, language use in the Chicano community, and theory and issues in the study of bilingualism from a sociolinguistic perspective.

How to Declare a Major—Students interested in declaring a Spanish major should see the Director of Undergraduate Studies.

Double Majors—The major in Spanish and Portuguese is designed to combine with a second major in another field and with study abroad. Students may not count the same courses to fulfill requirements in both majors.

Courses for Heritage Language Speakers—The Language Center offers a series of second- and third-year courses designed for students who grew up in homes where Spanish is spoken and who wish to develop their existing linguistic strengths. See the "Language Center" section of this bulletin for these courses.

MINORS

The minors in Spanish and Portuguese are for students who want to develop advanced linguistic competence in Spanish or Portuguese, or who wish to combine acquisition of linguistic competence with the study of the literature, thought, culture, or language systems of the Spanish- or Portuguese-speaking worlds. With the consent of the student's adviser, up to 5 units of relevant course work outside the department, and up to 10 units of relevant course work taken abroad, may count toward these minors. All courses must be taken for a letter grade in order to count towards the minor. Courses other than those listed as eligible may only count toward the minor with the approval of the minors coordinator or the Director of Undergraduate Studies. To apply for either of these minors or for more information, see the undergraduate student services office in the Division of Literatures, Cultures, and Languages.

MINOR IN SPANISH

30 units of course work taken for a letter grade. Up to 5 units of coursework outside the department may count towards the minor, with the approval of the minors coordinator. Up to 10 units of course work from abroad may be applied towards the minor.

Requirements—

1. SPANLANG 102.
2. A 100- or 200-level course in Iberian literature.
3. A 100- or 200-level course in Latin American literature.
4. Any additional 100- or 200-level courses in literature and culture to complete 30 units. IHUM courses taught at least partially by a faculty member of the department count towards these electives.

MINOR IN PORTUGUESE

Requirements—30 units of course work in Portuguese at any level, and in courses related to Portugal, Brazil, or other Lusophone cultures either within or outside the department. Courses not listed below must be approved by the minors coordinator or the Director of Undergraduate Studies to count toward the minor. Students must take at least two courses at the 100 level or higher related to Brazil or Portugal, choosing from one or more of the following subject areas:

1. Luso-Brazilian language, literature, and culture. Suggested courses include: PORTLANG 101, 102; PORTLIT 193Q; HISTORY 276.
2. Iberian studies courses that include Lusophone components. Suggested courses include: SPANLIT 136, 218, 278.
3. Latin American courses that include Lusophone components. Suggested courses include: SPANLIT 167, 240; CSRE 192.
4. Courses that include Luso-Brazilian immigration groups.
5. Language in the Portuguese-speaking world; any Portuguese language course.

Consult with the minors coordinator or the Coordinator of the Portuguese Language Program, Lyris Wiedemann, for more information on recommended courses. Minors must be approved by the minors coordinator or the Director of Undergraduate Studies.

MINOR IN LITERATURE AND MINOR IN MODERN LANGUAGES

The Division of Literatures, Cultures, and Languages offers two undergraduate minor programs, the minor in Literature and the minor in Modern Languages. These minors draw on literature and language courses offered in this and other literature departments. See the "Literatures, Cultures, and Languages" section of this bulletin for further details about these minors and their requirements.

HONORS PROGRAM

Spanish and Portuguese majors with a grade point average (GPA) of 3.3 (B+) or better in major courses may apply to the honors program in Spring Quarter of the junior year. Students should submit an application for the honors program and a proposal outline and may enroll for 2 units of SPANLIT 189B, for the drafting or revision of the thesis proposal and preliminary research. Honors students are encouraged to participate in the honors college coordinated by the Division of Literatures, Cultures, and Languages and offered at the end of the summer before the senior year. In Autumn Quarter of the senior year, students must enroll in DLCL 189, a 5-unit seminar that focuses on researching and writing the honors thesis. Students then enroll for 5 units of credit in SPANLIT 189A while composing the thesis during Winter Quarter. Each honors student must write an honors essay of 20-25 pages under the direction of a faculty member who serves as adviser, and the completed thesis must be submitted by the end of Winter Quarter. Students who do not enroll in a 189B course in the junior year may enroll in SPANLIT 189B in Spring Quarter of the senior year while revising the thesis, if approved by the thesis adviser. A total of 10-12 units are awarded for completion of honors course work, independent study, and the finished thesis. Students should consult their undergraduate advisers for additional information on the honors program.

STUDY ABROAD

All majors are encouraged to study abroad. To transfer credits from non-Stanford programs abroad, consult the Office of the University Registrar. Depending on course selections, up to 20 units of course work taken abroad may be applied toward the major and 10 units toward the minor in Spanish or Portuguese. Students planning to study abroad, or returning from study programs, are encouraged to consult with the Director of Undergraduate Studies, the minors coordinator, or an undergraduate adviser to coordinate the course work from abroad with their degree program.

The department and Bechtel International Center maintain information on study abroad programs. Stanford supports the options listed below and credits course work taken in academically sound programs, although the department does not sponsor any one in particular. Students considering different options are encouraged to speak with the Chair of the department or the Director of Undergraduate Studies.

STANFORD IN SANTIAGO, CHILE AND MADRID, SPAIN

The Bing Overseas Studies programs in Santiago, Chile and Madrid, Spain require one year of college-level Spanish (SPANLANG 3). Course work is primarily in Spanish. Information and course offerings, are listed in the "Overseas Studies" section of this bulletin or at http://osp.stanford.edu. Internships and research opportunities may be arranged for two quarter students.

SPAIN

The Department of Spanish and Portuguese recommends study in Spain with the Barcelona Consortium administered by Brown University, with which Stanford is associated. This program combines courses at the program's center with open access to courses at three Barcelona universities: Universitat Pompeu Fabra, University of Barcelona, and Autonomous University of Barcelona. Visiting faculty from Brown, Chicago, and Northwestern complement the offerings of these three major universities. Admission is competitive, presupposing competence in Spanish at the time of application. An introductory, three-week program in Mediterranean culture and Barcelona history prior to the beginning of the semester familiarizes students with the history and culture of the area.

The department also supports the Hamilton College Academic Year in Spain program, administered by the Department of Romance Languages of Hamilton College in cooperation with faculty members of Williams and Swarthmore colleges. It has its own facilities located on the outskirts of the University of Madrid campus. Spanish must be spoken at all times, in and outside class, and students are required to sign a pledge to this effect before their arrival. See http://www.hamilton.edu/academics/hcays/.

Other programs are also recognized by the department, and students are encouraged to discuss their interests with the Chair or with the Director of Undergraduate Studies.

BRAZIL AND PORTUGAL

The University maintains a relationship with the Universidade Estadual do Rio de Janeiro in Brazil at the graduate level. Students interested in study in Brazil or Portugal should contact Lyris Wiedemann.

TEACHING CREDENTIALS

For information concerning the requirements for teaching credentials, see the “School of Education” section of this bulletin and the credentials administrator, School of Education.

COTERMINAL B.A. AND M.A.

The requirements for the coterminal B.A. are the same as those outlined below for the M.A. No course can count for both the B.A. and M.A. degrees. Contact Graduate Admissions at the Registrar’s Office for information.

For University coterminal degree program rules and application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

STEP COTERMINAL TEACHING PROGRAM

The Department of Spanish and Portuguese, in cooperation with the Stanford Teacher Education Program (STEP) of the School of Education, offers a special course of study for students interested in becoming teachers. By following this course of study in Spanish Language, Literatures, and Cultures and enrolling in the STEP Coterminal Teaching Program, students can, after 5 years, receive a B.A. in Spanish and Portuguese, an M.A. in Education, and a California Teaching Credential.

The Spanish Language, Literatures, and Cultures curriculum consists of approximately 56 quarter units in addition to demonstrated proficiency in the language, defined as listening, speaking, reading, and writing at a level equivalent to advanced on the ACTFL Oral Proficiency Interview. This course of study fulfills all the major requirements of the Department of Spanish and Portuguese and includes coursework in linguistics and language diversity studies, the history of the Spanish-speaking world, and Spanish literature and cultures.

Students enrolled in the STEP Coterminal Teaching Program are also expected to complete a series of core courses during their undergraduate years. These include one course in developmental psychology; one course in cognitive psychology; one course in the social foundations of education; one course on the role of race, class, and ethnicity in American society; a structured internship experience in a community-based organization serving youth and/or their families; and a teaching practicum offered by the School of Education.

For more information about this option, consult Professor Valdés or the coordinator of the STEP Coterminal Teaching Program in CERAS 309; (650) 725-6321 or (650) 725-0652.

GRADUATE PROGRAMS

University requirements for the M.A. and Ph.D. degrees are discussed in the “Graduate Degrees” section of this bulletin.

MASTER OF ARTS IN SPANISH AND PORTUGUESE

This terminal M.A. degree program is for students who do not intend to continue their studies through the Ph.D. degree. Students in this program may not apply concurrently for entrance to the Ph.D. program. Students must complete a minimum of 45 graduate-level units, 36 of which must have a grade point average (GPA) of 3.0 or above.

The requirements for the M.A. are:

1. One course in literary or cultural theory
2. Two 200 or above courses in Latin American (including Brazilian) or Latino/Chicano literature and culture
3. Two 200 or above courses in Iberian Studies
4. One 300-level course in Iberian Studies and one in Latin American (including Brazilian)
5 Reading knowledge of Portuguese or Catalan for students concentrating in Spanish, or Spanish or Catalan for students concentrating in Portuguese.

Independent study courses (SPANLIT 299, 399) and crosslisted courses originating outside the department may not be used to fulfill requirements except by permission of the Director of Graduate Studies.

In addition, students may take approved courses in related fields such as classics, comparative literature, education, history of art, linguistics, modern thought, and philosophy.

DOCTOR OF PHILOSOPHY

The requirements of the Ph.D. are:

1. 135 units of graduate-level course work with a grade point average (GPA) of 3.0 (B) or above. Units completed toward the M.A. degree can be counted for the Ph.D.
2. One course on introduction to literary theory, which may be fulfilled with COMPLIT 369.
3. A reading knowledge of Portuguese and Catalan, or one of these and one other foreign language.
4. The qualifying paper, the comprehensive examination, and the University oral examination, as described below.
5. Teaching of three to five courses in the department.
6. Completion of a dissertation.

Independent study courses (299, 399) and crosslisted courses originating outside the department may not be used to fulfill requirements except by consent of the Director of Graduate Studies in consultation with the student’s graduate adviser. For residency and candidacy requirements, see the “Graduate Degrees” section of this bulletin. For further information, consult the department’s *Graduate Student Handbook*.

In preparation for teaching, Ph.D. candidates may elect to take APPLLING 201 in the first year.

In consultation with the adviser, students choose one major field of study from the following:

1. Medieval and Early Iberian Literature
2. Modern Iberian Literature and Film
3. Latin American Literature to Independence
4. Latin American Literature and Culture of the 19th and 20th Centuries, including Brazil
5. Chicano Literature and Culture.

In addition, candidates choose two secondary areas of study outside the major field from any of the above

At least four courses must be taken in the major field of study. At least two courses must be taken in each secondary area. Students whose major field is in Latin American or Latino/Chicano Literature must choose one secondary area in Iberian literature and vice versa.

In addition to the department’s course offerings, students may take relevant courses with the approval of their adviser in other departments and programs, such as the graduate programs in Comparative Literature, Feminist Studies, History, Humanities, Linguistics, or Modern Thought and Literature. It is also possible to complete a minor in another department with approval of the adviser. Not more than 20 units should be taken outside the department.

After the first year of study, the student’s progress is evaluated by the faculty to determine whether continuation to the Ph.D. is recommended and whether there are particular areas where improvement is needed. For this evaluation, students submit a research paper of approximately 20 pages, called the qualifying paper, by the third week of Winter Quarter of the second year. The requirements for this paper are outlined in the *Graduate Student Handbook*.

If approval of the qualifying paper is granted, the student should file a formal application for candidacy no later than the end of the second year, as prescribed by the University. Course requirements are usually completed by the third year of study. A written comprehensive examination on the major field and secondary areas is then taken. The examination is based on a list of readings, selected in consultation with the adviser, which integrates major and secondary topics in both Iberian and Latin American or Latino/Chicano Studies. At this time, students hand in a long research paper to be evaluated by the faculty. For further details, consult the *Graduate Student Handbook*.

Following the comprehensive examination, students should find a topic requiring extensive original research and request that a member of the department serve as dissertation adviser. The student must complete the Reading Committee form and request that the chair approve a committee to supervise the dissertation. The committee may advise extra preparation within or outside the department, and time should be allowed for such work. The University oral examination usually takes place one or two quarters after passing the comprehensive examination. The oral examination covers plans for the dissertation based on a prospectus approved by the committee (15 to 20 pages), and may be taken in English, Spanish, Portuguese, or Catalan, depending on the committee's composition.

The dissertation must be submitted to the reading committee in substantially final form at least four weeks before the University deadline in the quarter during which the candidate expects to receive the Ph.D. degree. Ph.D. dissertations must be completed and approved within five years from the date of admission to candidacy. Candidates taking more than five years must apply for reinstatement of candidacy.

PH.D. MINOR

For a minor in Spanish or Portuguese, the student must complete 25 units, with a grade point average (GPA) of 3.0 or above, selected from courses numbered 200 or higher.

Students who choose a minor in another department should consult with advisers in that department.

JOINT PH.D. PROGRAMS

The Department of Spanish and Portuguese participates in the Graduate Program in Humanities leading to a joint Ph.D. degree in Spanish and Humanities. For a description of that program, see the "Interdisciplinary Studies in Humanities" section of this bulletin.

COURSES

WIM indicates that the course satisfies the Writing in the Major requirements.

Students interested in literature and literary studies should also consult course listings in the departments of Asian Languages, Classics, Comparative Literature, English, French and Italian, German Studies, and Slavic Languages and Literatures, in the Program in Modern Thought and Literature, the Department of Philosophy, and in the Division of Literatures, Cultures, and Languages.

OVERVIEW

1. Stanford Introductory Seminars, freshman and sophomore preference
2. Literature, Culture, Linguistics, and Theory (120-399)
   a) Undergraduate Courses (130-199)
   b) Courses for Advanced Undergraduates and Graduates (200-299)
      Language, Linguistics, and Theory (200-212)
      Iberian Literature (213-239)
      Latin American Literature (240-279)
      Latino/Chicano Literature (280-289)
      Individual Work (299)
3. Graduate Seminars (300-399)
      Linguistics, Methodology, and Literary Theory (300-313)
      Iberian Literature (314-339)
      Latin American Literature (excluding Brazil) (340-369)
      Luso-Brazilian Literature (370-379)
      Chicano Literature (380-389)
      Individual Work (399)
      Dissertation Research (802)

Courses bearing the suffix 'E' are taught in English and do not assume competence in another language. All other courses require some knowledge of Spanish or Portuguese, and may be given in those languages or bilingually.

SPANISH, PORTUGUESE, AND CATALAN LANGUAGE COURSES

The following courses represent a typical sequence for three years of Spanish or Portuguese language study, or two years of Catalan. Majors and prospective majors should consult the requirements for a B.A. in Spanish above. For descriptions, other information, and additional courses including special emphasis, intensive, summer, and activity courses at the Yost House, see the "Language Center" section of this bulletin.

SPANLANG 1,2,3. First-Year Spanish
5 units, Aut, Win, Spr (Alexander, A; Catoira, L; Del Carpio, C; Flores, F; Junguito, M; Méndez Barletta, L; Miano, A; Ortiz Cuevas, C; Sánchez, K; Reinhold, V; Urruela, M)

SPANLANG 11C,12C,13C. Second-Year Spanish: Cultural Emphasis
4-5 units, Aut, Win, Spr (Burgos Jara, C; Catoira, L; Guzmán, C; Kenna, C; Méndez Barletta, L; Molitoris, J; Ortiz Cuevas, C; Perales, O; Schmidt, S; Urruela, M)

SPANLANG 100. Advanced Oral Communication
3 units, Aut, Win, Spr (Perales, O)

SPANLANG 101. The Structure of Spanish
3-5 units, Aut (Valdés, G)

SPANLANG 102. Composition and Writing Workshop
3-5 units, Aut (Staff)

SPANLANG 102B. Composition and Writing Workshop for Heritage Language Students—WIM
3-5 units, Win (Miano, A)

PORTLANG 1,2,3. First-Year Portuguese
5 units, **1:** *Aut (Sotelino, K),* **2:** *Win (Delgado, A),* **3:** *Spr (Staff)*

PORTLANG 11A,12A. Accelerated Second-Year Portuguese
3-5 units, Aut, Win, Spr (Delgado, A)

PORTLANG 101. Reading Brazil
3-4 units, Aut (Delgado, A)

PORTLANG 102. Brazil in Text: Advanced Grammar and Composition—WIM
3-4 units, Win (Wiedemann, L)

PORTLANG 103. Advanced Conversation: Brazil Today
3 units, Spr (Wiedemann, L)

CATLANG 1A,2A. Accelerated First-Year Catalan
5 units, **1A:** *Aut,* **2A:** *Win (San Juan Pastor, M)*

CATLANG 11A, 12A. Accelerated Second-Year Catalan
3-5 units, **11A:** *Spr (San Juan Pastor, M),* **12A:** *not given this year*

STANFORD INTRODUCTORY SEMINARS

SPANLIT 101N. Visual Studies and Chicana/o Art—Stanford Introductory Seminar. Preference to freshmen. Images, context, and spectatorship. Who is seen and not seen in visual contexts? Whose gaze is privileged? Which aspects of the past are circulated as visual representations? Whose fantasies are fed by which visual images? In what circumstances is looking and returning the gaze an act of political resistance? How do people interact with images to make and remake the world in the shape of their own desires and fantasies? GER:DB-Hum, EC-AmerCul
3-5 units, Spr (Yarbro-Bejarano, Y)

SPANLIT 104N. Race and Slavery in Literature of the Nineteenth-Century Spanish Empire—Stanford Introductory Seminar. Preference to freshmen. How race, slavery, and abolition were discussed in the Spanish context and how this differed from parallel debates in the Anglo-American world. 19th-century writers from Cuba and Spain who questioned the

validity of race as a concept and the morality of colonial slavery. Sources include Cuban and Spanish novels, plays, and poetry, and authors who may include Sab, Cecilia Valdez, Don Alvaro, Carolina Coronado, and Christopher Schmidt-Nowara. GER:EC-GlobalCom
3-4 units, Aut (Surwillo, L)

SPANLIT 108Q. Latin American Cinema: Politics and Aesthetics—Stanford Introductory Seminar. Preference to sophomores. What is cinema? What makes a film work as drama or art? How is a story presented to an audience for a political and social interest? Is society or the individual more important for these films? Films since the 60s about the Cuban revolution, the Argentinean dirty war, the Falkland Islands war, the disappeared in Chile and Uruguay, political science fiction, transnational cinema, and horror fantasy.
3-4 units, Win (Ruffinelli, J)

SPANLIT 114N. Lyric Poetry—Stanford Introductory Seminar. Preference to freshmen. For students with considerable competence in Spanish. Elements and expressive devices of lyric poetry: multidimensional language, denotation, connotation, image, metaphor, symbol, allegory, paradox, irony, meaning, idea, rhythm, and meter. Poets of Spain and Latin America of the late 19th and early 20th century including G. A. Bécquer, Rosalía de Castro, Rubén Darío, Miguel de Unamuno, Antonio Machado, García Lorca, Pablo Neruda, and Gabriela Mistral. In English and Spanish.
3-5 units, Spr (Predmore, M)

SPANLIT 119N. Buenos Aires, Havana, Mexico City: Modernism and the Latin American City—Preference to freshmen. The influence of architectural, artistic, and literary modernism on three Latin American cities during the 50s. The urban planning theories of Le Corbusier as adopted by architects including Clorindo Testa, Mario Pani, and Ricardo Porro. Authors include Le Corbusier, Marshall Berman, Jane Jacobs, Julio Cortázar, Guillermo Cabrera Infante, and Carlos Fuentes. Films: *I Am Cuba, Los Olvidados*, and *Sucedió en Buenos Aires*.
3-4 units, Win (Gallo, R)

SPANLIT 178N. Del Otro Lado: Latina/o Performance Art in the U.S.—(Same as DRAMA 17N.) Stanford Introductory Seminar. Preference to freshmen. Works by U.S. Latina/o performance artists from the margins of the mainstream Euro-American theater world. How performance art serves as a dramatized essay, producing transgressive explorations of queer and national and ethnic identities. Artists: Luis Alfaro, Nao Bustamante, the Coatlicue Theater Company, Guillermo Gómez-Peña, Celia Herrera Rodríguez, Ana Mendieta, and Carmelita Tropicana. Creation and performance of a short original piece; performance viewings. GER:DB-Hum, EC-AmerCul
3 units, Win (Moraga, C)

PORTLIT 193Q. Spaces and Voices of Brazil through Films—Stanford Introductory Seminar. Preference to sophomores. Brazilian culture through films that portray its five cultural-geographical regions. Focus is on movies and complementary texts on Brazilian culture to understand the forces that shaped the multicultural reality of modern Brazil.
3-4 units, Aut (Wiedemann, L)

LITERATURE, CULTURE, LINGUISTICS, AND THEORY

UNDERGRADUATE

SPANLIT 120. Introduction to Literary and Scholarly Research—Strategies and tactics for research and writing in the humanities; focus is on the Spanish-speaking world. How to write a research proposal; how to conduct research online and in the library; annotated bibliographies; bibliographical essays; rhetorical strategies; and common logical fallacies. WIM
3 units, Win (Surwillo, L)

SPANLIT 124. Beyond Spanglish: Bilingual Chicana/o Cultural Productions—The use of Spanglish by those who embrace it as part of a cultural identity and those who oppose it as a denigration of Spanish and English languages. Sociolinguistic perspectives on language mixing.
3-5 units, Aut (Madrigal, D)

SPANLIT 125. The Forms of Wonder—The representation of wonder in early colonial texts written by European chroniclers, its problematic re-appropriation by the magic realist novel, and eventual exhaustion within Latin American literature.
3-5 units, Win (Arellano, J)

SPANLIT 130. Cultural Perspectives in Iberia—Historical trends and cultural tropes in the Iberian Peninsula. Topics and authors vary.
3-5 units, not given this year

SPANLIT 131. Cultural Perspectives in the Luso-Hispanic Americas—Major theoretical debates about the construction of Latin American identities, from the 19th century to the present. Readings by writers, poets, philosophers, and historians, including Rodo, Retamar, O'Gorman, Vasconcelos, Henríquez-Ureña, Ramos, Paz, Carpentier, Lezama Lima, Borges, and Fuentes.
3-5 units, Win (Gallo, R)

SPANLIT 136. Survey of Modern Iberian Literature—1800 to the present. Topics include: romanticism; realism and its variants; the turn of the century; modernism and the avant garde; the Civil War; and the second half of the 20th century. Authors may include Mariano José de Larra, Gustavo Adolfo Bécquer, Rosalía de Castro, Benito Pérez Galdós, Joan Maragall, Eugeni d'Ors, Antonio Machado, Fernando Pessoa, Federico García Lorca, Salvador Espriu, Mercè Rodoreda, António Lobo Antunes, Manuel Rivas, Bernardo Atxaga, and Josep Maria Benet i Jornet. GER:DB-Hum
3-5 units, Win (Resina, J)

SPANLIT 140. Introduction to Methods of Literary and Cultural Analysis—Focus is on the question of the limits of the literary through textual analysis of dramatic and nonfiction works. Sources include canonical Latin American and peninsular Spanish works from 1500 to the present, and culturally significant texts such as the *Edict of Expulsion*, Civil War materials, and current newspaper essays. In Spanish.
3-5 units, Spr (Surwillo, L)

SPANLIT 157. Introduction to Medieval and Early Modern Iberian Literatures—(Same as PORTLIT 157.) Topics may include: lyric poetry and poetic performance; Jewish and Muslim literatures; the development of Castilian, Catalan, and Portuguese prose; the Valencian golden age; texts of the Renaissance and Baroque; the literature of imperial expansion into Africa, Asia, and the Americas. Authors may include: Alfonso X, Gonzalo de Berceo, Calderón de la Barca, Luis de Camões, Miguel de Cervantes, Cristóbal Colón, Luis de Góngora, Ramon Llull, Ausiàs March, Joanot Martorell, Fernão Mendes Pinto, Bernardim Ribeiro, Fernando de Rojas, Juan Ruiz, Garcilaso de la Vega, and María de Zayas. In Spanish.
3-5 units, Aut (Barletta, V)

SPANLIT 161. Survey of Latin American Literature—From independence to the present. Topics include romantic allegories of the nation; modernism and postmodernism; avant garde poetry; regionalism versus cosmopolitanism; indigenous and indigenist literature; magical realism and the literature of the boom; Afro-Hispanic literature; and testimonial narrative. Authors may include Rubén Darío, Gabriela Mistral, Pablo Neruda, Vicente Huidobro, César Vallejo, Jorge Luis Borges, José María Arguedas, Gabriel García Márquez, Octavio Paz, Rosario Castellanos, Nancy Morejón, Rigoberta Menchú, Joaquim Machado de Assis, and Clarice Lispector. GER:DB-Hum
3-5 units, Spr (Ruffinelli, J)

SPANLIT 180E. Introduction to Chicana/o Studies—(Same as CHICANST 180E, CSRE 180E.) Historical and contemporary experiences that have defined the status of Mexican-origin people living in the U.S. Topics include the U.S./Mexico border and the borderlands; immigration and anti-immigration sentiment; literary and cultural traditions; music; labor; historical perspectives on Mexicans in the U.S. and the Chicano movement; urban realities; gender relations; political and economic changes; and inter- and intra-group interactions. Sources include social science and humanities scholarship. GER:DB-Hum, EC-AmerCul
5 units, Spr (Yarbro-Bejarano, Y; Palafox, J)

SPANLIT 189A. Honors Research—Senior honors students enroll for 5 units in Winter while writing the honors thesis, and may enroll in 189B for 2 units in Spring while revising the thesis. Prerequisite: DLCL 189.
5 units, Win (Staff)

SPANLIT 189B. Honors Research—Open to juniors with consent of adviser while drafting honors proposal. Open to senior honors students while revising honors thesis. Prerequisites for seniors: 189A, DLCL 189.
2 units, Spr (Staff)

SPANLIT 193. The Cinema of Pedro Almodóvar—The evolution of Spain's most recognizable director from marginal, transgressive amateur cinema to polished visual style. The deliberate blurring of frontiers between mass and high culture; his use of metafilmic allusions and attention to sexuality, extreme experiences, and marginal characters. From his early work to recent award-winning films. Prerequisite: spoken Spanish. GER:DB-Hum
3-5 units, Spr (Resina, J)

SPANLIT 199. Individual Work—Open only to students in the department, or by consent of instructor.
1-12 units, Au, Win, Spr, Sum (Staff)

ADVANCED UNDERGRADUATES AND GRADUATE STUDENTS

LANGUAGE, LINGUISTICS, AND THEORY

SPANLIT 206. Language Use in the Chicano Community—(Same as EDUC 242, APPLLING 206.) The significance and consequences of language diversity in the culture and society of the U.S. Experiences of non-English background individuals through focus on Spanish-English bilingual communities.
3-5 units, Spr (Valdés, G)

SPANLIT 207. Theory and Issues in the Study of Bilingualism—(Same as EDUC 149, EDUC 249.) Sociolinguistic perspective. Emphasis is on typologies of bilingualism, the acquisition of bilingual ability, description and measurement, and the nature of societal bilingualism. Prepares students to work with bilingual students and their families and to carry out research in bilingual settings. (SSPEP)
3-5 units, Aut (Valdés, G)

IBERIAN LITERATURE

SPANLIT 215/315. Nineteenth-Century Spanish Serials—Focus is on the serial novel *María o la hija de un jornalero* by Wenceslao Ayguals de Izco, which tackled contemporary social concerns including the death penalty, prisons, Catholic church, empire, slavery, and the decline of the aristocracy. Form and content; and similarities in reading behaviors and strategies between the 19th and 21st centuries. Students simulate 19th-century subscription practices and receive weekly electronic installments.
3-5 units, Win (Surwillo, L)

SPANLIT 216. Other Words: Crypto-Muslims in Early Modern Iberia—Literature by and related to the large minority community of Muslim converts to Christianity in early modern Spain and Portugal. Introduction to literature in *Aljamiado* (Ibero-Romances written in Arabic script). Theoretical bases for the study of Muslim discourse in the West. Authors include Jaume Bleda, Miguel de Cervantes, Iça de Gebir, Lope de Vega, el Mançebo de Arévalo, Francisco Núñez Muley, and Juan de Ribera.
3-5 units, Spr (Barletta, V)

SPANLIT 224. The Spanish Republic, the Civil War, and the Aftermath—The significance of the civil war in Spanish, European, and world history. The International Brigades. The effect of war on the literary and cultural life of the country and the response of writers from Spain (Alberti, Lorca, Machado) and Latin America (Guillén, Neruda, Vallejo). Literary protest during the Franco regime by Aleixandre, Alonso, Cela, and Sender.
3-5 units, Aut (Predmore, M)

LATIN AMERICAN LITERATURE

SPANLIT 240. Brazilian and Spanish American Novellas—(Same as PORTLIT 240.) The novella as literary genre in contemporary Latin American fiction. Texts by Clarice Lispector, Mario Vargas Llosa, and Adolfo Bioy Casares.
3-5 units, Spr (Hatoum, M)

SPANLIT 242. The Rise of the Latin American Novel and Its Reception in Spain—60s Latin American novels that changed the paradigm in Spanish language novel writing. Focus is on Vargas Llosa (*La ciudad y los perros*), García Márquez (*Cien años de soledad*), Cortazar (*Rayuela*), and Donoso (*El obsceno pájaro de la noche*), emphasizing their critical reception in Spain from 1960 to 1980, as expressed in the collection *La llegada de los bárbaros* and related critical works.
3-5 units, Spr (Ruffinelli, J)

SPANLIT 244. The Formation of a Nation—(Same as PORTLIT 244.) Hispanic American and Brazilian processes of independence. Topics include: D. João VII in Rio de Janeiro; Rio as capital of a vanishing empire; English protection; agricultural economy and the role of slavery; the relation between the manor house and cities. Focus is on themes of a dependent economy, based on exportation of agricultural products and estate domination; case study of the Canudos war in the hinterland of Bahia. Challenges in the 20th century: dictatorships and the dilemmas of democracy in a globalized world.
3-5 units, Win (Costa-Lima, L)

SPANLIT 249. Reading Cinema Today—The relationship between cinema and literature, from the point of view of film movements and authors crucial to the constitution of a new film language. Syntactic and stylistic innovations that have led the complexity of image movement to a breaking point. Image time which transformed the traits of the classic cinema. Changes in film aesthetics. Texts include Rohmer, Deleuze, Tarkovski, Bazin, Buñuel, Morin, Metz, Godard, Bresson, and Robbe-Grillet.
3-5 units, Win (Sánchez, C)

SPANLIT 278. Senior Seminar: 1640, Revolution, and the Iberian Baroque—Iberian Baroque literature in the context of revolutions in Portugal and Catalonia. The relation between art and nationalist politics. Authors include: Pedro Calderón de la Barca, Alexandre de Ros, Francesc Fontanella, Luis de Góngora, Francisco Manuel de Melo, Francisco Quevedo, Jaume Romeu, António de Saldanha, António de Sousa de Macedo, and António Vieira. In Spanish. May be repeated for credit. WIM
3-5 units, Win (Barletta, V)

SPANLIT 278A. Senior Seminar: Freud in Latin America—The reception of Freudian writings and psychoanalytic theory in Latin America in the early 20th century. Readings including Honorio Degado (Peru), Martínez Estrada (Argentina), and Paz and Ramos (Mexico). WIM
3-5 units, Spr (Gallo, R)

LATINO/CHICANO LITERATURE

SPANLIT 282. Creative Non-Fiction Writing Workshop
3-5 units, Spr (Moraga, C)

SPANLIT 286/386. The Films of Lourdes Portillo—Focus is on the representation of Latina/o identity, human rights, social justice, and Latin American realities. Formal features, emphasizing experimentation with the documentary form. Films include: *After the Earthquake; Señorita Extraviada; Las Madres: The Mothers of Plaza de Mayo; La Ofrenda: The Days of the Dead; The Devil Never Sleeps; Corpus*.
3-5 units, Aut (Yarbro-Bejarano, Y)

SPANLIT 289. The Body in Chicana/o Cultural Representations—What cultural representations show about how the body is socially situated, constructed, and interpreted through race, gender, sex, class, and ability. Social meanings of the body as depicted in Chicana/o literature, film, and visual art. The body as: location of knowledge and resistance; target and challenger of racism, misogyny, class oppression, and homophobia; conforming or refusing to conform to discourses of the ideal citizen; and as site and agent of desire. Writers and artists may include Manuel Muñoz, Lourdes Portillo, Delilah Montoya, and Cherríe Moraga.
5 units, Aut (Yarbro-Bejarano, Y)

BRAZILIAN LITERATURE

PORTLIT 240. Brazilian and Spanish American Novellas—(Same as SPANLIT 240; see SPANLIT 240.)
3-5 units, Spr (Hatoum, M)

PORTLIT 244. The Formation of a Nation—(Same as SPANLIT 244; see SPANLIT 244.)
3-5 units, Win (Costa-Lima, L)

INDIVIDUAL WORK

PORTLIT 299. Individual Work—Open to department undergraduates or graduate students by consent of professor. May be repeated for credit.
1-12 units, Aut, Win, Spr, Sum (Staff)

SPANLIT 299. Individual Work—Open to department undergraduates or graduate students by consent of professor. May be repeated for credit.
1-12 units, Aut, Win, Spr, Sum (Staff)

GRADUATE SEMINARS

Open to undergraduates with consent of instructor.

IBERIAN LITERATURE

SPANLIT 314. Poetic Form and Performance: The Medieval Iberian Lyric—Poetic composition and performance in relation to language and social life in medieval Iberia. How performative genres mediate the processes by which the social is shaped and reconfigured. Themes of love, suffering, body, power, gender, and death. Texts include: Andalusian *muwashshahat* and *azjal* in Spanish, Galician-Portuguese *cantigas*, *Razón de amor*, Castilian *cancionero* poetry, and the Valencian *segle d'or*.
3-5 units, Win (Barletta, V)

SPANLIT 315. Nineteenth-Century Spanish Serials—(Same as 215; see 215.)
3-5 units, Win (Surwillo, L)

SPANLIT 324. Modern Catalan Literature—The recent resurgence of Catalan and cultural production centered in Barcelona. Writers from the 20th-century canon, including Maragall, d'Ors, Pla, Sagarra, Rodoreda, Espriu, and Benet i Jornet. In Spanish.
3-5 units, Aut (Resina, J)

SPANLIT 336. Early 20th-Century Peninsular Spanish Poetry—Poetry in restoration Spain, 1871-1930, against the background of the democratic tradition of Spanish liberalism. Emphasis is on stylistic analysis and concepts such as the generation of 1898, modernism, Krausism, pure poetry, and symbolic systems.
3-5 units, Spr (Predmore, M)

LATIN AMERICAN LITERATURE

SPANLIT 357. The Novel and Latin American Sociopolitical History—(Same as PORTLIT 357.) The modern European conception of literature as in Schlegel's *Fragments* and the break with the belles lettres tradition. Topics include: the 19th-century gap between Europe and Latin American society; absence of middle classes and rise of the intellectual in spheres of power; colonial heritage; role of positivism (Comte) and evolutionism, including Sarmiento's *Facundo* and Euclides da Cunha's *Os Sertões;* documentalism and national identity; slow growth of intellectual presence. Notable exception: Machado de Assis' novels *D. Casmurro* and *Esaú e Jacó*.
3-5 units, Win (Costa-Lima, L)

SPANLIT 386. The Films of Lourdes Portillo—(Same as 286; see 286.)
3-5 units, Aut (Yarbro-Bejarano, Y)

BRAZILIAN LITERATURE

PORTLIT 357. The Novel and Latin American Sociopolitical History—(Same as SPANLIT 357; see SPANLIT 357.)
3-5 units, Win (Costa-Lima, L)

INDIVIDUAL WORK

PORTLIT 399. Individual Work—For Spanish and Portuguese department graduate students only. Prerequisite: consent of instructor.
1-12 units, Aut, Win, Spr, Sum (Staff)

SPANLIT 399. Individual Work—For Spanish and Portuguese department graduate students only. Prerequisite: consent of instructor.
1-12 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

ANTHSCI 103/262C. Cultural Diversity, Ethnicity, and Governance in Indigenous Latin America
3-5 units, Spr (Karp-Toledo, E)

CHICANST 165G. American Dreams: Mexican Americans, Immigration since 1964, and the Middle Class—(Same as CSRE 165G, SOC 165G.)
5 units, Win (Gonzalez, M)

CHICANST 181S. U.S.-Mexico Borderlands in Comparative Perspective—(Same as CSRE 181S.)
5 units, Spr (Palafox, J)

DANCE 43. Afro-Peruvian and Afro-Brazilian Dance
1 unit, Win (Cashion, S)

DLCL 189. Honors Thesis Seminar
5 units, Aut (Surwillo, L)

DRAMA 177/277. Playwriting
5 units, Win (Moraga, C)

OVERSEAS STUDIES

Courses approved for the Spanish and Portuguese majors and taught overseas can be found in the "Overseas Studies" section of this bulletin, or in the Overseas Studies office, 126 Sweet Hall.

SANTIAGO

OSPSANTG 42. Women's Representation in the Cinema of the Southern Cone
3 units, Win (Staff)

OSPSANTG 56. Contemporary Chilean Women Writers
3-5 units, Spr (Haro, P)

OSPSANTG 104X. Modernization and Culture in Latin America
5 units, Aut (Subercaseaux, B)

OSPSANTG 111. Social Heterogeneity in Latin America
5 units, Aut (Valdés, T)

OSPSANTG 118X. Artistic Expression in Latin America
5 units, Win (Albornoz, C)

STATISTICS

Emeriti: Theodore W. Anderson, Albert Bowker, Ingram Olkin, Charles Stein
Chair: Trevor J. Hastie
Professors: Thomas M. Cover, Amir Dembo, Persi Diaconis, David L. Donoho, Bradley Efron, Jerome H. Friedman, Trevor J. Hastie, Iain M. Johnstone, Tze L. Lai, Art Owen, Joseph P. Romano, David O. Siegmund, Paul Switzer, Robert J. Tibshirani, Wing H. Wong
Associate Professors: Jonathan Taylor, Guenther Walther
Assistant Professors: Andrea Montanari, Nancy Zhang
Professor (Teaching): Susan Holmes
Courtesy Professor: Richard A. Olshen
Courtesy Associate Professors: Simon Jackman, David Rogosa
Consulting Professor: Charles Chui

Mail Code: 94305-4065
Phone: (650) 723-2620
Web Site: http://www-stat.stanford.edu

Courses given in Statistics have the subject code STATS. For a complete list of subject codes, see Appendix.

The department's goals are to acquaint students with the role played in science and technology by probabilistic and statistical ideas and methods, to provide instruction in the theory and application of techniques that have been found to be commonly useful, and to train research workers in probability and statistics. There are courses for general students as well as those who plan careers in statistics in business, government, industry, and teaching.

The requirements for a degree in Statistics are flexible, depending on the needs and interests of the students. Some students may be interested in the theory of statistics and/or probability, whereas other students may wish to apply statistical and probabilistic methods to a substantive area. The department has long recognized the relation of statistical theory to applications. It has fostered this by encouraging a liaison with other departments in the form of joint and courtesy faculty appointments: Economics (Anderson), Education (Olkin, Rogosa), Electrical Engineering (Cover), Geological and Environmental Sciences (Switzer), Health Research and Policy (Efron, Hastie, Johnstone, Olshen, Tibshirani, Wong), Mathematics (Dembo, Diaconis), Political Science (Jackman), and the Stanford Linear Accelerator Center (Friedman). The research activities of the department reflect an interest in applied and theoretical statistics and probability. There are workshops in biology/medicine and in environmental factors in health.

In addition to courses for Statistics majors, the department offers a number of service courses designed for students in other departments. These tend to emphasize the application of statistical techniques rather than their theoretical development.

The Department of Statistics is well equipped for statistical applications and research in computational statistics. Computer facilities include several networked Unix servers and a PC lab for general research and teaching use. The Mathematical Sciences Library serves the department jointly with the departments of Mathematics and Computer Science.

The department has always drawn visitors from other countries and universities. As a consequence, there is usually a wide range of seminars offered by both the visitors and our own faculty.

UNDERGRADUATE PROGRAMS

MAJOR

Students wishing to build a concentration in probability and statistics are encouraged to consider declaring a major in Mathematical and Computational Science. This interdepartmental program is administered in the Department of Statistics and provides core training in computing, mathematics, operations research, and statistics, with opportunities for further elective work and specialization. See the "Mathematical and Computational Science" section of this bulletin.

MINOR

The undergraduate minor in Statistics is designed to complement major degree programs primarily in the social and natural sciences. Students with an undergraduate Statistics minor should find broadened possibilities for employment. The Statistics minor provides valued preparation for professional degree studies in postgraduate academic programs.

The minor consists of a minimum of six courses with a total of at least 20 units. There are two required courses (8 units) and four qualifying or elective courses (12 or more units). An overall 2.75 grade point average (GPA) is required for courses fulfilling the minor.

1. *Qualifying Courses:* at most, one of these two courses may be counted toward the six course requirement for the minor: MATH 52; STATS 191.
2. *Required Courses:* STATS 116 and 200.
3. *Elective Courses:* at least one of the elective courses should be a STATS 200-level course. The remaining two elective courses may also be 200-level courses. Alternatively, one or two elective courses may be approved courses in other departments. Special topics courses and seminars for undergraduates are offered from time to time by the department and these may be counted toward the course requirement. Examples of elective course sequences are:

   STATS 202, 203, emphasizing data analysis and applied statistics
   STATS 205, 206, (207), emphasizing statistical methodology
   STATS 206, ECON 160, emphasizing economic optimization
   STATS 206, PSYCH 156, emphasizing psychology modeling and experiments
   STATS 207, EE 264, (279), emphasizing signal processing
   STATS 217, BIOSCI 283, emphasizing genetic and ecologic modeling
   STATS 217, 218, emphasizing probability and its applications
   STATS 240, 250, emphasizing mathematical finance

GRADUATE PROGRAMS

University requirements for the M.A. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

The department requires that the student take 45 units of work from offerings in the Department of Statistics or from authorized courses in other departments. Ordinarily, four or five quarters are needed to complete all requirements.

Students must fulfill the following requirements for the M.S. degree:

1. STATS 116, 200, 191, and 217. Courses previously taken may be waived by the adviser, in which case they must be replaced by other graduate courses offered by the department.
2. One of MATH 103, 113, 115, 171; and one of CS 106A, 106X, 137. Substitution of other courses in Mathematics and Computer Science may be made with consent of the adviser.
3. At least four additional courses from graduate offerings in the department (202-399). Consent of the adviser is required in order to take more than 6 units of STATS 260A,B,C, 390, or 399.
4. Additional units to complete the requirements may be chosen from the list available from the department web site. Other graduate courses (200 or above) may be authorized by the adviser if they provide skills relevant to statistics or deal primarily with an application of statistics or probability and do not overlap courses in the student's program. There is sufficient flexibility to accommodate students with interests in applications to business, computing, economics, engineering, health, operations research, and biological and social sciences.

Students with a strong mathematical background who may wish to go on to a Ph.D. in Statistics should consider applying to the Ph.D. program.

Statistics courses required for the M.S. degree must be taken for letter grades, and an overall 2.75 grade point average (GPA) is required.

DOCTOR OF PHILOSOPHY

The department looks for students who want to prepare for research careers in statistics or probability, either applied or theoretical. Advanced undergraduate or master's level work in mathematics and statistics provides a good background for the doctoral program. Quantitatively oriented students with degrees in other scientific fields are also encouraged to apply for admission. The program normally takes four years to complete.

Program Summary—STATS 300A,B,C, 305, 306A,B, and 310A,B,C (first-year core program); pass two of three parts of the qualifying examination (beginning of second year); breadth requirement (second or third year); University oral examination (end of third year or beginning of fourth year); dissertation (fourth year).

In addition, students are required to take 9 units of advanced topics courses offered by the department (including at least two of the following: 314, 317, 318, 315A, or 315B, but not including literature, research, or consulting), and 3 units of statistical consulting. All students who have passed the qualifying exam but have not yet passed the University oral examination must take 319 at least once per year.

First-Year Core Courses—STATS 300 systematically surveys the ideas of estimation and of hypothesis testing for parametric and nonparametric models involving small and large samples. 305 is concerned with linear regression and the analysis of variance. 306 surveys a large number of modeling techniques, related to but going beyond the linear models of 305. 310 is a measure-theoretic course in probability theory, beginning with basic concepts of the law of large numbers and martingale theory. Students who do not have enough mathematics background can take 310 after their first year but need to have their first-year program approved by the Ph.D. program adviser.

Qualifying Examinations—These are intended to test the student's level of knowledge when the first-year program, common to all students, has been completed. There are separate examinations in the three core subjects of statistical theory and methods, applied statistics, and probability theory, and all are typically taken during the summer between the student's first and second years. Students may take two or three of these examinations and are expected to show acceptable performance in two examinations.

Breadth Requirement—Students are advised to choose an area of concentration in a specific scientific field of statistical applications; this can be realized by taking at least 15 units of course work approved by the Ph.D. program adviser.

Current areas with suggested course options include:

Computational Biology and Statistical Genomics—Students are expected to take 9 units of graduate courses in genetics or neurosciences (imaging), such as GENE 203/BIOSCI 203, as well as 9 units of classes in Statistical Genetics or Bioinformatics, GENE 344A,B, STATS 345, STATS 366, STATS 367.

Machine Learning—Courses can be chosen from the following list:
Statistical Learning: STATS 315A and 315B
Data Bases: CS 245, 346, 347
Probabilistic Methods in AI: CS 221, 354
Statistical Learning Theory and Pattern Classification: CS 229

Applied Probability—Students are expected to take 15 units of graduate courses in some of the following areas:
Control and Stochastic Calculus: MS&E 322, 351, MATH 237, EE 363
Finance: STATS 250, FINANCE 622, MATH 236
Information Theory: EE 376A, 376B
Monte Carlo: STATS 318, 345, 362, MS&E 323
Queuing Theory: GSB 661, 663, MS&E 335
Stochastic Processes: STATS 317, MATH 234

Earth Science Statistics—Students are expected to take:
STATS 317, 318, 352
and three courses from the GES or Geophysics departments, such as GES 144 or GEOPHYS 210.

Social and Behavioral Sciences—Students are expected to take three advanced courses from the department with an applied orientation such as:
STATS 261/262, 324, 343, 354
and three advanced quantitative courses from departments such as Anthropology, Economics, Political Science, Psychology, and Sociology, and the schools of Education, Business, or Medicine.

University Oral Examination—The University oral examination is taken on the recommendation of the student's research adviser after the thesis problem has been well defined and some research progress has been made. Usually, this happens early in the student's fourth year. The oral examination consists of a 40-minute presentation on the thesis topic, followed by two question periods. The first question period relates directly to the student's presentation; the second is intended to explore the student's familiarity with broader statistical topics related to the thesis research.

Financial Support—Students accepted to the Ph.D. program are offered financial support. All tuition expenses are paid and there is a fixed monthly stipend determined to be sufficient to pay living expenses. Financial support can be continued for five years, department resources permitting, for students in good standing. The resources for student financial support derive from funds made available for student teaching and research assistantships. Students receive both a teaching and research assignment each quarter which, together, do not exceed 20 hours. Students are strongly encouraged to apply for outside scholarships, fellowships, and other forms of financial support.

PH.D. MINOR

The Department of Statistics devises individual Ph.D. minor programs, but the department urges all graduate students in other fields who wish to have a subspecialty in statistics to study for an M.S. degree instead. The unit requirement for an M.S. degree is 45 units, whereas the number of units required for a minor averages around 30. This difference of 15 units can be made up by the student by including in the M.S. program courses from his or her own field which are related to statistics or applications of statistics.

COURSES

INTRODUCTORY

Introductory courses for any student with an interest in the problems of descriptive statistics and statistical inferences are STATS 30, 50, 60, and 141. These courses have no mathematical prerequisites. STATS 60 and 141 explain the techniques and methods of statistical inference. STATS 60 emphasizes applications in the social sciences and STATS 141 applications in the biological sciences. STATS 60 and 141 can be followed by STATS 191 which explains more advanced methods and their applications.

STATS 110, 116, 200, 217-218 are introductory but have a calculus prerequisite. STATS 110 covers the most important techniques used in the analysis of experimental data in engineering and science. STATS 110 can be followed by STATS 191. STATS 116 provides a general introduction to the theory of probability. It may be followed by STATS 200, which deals with statistical theory, or by 217 and 218, which deal with stochastic processes. The sequence 116, 200 is a two quarter sequence in basic mathematical statistics; the sequence 116, 217, 218 is a one-year course in basic probability theory.

STATS 43N. Displaying Data: Principles, Computer Graphics, and the Internet—Stanford Introductory Seminar. Preference to freshmen. Principles of displaying data and envisioning information based on literature and historical examples. Application of these principles to media such as computer graphics and the Internet. Student projects. GER:DB-Math
3 units, Spr (Walther, G)

STATS 47N. Breaking the Code?—Stanford Introductory Seminar. Preference to freshmen. Cryptography and its counterpart, cryptanalysis or code breaking. How the earliest cryptanalysts used statistical tools to decrypt messages by uncovering recurring patterns. How such frequency-analysis tools have been used to analyze biblical texts to produce a Bible code, and to detect genes in the human genome. Overview of codes and ciphers. Statistical tools useful for code breaking. Students use simple computer programs to apply these tools to break codes and explore applications to various kinds of data. GER:DB-Math
3 units, Spr (Holmes, S)

STATS 50. Mathematics of Sports—(Same as MCS 100.) The use of mathematics, statistics, and probability in the analysis of sports performance, sports records, and strategy. Topics include mathematical analysis of the physics of sports and the determinations of optimal strategies. New diagnostic statistics and strategies for each sport. Corequisite: STATS 116. GER:DB-Math

3 units, Spr (Cover, T)

STATS 60. Introduction to Statistical Methods: Precalculus—(Graduate students register for 160; same as PSYCH 10.) Techniques for organizing data, computing, and interpreting measures of central tendency, variability, and association. Estimation, confidence intervals, tests of hypotheses, t-tests, correlation, and regression. Possible topics: analysis of variance and chi-square tests, computer statistical packages. GER:DB-Math

5 units, Aut (Thomas, E), Win (Walther, G), Spr (Boik, J), Sum (Staff)

STATS 110. Statistical Methods in Engineering and the Physical Sciences—Introduction to statistics for engineers and physical scientists. Topics: descriptive statistics, probability, interval estimation, tests of hypotheses, nonparametric methods, linear regression, analysis of variance, elementary experimental design. Prerequisite: one year of calculus. GER:DB-Math

4-5 units, Aut (Srinivasan, B), Sum (Staff)

STATS 116. Theory of Probability—Probability spaces as models for phenomena with statistical regularity. Discrete spaces (binomial, hypergeometric, Poisson). Continuous spaces (normal, exponential) and densities. Random variables, expectation, independence, conditional probability. Introduction to the laws of large numbers and central limit theorem. Prerequisites: MATH 52 and familiarity with infinite series, or equivalent. GER:DB-Math

3-5 units, Aut (Donoho, D), Spr (Wong, W), Sum (Staff)

STATS 141. Biostatistics—(Same as BIOSCI 141.) Introductory statistical methods for biological data: describing data (numerical and graphical summaries); introduction to probability; and statistical inference (hypothesis tests and confidence intervals). Intermediate statistical methods: comparing groups (analysis of variance); analyzing associations (linear and logistic regression); and methods for categorical data (contingency tables and odds ratio). Course content integrated with statistical computing in R. See http://www-stat.stanford.edu/~rag/stat141/. GER:DB-Math

4-5 units, Aut (Rogosa, D)

STATS 160. Introduction to Statistical Methods: Precalculus—(Same as 60, PSYCH 10; see 60.)

5 units, Aut (Thomas, E), Win (Walther, G), Spr (Boik, J), Sum (Staff)

STATS 166. Computational Biology—(Graduate students register for 366; same as BIOMEDIN 366.) Methods to understand sequence alignments and phylogenetic trees built from molecular data, and general genetic data. Phylogenetic trees, median networks, microarray analysis, Bayesian statistics. Binary labeled trees as combinatorial objects, graphs, and networks. Distances between trees. Multivariate methods (PCA, CA, multidimensional scaling). Combining data, nonparametric inference. Algorithms used: branch and bound, dynamic programming, Markov chain approach to combinatorial optimization (simulated annealing, Markov chain Monte Carlo, approximate counting, exact tests). Software such as Matlab, Phylip, Seq-gen, Arlequin, Puzzle, Splitstree, XGobi.

2-3 units, Aut (Holmes, S)

STATS 191. Introduction to Applied Statistics—Statistical tools for modern data analysis. Topics include regression and prediction, elements of the analysis of variance, bootstrap, and cross-validation. Emphasis is on conceptual rather than theoretical understanding. Applications to social/biological sciences. Student assignments/projects require use of the software package R. Recommended: 60, 110, or 141. GER:DB-Math

3-4 units, Win (Zhang, N)

STATS 199. Independent Study—For undergraduates.

1-15 units, Aut, Win, Spr, Sum (Staff)

CONTINUATION

Courses in this category are designed for use in applications. Generally, they have introductory statistics or probability as prerequisites.

STATS 200. Introduction to Statistical Inference—Modern statistical concepts and procedures derived from a mathematical framework. Statistical inference, decision theory; point and interval estimation, tests of hypotheses; Neyman-Pearson theory. Bayesian analysis; maximum likelihood, large sample theory. Prerequisite: 116.

3 units, Win (Romano, J), Sum (Staff)

STATS 202. Data Analysis—Data mining is used to discover patterns and relationships in data. Emphasis is on large complex data sets such as those in very large databases or through web mining. Topics: decision trees, neural networks, association rules, clustering, case based methods, and data visualization.

3 units, Aut (Srinivasan, B), Sum (Staff)

STATS 203. Introduction to Regression Models and Analysis of Variance—Modeling and interpretation of observational and experimental data using linear and nonlinear regression methods. Model building and selection methods. Multivariable analysis. Fixed and random effects models. Experimental design. Pre- or corequisite: 200.

3 units, Win (Switzer, P)

STATS 205. Introduction to Nonparametric Statistics—Nonparametric analogs of the one- and two-sample t-tests and analysis of variance; the sign test, median test, Wilcoxon's tests, and the Kruskal-Wallis and Friedman tests, tests of independence. Nonparametric regression and nonparametric density estimation, modern nonparametric techniques, nonparametric confidence interval estimates.

3 units, Spr (Zhang, N)

STATS 206. Applied Multivariate Analysis—Introduction to the statistical analysis of several quantitative measurements on each observational unit. Emphasis is on concepts, computer-intensive methods. Examples from economics, education, geology, psychology. Topics: multiple regression, multivariate analysis of variance, principal components, factor analysis, canonical correlations, multidimensional scaling, clustering. Pre- or corequisite: 200.

3 units, Aut (Holmes, S), Sum (Staff)

STATS 208. Introduction to the Bootstrap—The bootstrap is a computer-based method for assigning measures of accuracy to statistical estimates. By substituting computation in place of mathematical formulas, it permits the statistical analysis of complicated estimators. Topics: nonparametric assessment of standard errors, biases, and confidence intervals; related resampling methods including the jackknife, cross-validation, and permutation tests. Theory and applications. Prerequisite: course in statistics or probability.

3 units, not given this year

STATS 209. Understanding Statistical Models and their Social Science Applications—(Same as EDUC 260X, HRP 239) Information that statistical modeling can provide in experimental and non-experimental settings emphasizing misconceptions in social science applications such as causal modeling. Text is *Statistical Models: Theory and Practice*, by David Freedman. See http://www-stat.stanford.edu/~rag/stat209. Prerequisite: intermediate-level statistical methods including multiple regression, logistic regression, and log-linear models.

3 units, Win (Rogosa, D)

STATS 211. Topics in Quantitative Methods: Meta-Analysis—Meta-analysis as a quantitative method for combining the results of independent studies enabling researchers to evaluate available evidence. Examples of meta-analysis in medicine, education, and social and behavioral sciences. Statistical methods include nonparametric methods, contingency tables, regression and analysis of variance, and Bayesian methods. Project involving an existing published meta-analysis. Prerequisite: basic sequence in statistics.

1-3 units, Win (Olkin, I)

STATS 212. Applied Statistics with SAS—Data analysis and implementation of statistical tools in SAS. Topics: reading in and describing data, categorical data, dates and longitudinal data, correlation and regression, nonparametric comparisons, ANOVA, multiple regression, multivariate data analysis, using arrays and macros in SAS. Prerequisite: statistical techniques at the level of STATS 191 or 203; knowledge of SAS not required.
3 units, Sum (Staff)

STATS 215. Statistical Models in Biology—Poisson and renewal processes, Markov chains in discrete and continuous time, branching processes, diffusion. Applications to models of nucleotide evolution, recombination, the Wright-Fisher process, coalescence, genetic mapping, sequence analysis. Theoretical material approximately the same as in STATS 217, but emphasis is on examples drawn from applications in biology, especially genetics. Prerequisite: 116 or equivalent.
3 units, Spr (Siegmund, D)

STATS 217. Introduction to Stochastic Processes—Discrete and continuous time Markov chains, point processes, random walks, branching processes, first passage times, recurrence and transience, stationary distributions.
3 units, Win (Rajaratnam, B), Sum (Staff)

STATS 218. Introduction to Stochastic Processes—Renewal theory, Brownian motion, Gaussian processes, second order processes, martingales.
3 units, Sum (Staff)

STATS 219. Stochastic Processes—(Same as MATH 136.) Introduction to measure theory, Lp spaces and Hilbert spaces. Random variables, expectation, conditional expectation, conditional distribution. Uniform integrability, almost sure and Lp convergence. Stochastic processes: definition, stationarity, sample path continuity. Examples: random walk, Markov chains, Gaussian processes, Poisson processes, Martingales. Construction and basic properties of Brownian motion. Prerequisite: STATS 116 or MATH 151 or equivalent. Recommended: MATH 115 or equivalent.
3 units, Aut (Ross, K), Win (Dembo, A)

STATS 220. Continuous Time Stochastic Control—Optimal control of diffusion processes. Dynamic programming, maximum principles, Hamilton-Jacobi-Bellman equations, verification theorems, viscosity solutions, singular control, optimal stopping, numerical solution methods, control with partial information, and adaptive control. Applications to financial mathematics, including optimal consumption and portfolio selection, super-replication under portfolio constraints, and irreversible investment. Prerequisite: MATH 236. Recommended: partial differential equations at the level of MATH 220B.
3 units, Spr (Ross, K)

STATS 225. Bayesian Analysis—Bayesian inference; decision theory; computational methods in Bayesian statistics; Monte Carlo simulation; Markov chain process; Markov chain Monte Carlo sampling; Bayesian regression and classification models; Bayesian analysis of real data; Gaussian process priors for regression and classification; Dirichlet process mixtures for unsupervised learning.
3 units, Aut (Shahbaba, B)

STATS 237. Time Series Modeling and Forecasting—Box-Jenkins and Bayesian approaches. State-space and change-point models. Application to revenue prediction, forecasting product demand, and other real world problems. Development and assessment of models and forecasts in practical applications. Hands-on experience with real data.
3 units, Sum (Staff)

STATS 239A,B. Workshop in Quantitative Finance—Topics of current interest. B may be repeated for credit.
*1 unit, **A:** Aut, **B:** Spr (Lai, T)*

STATS 240. Statistical Methods in Finance—(SCPD students register for 240P.) Regression analysis and applications to pricing and investment models. Principal components and multivariate analysis. Parametric influence. Financial time series. Estimation and modeling of volatilities. Statistical methods for portfolio management. Hands-on experience with financial data.
3-4 units, Aut (Lai, T)

STATS 240P. Statistical Methods in Finance—For SCPD students. See 240.
3 units, Aut (Lai, T)

STATS 241. Statistical Modeling in Financial Markets—(SCPD students register for 241P.) Nonparametric regression and yield curve smoothing. Advanced time series modeling and forecasting. Market risk measures. Substantive and empirical modeling approaches in financial markets. Statistical trading strategies. Prerequisite: 240 or equivalent.
3-4 units, Spr (Lai, T)

STATS 241P. Statistical Modeling in Financial Markets—For SCPD students. See 241.
3 units, Spr (Lai, T)

STATS 243. Introduction to Mathematical Finance—Interest rate and discounted value. Financial derivatives, hedging, and risk management. Stochastic models of financial markets, introduction to Ito calculus and stochastic differential equations. Black-Scholes pricing of European options. Optimal stopping and American options. Prerequisites: MATH 53, STATS 116, or equivalents.
3-4 units, Sum (Staff)

STATS 250. Mathematical Finance—(Same as MATH 238.) Stochastic models of financial markets. Forward and futures contracts. European options and equivalent martingale measures. Hedging strategies and management of risk. Term structure models and interest rate derivatives. Optimal stopping and American options. Corequisites: MATH 236 and 227 or equivalent.
3 units, Win (Papanicolaou, G)

STATS 252. Data Mining and Electronic Business—The Internet and related technologies have caused the cost of communication and transactions to plummet, and consequently the amount of potentially relevant data to explode. The underlying principles, statistical issues, and algorithmic approaches to data mining and e-business, with real world examples.
3 units, Sum (Staff)

STATS 253. Spatial Statistics—(Graduate students register for 352.) Statistical descriptions of spatial variability, spatial random functions, grid models, spatial partitions, spatial sampling, linear and nonlinear interpolation and smoothing with error estimation, Bayes methods and pattern simulation from posterior distributions, multivariate spatial statistics, spatial classification, nonstationary spatial statistics, space-time statistics and estimation of time trends from monitoring data, spatial point patterns, models of attraction and repulsion. Applications to earth and environmental sciences, meteorology, astronomy, remote-sensing, ecology, materials. GER:DB-Math
3 units, Aut (Switzer, P)

STATS 260A,B,C. Workshop in Biostatistics—(Same as HRP 260A,B,C) Applications of statistical techniques to current problems in medical science.
*1-2 units, **A:** Aut, **B:** Win, **C:** Spr (Olshen, R)*

STATS 261. Intermediate Biostatistics: Analysis of Discrete Data—(Same as BIOMEDIN 233, HRP 261.) The 2x2 table. Chi-square test. Fisher's exact test. Odds ratios. Sampling plans; case control and cohort studies. Series of 2x2 tables. Mantel Hantzel. Other tests. k x m tables. Matched data logistic models. Conditional logistic analysis, application to case-control data. Log-linear models. Generalized estimating equations for longitudinal data. Cell phones and car crashes: the crossover design. Special topics: generalized additive models, classification trees, bootstrap inference.
3 units, Win (Sainani, K)

STATS 262. Intermediate Biostatistics: Regression, Prediction, Survival Analysis—(Same as HRP 262.) Methods for analyzing longitudinal data. Topics include Kaplan-Meier methods, Cox regression, hazard ratios, time-dependent variables, longitudinal data structures, profile plots, missing data, modeling change, MANOVA, repeated-measures ANOVA, GEE, and mixed models. Emphasis is on practical applications. Prerequisites: basic ANOVA and linear regression.
3 units, Spr (Sainani, K)

STATS 297. Practical Training—For students in the M.S. program in Financial Mathematics only. Students obtain employment in a relevant industrial or research activity to enhance their professional experience. May be repeated for credit. Prerequisite: consent of adviser.
1-3 units, Aut, Win, Spr, Sum (Lai, T)

STATS 298. Industrial Research for Statisticians—Masters-level research as in 299, but must be conducted for an off-campus employer. Final report required. Prerequisite: enrollment in Statistics M.S. or Ph.D. program, prior to candidacy.
1-9 units, Aut, Win, Spr, Sum (Staff)

STATS 299. Independent Study—For Statistics M.S. students only. Reading or research program under the supervision of a Statistics faculty member. May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

PRIMARILY FOR DOCTORAL STUDENTS

Sequences 300A,B,C, 305, 306A,B, and 310A,B,C comprise the fundamental sequence which serves as a general introduction to and prerequisite for further work.

STATS 300. Advanced Topics in Statistics—May be repeated for credit.
3 units, Sum (Staff)

STATS 300A,B,C. Theory of Statistics—Elementary decision theory; loss and risk functions, Bayes estimation; UMVU estimator, minimax estimators, shrinkage estimators. Hypothesis testing and confidence intervals: Neyman-Pearson theory; UMP tests and uniformly most accurate confidence intervals; use of unbiasedness and invariance to eliminate nuisance parameters. Large sample theory: basic convergence concepts; robustness; efficiency; contiguity, locally asymptotically normal experiments; convolution theorem; asymptotically UMP and maximin tests. Asymptotic theory of likelihood ratio and score tests. Rank permutation and randomization tests; jackknife, bootstrap, subsampling and other resampling methods. Further topics: sequential analysis, optimal experimental design, empirical processes with applications to statistics, Edgeworth expansions, density estimation, time series.
2-4 units, **A:** *Aut (Romano, J),* **B:** *Win (Walther, G),* **C:** *Spr (Seigmund, D)*

STATS 305. Introduction to Statistical Modeling—The linear model: simple linear regression, polynomial regression, multiple regression, anova models; and with some extensions, orthogonal series regression, wavelets, radial basis functions, and MARS. Topics: normal theory inference (tests, confidence intervals, power), related distributions (t, chi-square, F), numerical methods (QR, SVD), model selection/regularization (Cp, AIC, BIC), diagnostics of model inadequacy, and remedies including bootstrap inference, and cross-validation. Emphasis is on problem sets involving substantial computations with data sets, including developing extensions of existing methods. Prerequisites: consent of instructor, 116, 200, applied statistics course, CS 106A, MATH 114.
2-4 units, Aut (Hastie, T)

STATS 306A. Methods for Applied Statistics—Extension of modeling techniques of 305: binary and discrete response data and nonlinear least squares. Topics include regression, Poisson loglinear models, classification methods, clustering. May be repeated for credit. Prerequisite: 305 or equivalent.
2-4 units, Win (Owen, A)

STATS 306B. Methods for Applied Statistics—Unsupervised learning techniques in statistics, machine learning, and data mining.
2-4 units, Spr (Donoho, D)

STATS 310A. Theory of Probability—Mathematical tools: asymptotics, metric spaces; measure and integration; Lp spaces; some Hilbert spaces theory. Probability: independence, Borel-Cantelli lemmas, almost sure and Lp convergence, weak and strong laws of large numbers. Weak convergence and characteristic functions; central limit theorems; local limit theorems; Poisson convergence. Prerequisites: 116, MATH 171.
2-4 units, Aut (Dembo, A)

STATS 310B. Theory of Probability—Stopping times, 0-1 laws, Kolmogorov consistency theorem. Uniform integrability. Radon-Nikodym theorem, branching processes, conditional expectation, discrete time martingales. Exchangeability. Large deviations. Laws of the iterated logarithm. Birkhoff's and Kingman's ergodic theorems. Recurrence, entropy. Prerequisite: 310A or MATH 230A.
2-4 units, Win (Siegmund, D)

STATS 310C. Theory of Probability—Infinitely divisible laws. Continuous time martingales, random walks and Brownian motion. Invariance principle. Markov and strong Markov property. Processes with stationary independent increments. Prerequisite: 310B or MATH 230B.
2-4 units, Spr (Lai, T)

STATS 314. Advanced Statistical Methods—May be repeated for credit.
2-3 units, not given this year

STATS 315A. Modern Applied Statistics: Learning—Topics: clustering, biclustering, and spectral clustering. Data analysis using the singular value decomposition, nonnegative decomposition, and generalizations. Plaid model, aspect model, and additive clustering. Correspondence analysis, Rasch model, and independent component analysis. Page rank, hubs, and authorities. Probabilistic latent semantic indexing. Recommender systems. Applications to genomics and information retrieval. Prerequisite: 315A,B, 305, 306A,B, or consent of instructor.
2-3 units, Aut (Tibshirani, R)

STATS 315B. Modern Applied Statistics: Data Mining—Three-part sequence. New techniques for predictive and descriptive learning using ideas that bridge gaps among statistics, computer science, and artificial intelligence. Emphasis is on statistical aspects of their application and integration with more standard statistical methodology. Predictive learning refers to estimating models from data with the goal of predicting future outcomes, in particular, regression and classification models. Descriptive learning is used to discover general patterns and relationships in data without a predictive goal, viewed from a statistical perspective as computer automated exploratory analysis of large complex data sets.
2-3 units, Win (Friedman, J)

STATS 315C. Modern Applied Statistics: Transposable data—Topics: clustering, biclustering, and spectral clustering. Data analysis using the singular value decomposition, nonnegative decomposition, and generalizations. Plaid model, aspect model, and additive clustering. Correspondence analysis, Rasch model, and independent component analysis. Page rank, hubs, and authorities. Probabilistic latent semantic indexing. Recommender systems. Applications to genomics and information retrieval. Prerequisite: 315A,B, 305/306A,B, or consent of instructor.
2-3 units, Spr (Owen, A)

STATS 316. Stochastic Processes on Graphs—Local weak convergence, Gibbs measures on trees, cavity method, and replica symmetry breaking. Examples include random k-satisfiability, the assignment problem, spin glasses, and neural networks. Prerequisite: 310A or equivalent.
1-3 units, Aut (Montanari, A; Dembo, A)

STATS 318. Modern Markov Chains—Tools for understanding Markov chains as they arise in applications. Random walk on graphs, reversible Markov chains, Metropolis algorithm, Gibbs sampler, hybrid Monte Carlo, auxiliary variables, hit and run, Swedson-Wong algorithms, geometric theory, Poincare-Nash-Cheger-Log-Sobolov inequalities. Comparison techniques, coupling, stationary times, Harris recurrence, central limit theorems, and large deviations.
2-3 units, Spr (Diaconis, P)

STATS 319. Literature of Statistics—Literature study of topics in statistics and probability culminating in oral and written reports. May be repeated for credit.
1-3 units, Aut (Walther, G), Spr (Donoho, D)

STATS 324. Multivariate Analysis—Classic multivariate statistics: properties of the multivariate normal distribution, determinants, volumes, projections, matrix square roots, the singular value decomposition; Wishart distributions, Hotelling's T-square; principal components, canonical correlations, Fisher's discriminant, the Cauchy projection formula.
2-3 units, Win (Efron, B)

STATS 327. Software for Data Analysis—Principles and techniques for writing statistical data analysis software using the S language, specifically the R software, as the main medium. Software project. Prerequisite: experience with S.
2-3 units, Win (Chambers, J)

STATS 345. Computational Molecular Biology—Gene expression microarrays: preliminary data analysis and processing computation of expression indices, supervised and unsupervised learning methods, incorporation of information from gene ontology and biological knowledge base. Sequence analysis: alignment and search algorithms, hidden Markov models, stochastic models for sequence motifs and regulatory modules. Introduction to transcriptional regulatory network.
2-3 units, Spr (Zhang, N)

STATS 350. Topics in Probability Theory: Probabilistic Concepts in Statistical Physics and Information Theory—Concentration of measure techniques. Mean field models for disordered systems: infinite size limit, computing the free energy, ultrametricity, dynamics. Interpolation techniques and infinite size limit in information theory and coding. May be repeated once for credit. Prerequisite: 310A or equivalent.
1-3 units, Win (Dembo, A; Montanari, A)

STATS 352. Spatial Statistics—(Same as 253; see 253.)
3 units, Aut (Switzer, P)

STATS 362. Monte Carlo Sampling—Fundamentals of Monte Carlo methods. Generating uniform and nonuniform variables, random vectors and processes. Monte Carlo integration and variance reduction. Quasi-Monte Carlo sampling. Markov chain Monte Carlo, including Gibbs sampling and Metropolis-Hastings. Examples, problems and motivations from Bayesian statistics, computational finance, computer graphics, physics.
2-3 units, Aut (Owen, A)

STATS 364. Splines and Multi-Level Representations—Splines as a tool for data processing and representation; the property of multi-level approximation of B-splines facilitates the construction and integration of their associated basis functions, wavelets, for data analysis and editing. Univariate and bivariate splines and wavelets. Extension of polynomial splines to achieve properties such as orthogonality and reduced support size; applications to curve and surface fitting and subdivisions.
3 units, Win (Chui, C)

STATS 366. Computational Biology—(Same as 166, BIOMEDIN 366; see 166.)
2-3 units, Aut (Holmes, S)

STATS 367. Statistical Models in Genetics—Stochastic models and related statistical problems in linkage analysis of qualitative and quantitative traits in humans and experimental populations; sequence alignment and analysis; and population genetics/evolution, both classical (Wright-Fisher-Kimura) and modern (Kingman coalescent). Computational algorithms as applications of dynamic programming, Markov chain Monte Carlo, and hidden Markov models. Prerequisites: knowledge of probability through elementary stochastic processes and statistics through likelihood theory.
2-3 units, Win (Siegmund, D)

STATS 374. Large Deviations—(Same as MATH 234.) Combinatorial estimates and the method of types. Large deviation probabilities for partial sums and for empirical distributions, Cramer's and Sanov's theorems and their Markov extensions. Applications in statistics, information theory, and statistical mechanics. Prerequisite: MATH 230A or STATS 310.
3 units, not given this year

STATS 390. Consulting Workshop—Skills required of practicing statistical consultants, including exposure to statistical applications. Students participate as consultants in the department's drop-in consulting service, analyze client data, and prepare formal written reports. Seminar provides supervised experience in short term consulting. May be repeated for credit. Prerequisites: course work in applied statistics or data analysis, and consent of instructor.
1-3 units, Aut (Owen, A), Win (Tibshirani, R), Spr (Olshen, R), Sum (Staff)

STATS 398. Industrial Research for Statisticians—Doctoral research as in 298, but must be conducted for an off-campus employer. Final report required. May be repeated for credit. Prerequisite: Statistics Ph.D. candidate.
1-9 units, Aut, Win, Spr, Sum (Staff)

STATS 399. Research—Research work as distinguished from independent study of nonresearch character listed in 199. May be repeated for credit.
1-10 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

EE 374. Inference in Graphical Models
3 units, not given this year

EE 376A. Information Theory
3 units, Win (Cover, T)

EE 376B. Information Theory
3 units, not given this year

GENE 211. Genomics
3 units, Win (Cherry, J; Myers, R; Sidow, A; Sherlock, G)

GENE 244. Introduction to Statistical Genetics
3 units, Aut (Tang, H)

MATH 236. Introduction to Stochastic Differential Equations
3 units, Win (Papanicolaou, G)

POLISCI 350B. Political Methodology II—(Same as POLISCI 150B)
5 units, Win (Jackman, S)

PROGRAM IN SYMBOLIC SYSTEMS

Director: Ivan A. Sag
Program Coordinator: Todd Davies
Program Committee: Lera Boroditsky, Todd Davies, Scott Klemmer, Byron Reeves, Eric Roberts, Ivan A. Sag, Paul Skokowski, Kenneth A. Taylor, Thomas A. Wasow
Program Faculty:
Art and Art History: Scott Bukatman (Associate Professor)
Applied Physics: Bernardo Huberman (Consulting Professor)
Classics: Reviel Netz (Professor)
Communication: Jeremy Bailenson (Assistant Professor), Clifford Nass (Professor), Byron Reeves (Professor), Frederick Turner (Assistant Professor)
Computer Science: David Dill (Professor), Brian Jeffrey Fogg (Consulting Assistant Professor), Michael Genesereth (Associate Professor), Margaret Johnson (Senior Lecturer), Oussama Khatib (Professor), Scott Klemmer (Assistant Professor), Daphne Koller (Professor), Jean-Claude Latombe (Professor), Marc Levoy (Professor), Christopher Manning (Associate Professor), John McCarthy (Professor Emeritus), Andrew Ng (Assistant Professor), Nils Nilsson (Professor Emeritus), Vaughan Pratt (Professor Emeritus), Eric Roberts (Professor, Teaching), Tim Roughgarden (Assistant Professor), Mehran Sahami (Associate Professor, Teaching), Sebastian Thrun (Associate Professor), Terry Winograd (Professor)
Economics: Muriel Niederle (Assistant Professor)
Education: Raymond P. McDermott (Professor), Roy Pea (Professor), Daniel Schwartz (Professor)
Electrical Engineering: John R. Koza (Consulting Professor), Krishna Shenoy (Assistant Professor)
French and Italian: Jean-Pierre Dupuy (Professor)
Genetics: Russ B. Altman (Professor)
Graduate School of Business: Baba Shiv (Associate Professor)
History: Jessica G. Riskin (Associate Professor)
Linguistics: Arto Anttila (Assistant Professor), Joan Bresnan (Professor), Eve Clark (Professor), Vivienne Fong (Lecturer), Daniel Jurafsky (Associate Professor), Ronald Kaplan (Consulting Professor), Lauri Karttunen (Consulting Professor), Martin Kay (Professor), Beth Levin (Professor), Christopher Manning (Associate Professor), Stanley Peters (Professor), Ivan A. Sag (Professor), Thomas A. Wasow (Professor), Annie Zaenen (Consulting Professor)
Management Science and Engineering: Pamela Hinds (Associate Professor)
Mathematics: Keith Devlin (Consulting Professor), Persi Diaconis (Professor), Solomon Feferman (Professor Emeritus)
Medicine: Russ B. Altman (Professor), John R. Koza (Consulting Professor)
Music: Jonathan Berger (Associate Professor), Christopher Chafe (Professor), Eleanor Selfridge-Field (Consulting Professor), William L. Verplank (Lecturer)
Neurobiology: Ben Barres (Professor), William T. Newsome (Professor), Jennifer Raymond (Assistant Professor)
Philosophy: Michael Bratman (Professor), Alexis Burgess (Assistant Professor), Mark Crimmins (Associate Professor), John Etchemendy (Professor), Solomon Feferman (Professor Emeritus), Dagfinn Føllesdal (Professor), David Israel (Consulting Associate Professor), Krista Lawlor (Assistant Professor), Grigori Mints (Professor), Marc Pauly (Assistant Professor), Raymond Perrault (Consulting Associate Professor), John Perry (Professor), Brian Skryms (Professor), Kenneth Taylor (Professor), Johan van Benthem (Professor), Thomas A. Wasow (Professor)
Psychiatry and Behavioral Sciences: Vinod Menon (Associate Professor, Research)
Psychology: Lera Boroditsky (Assistant Professor), Herbert H. Clark (Professor), Anne Fernald (Associate Professor), Susan Johnson (Assistant Professor), Brian Knutson (Assistant Professor), Ellen Markman (Professor), James McClelland (Professor), Michael Ramscar (Assistant Professor), Samuel McClure (Assistant Professor), Barbara Tversky (Professor Emeritus), Anthony Wagner (Associate Professor), Brian Wandell (Professor)
Statistics: Persi Diaconis (Professor), Susan P. Holmes (Professor, Teaching)
Symbolic Systems: William Byrne (Consulting Assistant Professor), Todd Davies (Lecturer), Tracy King (Consulting Associate Professor), Pat Langley (Consulting Professor), Jeff Shrager (Consulting Associate Professor), Paul Skokowski (Consulting Associate Professor)
Other Affiliates: David Barker-Plummer (CSLI Engineering Research Associate), Daniel Flickinger (CSLI Senior Research Engineer), John Kunz (Senior Research Engineer), Stephan Oepen (CSLI Senior Research Engineer)

Program Offices: Margaret Jacks Hall, Building 460, Room 40A
Mail Code: 94305-2150
Phone: (650) 723-4284
Email: ssp-af@csli.stanford.edu
Web Site: http://symsys.stanford.edu/

Courses given in the Program in Symbolic Systems have the subject code SYMBSYS. For a complete list of subject codes, see Appendix.

The observation that both human beings and computers can manipulate symbols lies at the heart of Symbolic Systems, an interdisciplinary program focusing on the relationship between natural and artificial systems that represent, process, and act on information. Computer programs, natural languages, the human mind, and the Internet embody concepts whose study forms the core of the Symbolic Systems curriculum, such as computation, representation, communication, and intelligence. A body of knowledge and theory has developed around these notions, from disciplines like philosophy, computer science, linguistics, psychology, statistics, neurobiology, and communication. Since the invention of computers, researchers have been working across these disciplines to study questions such as: in what ways are computers and computer languages like human beings and their languages; how can the interaction between people and computers be made easier and more beneficial?

The core requirements of the Symbolic Systems Program (SSP) include courses in symbolic logic, the philosophy of mind, formal linguistics, cognitive psychology, programming, the mathematics of computation, statistical theory, artificial intelligence, and interdisciplinary approaches to cognitive science. These courses prepare students with the vocabulary, theoretical background, and technical skills needed for study and research at the advanced undergraduate and graduate levels. Most of the courses in SSP are drawn from affiliated departments. Courses designed specifically for the program are aimed at integrating and supplementing topics covered by the department-based offerings. The curriculum includes humanistic approaches to questions about language and intelligence, as well as training in science and engineering.

SSP offers B.S. and M.S. degree programs. Both programs require students to master a common core of required courses and to choose an area of specialization.

UNDERGRADUATE PROGRAMS

BACHELOR OF SCIENCE

The program leading to a B.S. in Symbolic Systems provides students with a core of concepts and techniques, drawing on faculty and courses from various departments. The curriculum prepares students for advanced training in the interdisciplinary study of language and information, or for postgraduate study in any of the main contributing disciplines. It is also excellent preparation for employment immediately after graduation.

Symbolic Systems majors must complete a core of required courses plus a field of study consisting of six additional courses. All major courses are to be taken for letter grades unless an approved course is offered satisfactory/no credit only. All core courses must be passed with a grade of 'C-' or better. Students who receive a grade lower than this in a core course must alert the program of this fact so that a decision can be made about whether the student should continue in the major.

CORE REQUIREMENTS

In order to graduate with a B.S. in Symbolic Systems, a student must complete the following requirements. Some of these courses have other courses as prerequisites; students are responsible for completing each course's prerequisites before they take it.

1. *Cognitive Science*: SYMBSYS 100. Introduction to Cognitive Science
2. *Computer Programming*:
   a) CS 106A. Programming Methodology *and* 106B. Programming Abstractions; *or* 106X. Programming Methodology and Abstractions (Accelerated); *and*
   b) CS 107. Programming Paradigms
3. *Logic*:
   a) PHIL 150. Basic Concepts in Mathematical Logic; *or* 150X. Basic Concepts in Mathematical Logic, *and* CS 103A. Discrete Mathematics for Computer Science, *or* 103X. Discrete Structures (Accelerated); *and*
   b) PHIL 151. First-Order Logic
4. *Computational Theory*:
   a) CS 103B. Discrete Structures; *or* 103X. Discrete Structures (Accelerated); *and*
   b) CS 154. Introduction to Automata and Complexity Theory; *or* PHIL 152. Computability and Logic
5. *Probability*: one of the following:
   CME 106/ENGR 155C. Introduction to Probability and Statistics for Engineers
   EE 178. Probabilistic Systems Analysis
   MATH 151. Introduction to Probability Theory
   MS&E 120. Probabilistic Analysis
   STATS 110. Statistical Methods in Engineering and the Physical Sciences
   STATS 116. Theory of Probability
   STATS 121. Probability, Induction, Statistics
6. *Philosophical Foundations*:
   a) an introductory course in Philosophy must be taken prior to the required PHIL 80, from among the following:
   PHIL 10. God, Self, and World: An Introduction to Philosophy
   PHIL 20. Introduction to Moral Philosophy
   PHIL 30. Introduction to Political Philosophy
   PHIL 60. Introduction to Philosophy of Science
   PHIL 102. Modern Philosophy, Descartes to Kant
   IHUM 23A,B. The Fate of Reason
   and
   b) PHIL 80. Mind, Matter, and Meaning (WIM)
7. *Cognitive Psychology*: PSYCH 55. Introduction to Cognition and Brain; *or* PSYCH 40. Introduction to Cognitive Psychology
8. *Language and Mind:* one of the following:
   LINGUIST 1. Introduction to Linguistics
   LINGUIST 140. Language Acquisition I
   PHIL 181. Philosophy of Language
   PSYCH 131. Language and Thought
   PSYCH 137. Birds to Words: Cognition, Communication, and Language
9. *Linguistic Theory*: one of the following:
   LINGUIST 120. Introduction to Syntax
   LINGUIST 130A. Introduction to Linguistic Meaning
   LINGUIST 180. Introduction to Computational Linguistics
   LINGUIST 230A. Introduction to Semantics and Pragmatics
10. *Artificial Intelligence*: CS 121. Introduction to Artificial Intelligence, *or* 221. Artificial Intelligence: Principles and Techniques
11. *Advanced Small Seminar:** an upper-division, limited-enrollment seminar drawing on material from other courses in the core. Courses listed under Symbolic Systems Program offerings with numbers from SYMBSYS 201 through 209 are acceptable, as are other courses which are announced at the beginning of each academic year.

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* A course taken to fulfill one of these requirements can also be counted toward another requirement, as part of either the core or a student's concentration (see below), but not both.

FIELDS OF STUDY

In addition to the core requirements listed above, the Symbolic Systems major requires each student to complete a field of study consisting of six courses that are thematically related to each other. Students select concentrations from the list below or design others in consultation with their advisers. The field of study is declared on Axess; it appears on the transcript but not on the diploma.

Applied Logic
Artificial Intelligence
Cognitive Science
Computer Music
Decision Making and Rationality
Human-Computer Interaction
Learning
Natural Language
Neurosciences
Philosophical Foundations

MINOR

Students may minor in Symbolic Systems by completing either item 1 or item 2 below.

1. One course in each of the following core areas (please note that several of these courses have prerequisites):
   a) *Cognition*: SYMBSYS 100* *or* PSYCH 40 *or* 55
   b) *Logic and Computation*: PHIL 150 *or* 151, *or* CS 103B, 103X, *or* 154
   c) *Computer Programming*: CS 106B, 106X, *or* 107
   d) *Philosophical Foundations*: SYMBSYS 100* *or* PHIL 80
   e) *Formal Linguistics*: LINGUIST 120, 130A, *or* 130B
   f) *Artificial Intelligence*: CS 121 *or* 221
2. SYMBSYS 100, plus an interdisciplinary SSP concentration listed on the SSP web site at http://symsys.stanford.edu. To qualify, the selection of courses used for the minor must be interdisciplinary: it must either include courses from at least three departments, or include more than one course from each of two departments.

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*SYMBSYS 100 may not be counted for both areas 'a' and 'd'.

UNDERGRADUATE RESEARCH

The program strongly encourages all SSP majors to gain experience in directed research by participating in faculty research projects or by pursuing independent study. In addition to the Symbolic Systems Honors Program (see below), the following avenues are offered.

1. *Summer Internships:* students work on SSP-related faculty research projects. Application procedures are announced in the winter quarter for SSP majors.
2. *Research Assistantships:* other opportunities to work on faculty research projects are typically announced to SSP majors as they arise during the academic year.
3. *Independent Study*: under faculty supervision. For course credit, students should enroll in SYMBSYS 196.

Contact SSP for more information on any of these possibilities, or see http://symsys.stanford.edu/. In addition, the Undergraduate Advising and Research office offers grants and scholarships supporting student research projects at all levels; see http://urp.stanford.edu/.

HONORS PROGRAM

Seniors in SSP may apply for admission to the Symbolic Systems honors program prior to the beginning of their final year of study. Students who are accepted into the honors program can graduate with honors by completing an honors thesis under the supervision of a faculty member. Course credit for the honors project may be obtained by registering for SYMBSYS 190, Honors Tutorial, for any quarters while a student is working on an honors project. Juniors who are interested in doing an honors project during their senior year are advised to take SYMBSYS 91, Junior Honors Seminar. SYMBSYS 191, Senior Honors Seminar, is recommended for honors students during the senior year. Contact SSP or visit the program's web site for more information on the honors program, including deadlines and policies.

COTERMINAL BACHELOR'S AND MASTER'S DEGREES

Many SSP majors also complete coterminal M.S. or M.A. degrees in affiliated departments. In addition to the Symbolic Systems M.S. program (see below), the Department of Philosophy offers a special Symbolic Systems track for interdisciplinary graduate level work.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

GRADUATE PROGRAMS

The University's basic requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE

The M.S. degree in Symbolic Systems is designed to be completed in the equivalent of one academic year by coterminal students or returning students who already have a B.S. degree in Symbolic Systems, and in two years or less by other students depending upon level of preparation. Admission is competitive, providing a limited number of students with the opportunity to pursue course and project work in consultation with a faculty adviser who is affiliated with the Symbolic Systems Program. The faculty adviser may impose requirements beyond those described here.

Admission to the program as a coterminal student is subject to the policies and deadlines described in the "Undergraduate Degrees" section of this bulletin (see "Coterminal Bachelor's and Master's Degrees"). Applicants to the M.S. program are reviewed each Winter Quarter. Information on deadlines, procedures for applying, and degree requirements are available from the program's student services coordinator in the Linguistics Department office (460-127E) and at http://symsys.stanford.edu/ssp_static?page=masters.html.

REQUIREMENTS

A candidate for the M.S. degree in Symbolic Systems must complete a program of 45 units. At least 36 of these must be graded units, passed with an average grade of 3.0 (B) or better, and any course taken to fulfill requirements A, B, or C below must be taken for a letter grade unless the course is offered S/NC only. The 45 units may include no more than 21 units of courses from those listed below under Requirements A and B. Furthermore, none of the 45 units to be counted toward the M.S. degree may include units counted toward an undergraduate degree at Stanford or elsewhere. Course requirements are waived only if evidence is provided that similar or more advanced courses have been taken, either at Stanford or another institution. Courses that are waived rather than taken may not be counted toward the M.S. degree.

Each candidate for the M.S. degree must fulfill the following requirements:

REQUIREMENT A

Demonstrated competence in the core requirements for the B.S. degree in Symbolic Systems. Candidates who have gone through the Symbolic Systems undergraduate program satisfy this requirement in the course of the B.S. degree in Symbolic Systems. Other students admitted as candidates for a Symbolic Systems M.S. degree must complete or show evidence of having passed equivalent courses covering all the Symbolic Systems undergraduate core requirements, with the exception of the advanced small seminar requirement.

REQUIREMENT B

1. Submission to and approval by the Symbolic Systems Program office of these pre-project research documents:
   a) project area statement, endorsed with a commitment from the student's prospective project adviser due no later than May 1 of the academic year prior to the expected graduation year; and
   b) qualifying research paper due no later than the end of the Summer Quarter prior to the expected graduation year.
2. Completion of two additional skill requirements:
   a) *Computer Programming:* CS 108, Object-Oriented Systems Design; *and*
   b) *Empirical Methods:* one of the following:
      COMM 206. Communication Research Methods
      COMM 239. Questionnaire Design for Surveys and Laboratory Experiments: Social and Cognitive Perspectives
      COMM 268. Experimental Research in Advanced User Interfaces
      LINGUIST 280/CS 224N. Natural Language Processing
      PSYCH 110. Research Methods and Experimental Design
      PSYCH 252. Statistical Methods for Behavioral and Social Science (for 3 or more units)
      PSYCH 253. Statistical Theory, Models, and Methodology (for 3 units)
      STATS 191. Introduction to Applied Statistics
      STATS 200. Introduction to Statistical Inference
      a Statistics course numbered higher than 200
3. Completion of three quarters of the Symbolic Systems Program M.S. Seminar (SYMBSYS 291).

REQUIREMENT C

Completion of an approved specialization track. All tracks of the Symbolic Systems M.S. program require students to do a substantial project. The course requirements for each track are designed to prepare a student to undertake such a project. The nature of the project depends on the student's focus, but it should be academic in nature (contributing to generalizable knowledge) and it should relate to the subject matter of symbolic systems more or equally appropriately as it does to other master's degree programs at Stanford. In all cases, a written thesis or paper describing the project is required. The project normally takes three quarters, and work on the project may account for up to 15 units of a student's program. The thesis must be read and approved for the master's degree in Symbolic Systems by two qualified readers approved by the program, at least one of whom must be a member of the academic council. Each track of the Symbolic Systems M.S. program has its own core requirements, as well as unit requirements from a set of elective courses. The tracks and their requirements are as follows.

The Human-Computer Interaction (HCI) Track—The HCI Core: a course in Computer Science numbered 141-179 (excluding 147), *or* CS 241-279 (excluding 247A), *or* CS 295, Software Engineering; *and* CS 147, Introduction to Human-Computer Interaction Design; *and* CS 247A, Human-Computer Interaction: Interaction Design Studio*; and* CS 376, Research Topics in Human-Computer Interaction.

For HCI electives, at least 9 additional units of HCI courses, chosen in consultation with the student's adviser. The following are examples of themes around which an elective program might be built: animation, business systems, computer-aided design, computer graphics, data interfaces, decision systems, design for disabilities, design principles, dialogue systems, digital art, digital media, education technology, game design, history of computers, information retrieval, intelligent interfaces, interaction design, Internet design, medical informatics, multimedia design, object-oriented design, philosophy of computation, social aspects of computing, usability analysis, virtual reality, and workplace computing.

The Natural Language Technology (NLT) Track—For the NLT core, in addition to the courses below, students must complete LINGUIST 280/CS 224N, Natural Language Processing, which can be used as the empirical methods course for Requirement B above.

1) An in-depth theory of English grammar course such as LINGUIST 221A, Foundations of English Grammar
2) A graduate-level semantics course (if not already taken as part of Requirement A) such as LINGUIST 232A, Lexical Semantics, or 230B, Semantics and Pragmatics
3) A two-course sequence in Computational Linguistics:
   LINGUIST 180. Introduction to Computer Speech and Language Processing, *and*
   LINGUIST 283. Programming and Algorithms for Natural Language Processing

For NLT electives, at least 9 additional units of natural language technology courses, chosen in consultation with the student's adviser.

The Individually Designed Option—Students wishing to design their own M.S. curriculum in Symbolic Systems must present a project plan as part of their application. This plan must be endorsed by the student's adviser prior to admission to the Symbolic Systems M.S. program. The application must also specify at least 20 units of course work that the student will take in support of the project.

Students are admitted under this option only if they present well-developed plans whose interdisciplinary character makes them inappropriate for any departmental master's program, but appropriate for Symbolic Systems.

COURSES

SYMBSYS 10. Symbolic Systems Forum—A weekly lecture series, featuring different speakers who report on research of general interest to Symbolic Systems students and faculty. Regular attendance required for credit. May be repeated for credit.
1 unit, Aut, Win, Spr (Davies, T)

SYMBSYS 100. Introduction to Cognitive Science—(Same as LINGUIST 144, PHIL 190, PSYCH 130.) The history, foundations, and accomplishments of the cognitive sciences, including presentations by leading Stanford researchers in artificial intelligence, linguistics, philosophy, and psychology. Overview of the issues addressed in the Symbolic Systems major. GER:DB-SocSci
4 units, Spr (Davies, T)

SYMBSYS 145. Cognition in Interaction Design—Interactive systems from the standpoint of human cognition. Topics include skill acquisition, complex learning, reasoning, language, perception, methods in usability testing, special computational techniques such as intelligent and adaptive interfaces, and design for people with cognitive disabilities. Students conduct analyses of real world problems of their own choosing and redesign/analyze a project of an interactive system. GER:DB-SocSci
3 units, Win (Shrager, J)

SYMBSYS 170/270. Decision Behavior: Theory and Evidence—(Graduate students register for 270.) Introduction to the study of judgment and decision making, relating theory and evidence from disciplines such as psychology, economics, statistics, neuroscience, and philosophy. The development and critique of Homo economicus as a model of human behavior, and more recent theories based on empirical findings. Recommended: background in formal reasoning.
3-4 units, not given this year (Davies, T)

SYMBSYS 205. Systems: Theory, Science, and Metaphor—Systems science explores abstract properties of systems such as network connectivity, complexity, and emergence, with applications in natural, social, and artificial domains. How useful are these theories? Are their claims testable or generalizable? Do they change the way people think and talk? Topics announced during the previous quarter on course web site. Limited enrollment. Prerequisites: Symbolic Systems undergraduate core course in each of philosophy, psychology or linguistics, and computer science.
3 units, not given this year (Davies, T)

SYMBSYS 206. Topics in the Philosophy of Neuroscience—Does understanding the brain or computational models of the brain allow understanding of the mind? Recent literature on neurophilosophical and neuroskeptical approaches to the mind including perception, neurophenomenology, sensorimotor accounts, computational models, and eliminativism. Prerequisites: PHIL 80, and familiarity with philosophy or neuroscience, or consent of instructor. May be repeated for credit.
3 units, Aut (Skokowski, P)

SYMBSYS 209. Battles Over Bits—The changing nature of information in the Internet age and its relationship to human behavior. Philosophical assumptions underlying practices such as open source software development, file sharing, common carriage, and community wireless networks, contrasted with arguments for protecting private and commercial interests such as software patents, copy protection, copyright infringement lawsuits, and regulatory barriers. Theory and evidence from disciplines including psychology, economics, computer science, law, and political science. Prerequisite: PSYCH 40, 55, 70, or SYMBSYS 202.
3 units, Aut (Davies, T)

SYMBSYS 210. Learning Facial Emotions: Art versus Psychology—Differences between art and psychology approaches to learning to recognize, feel, and empathetically respond to facial expressions. Computational learning theory, motivation measurement, and emotion and empathetic response measurement. Experiments with human subjects. Art lab. Prerequisites: Psychology or Computer Science course in learning, emotions, or HCI.
3 units, Win (Wilkins, D; Davis-Kivelson, P)

RESEARCH

SYMBSYS 91. Junior Honors Seminar—Recommended for juniors doing an honors project during the following year. Defining a topic, choosing an adviser, considering overall goals. Resources at Stanford and some experiences of seniors discussed with guest speakers.
2 units, Win (Davies, T)

SYMBSYS 190. Senior Honors Tutorial—Under the supervision of their faculty honors adviser, students work on their senior honors project. May be repeated for credit.
1-5 units, Aut, Win, Spr, Sum (Staff)

SYMBSYS 191. Senior Honors Seminar—Recommended for seniors doing an honors project. Under the leadership of the Symbolic Systems program coordinator, students discuss, and present their honors project.
2 units, Aut (Davies, T)

SYMBSYS 196. Independent Study—Independent work under the supervision of a faculty member. Can be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

SYMBSYS 290. Master's Degree Project
1-15 units, Aut, Win, Spr, Sum (Staff)

SYMBSYS 291. Master's Program Seminar—Enrollment limited to students in the Symbolic Systems M.S. degree program. May be repeated for credit.
1 unit, Aut, Win, Spr (Davies, T)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOSCI 150/250. Human Behavioral Biology—(Same as HUMBIO 160)
5 units, Spr (Sapolsky, R), alternate years, not given next year

CME 106. Introduction to Probability and Statistics for Engineers—(Same as ENGR 155C.)
3-4 units, Win, Sum (Khayms, V)

COMM 106/206. Communication Research Methods
4-5 units, Win (Gauthier, L; Groom, V)

COMM 169/269. Computers and Interfaces
4-5 units, Win (Nass, C)

CS 103A. Discrete Mathematics for Computer Science
3 units, Aut, Win (Plummer, R)

CS 103B. Discrete Structures
3 units, Win, Spr (Sahami, M)

CS 103X. Discrete Structures (Accelerated)
3-4 units, Win (Koltun, V)

CS 106A. Programming Methodology—(Same as ENGR 70A.)
3-5 units, Aut (Sahami, M), Win, Spr (Young, P), Sum (Staff)

CS 106B. Programming Abstractions—(Same as ENGR 70B.)
3-5 units, Aut (Staff), Win (Zelenski, J), Spr, Sum (Staff)

CS 106X. Programming Abstractions (Accelerated)—(Same as ENGR 70X.)
3-5 units, Aut (Zelenski, J), Win (Cain, G)

CS 107. Programming Paradigms
3-5 units, Aut, Spr (Cain, G)

CS 108. Object-Oriented Systems Design
3-4 units, Aut, Win (Parlante, N)

CS 121. Introduction to Artificial Intelligence
3 units, Spr (Latombe, J), Sum (Staff)

CS 147. Introduction to Human-Computer Interaction Design
3-4 units, Aut (Klemmer, S)

CS 154. Introduction to Automata and Complexity Theory
3-4 units, Aut (Dill, D), Spr (Motwani, R), Sum (Staff)

CS 161. Design and Analysis of Algorithms
3-4 units, Aut (Plotkin, S), Win (Roughgarden, T), Sum (Staff)

CS 201. Computers, Ethics, and Social Responsibility
3-4 units, Win (Johnson, M)

CS 205A. Mathematical Methods for Robotics, Vision, and Graphics
3 units, Aut (Fedkiw, R)

CS 221. Artificial Intelligence: Principles and Techniques
3-4 units, Aut (Ng, A)

CS 223A. Introduction to Robotics
3 units, Win (Khatib, O)

CS 223B. Introduction to Computer Vision
3 units, Win (Kosecka, J)

CS 224M. Multi-Agent Systems
3 units, Win (Shoham, Y)

CS 228. Probabilistic Models in Artificial Intelligence
3 units, Win (Koller, D)

CS 229. Machine Learning
3 units, Aut (Ng, A)

CS 247. Human-Computer Interaction Design Studio
3-4 units, Win (Winograd, T)

CS 249B. Advanced Object-Oriented Programming
3 units, Win (Cheriton, D)

ECON 51. Economic Analysis II
5 units, Aut (Tendall, M), Win (Einav, L), Sum (Staff)

ECON 160. Game Theory and Economic Applications
5 units, Win (Cojoc, D)

EDUC 218. Topics in Cognition and Learning: Play
3 units, Aut (Schwartz, D)

EE 178. Probabilistic Systems Analysis
3 units, Win (El Gamal, A)

EE 376A. Information Theory
3 units, Win (Cover, T)

ENGR 62. Introduction to Optimization—(Same as MS&E 111.)
4 units, Aut (Goel, A), Spr (Van Roy, B)

FRENGEN 295. Science, Technology, and Society in Europe and the U.S.: Ethical Debates and Controversies
3-5 units, Win (Dupuy, J)

LINGUIST 1. Introduction to Linguistics
4 units, Aut (Eckert, P; Sag, I), Spr (Staff)

LINGUIST 105/205A. Phonetics
4 units, Spr (Staff)

LINGUIST 110. Introduction to Phonetics and Phonology
4 units, Spr (Anttila, A)

LINGUIST 120. Introduction to Syntax
4 units, Aut (Wasow, T)

LINGUIST 124A/224A. Introduction to Formal Universal Grammar
4 units, Spr (Bresnan, J)

LINGUIST 130A. Introduction to Linguistic Meaning
4 units, Spr (Staff)

LINGUIST 130B. Introduction to Lexical Semantics
4 units, Win (Fong, V)

LINGUIST 140/240. Language Acquisition I
4 units, Aut (Clark, E)

LINGUIST 180. Introduction to Computational Linguistics
4 units, Aut (Jurafsky, D)

LINGUIST 187/287. Grammar Engineering
1-4 units, Win (Flickinger, D; Oepen, S)

LINGUIST 210A. Phonology
4 units, Aut (Anttila, A)

LINGUIST 210B. Advanced Phonology
4 units, Win (Anttila, A)

LINGUIST 222A. Foundations of Syntactic Theory I
2-4 units, Aut (Levin, B)

LINGUIST 230A. Introduction to Semantics and Pragmatics
2-4 units, Win (Peters, S)

LINGUIST 232A. Lexical Semantics
2-4 units, Spr (Levin, B)

LINGUIST 241. Language Acquisition II
1-4 units, Win (Clark, E)

MATH 103. Matrix Theory and Its Applications
3 units, Aut (Milanov, T), Win, Spr (Nedelec, L), Sum (Staff)

MATH 113. Linear Algebra and Matrix Theory
3 units, Aut (Vasy, A), Win (Cohen, R)

MATH 151. Introduction to Probability Theory
3 units, Win (Liu, T)

ME 115. Human Values in Design
3 units, Win (Boyle, B)

MS&E 120. Probabilistic Analysis
5 units, Aut (Shachter, R)

MS&E 121. Introduction to Stochastic Modeling
4 units, Win (Glynn, P)

MS&E 201. Dynamic Systems
3-4 units, Spr (Tse, E)

MUSIC 151. Psychophysics and Cognitive Psychology for Musicians
4 units, Spr (Berger, J)

MUSIC 220A. Fundamentals of Computer-Generated Sound
2-4 units, Aut (Chafe, C; Wang, G)

MUSIC 220B. Compositional Algorithms, Psychoacoustics, and Spatial Processing
2-4 units, Win (Wang, G)

MUSIC 250A. HCI Theory and Practice
3-4 units, Aut, Win (Staff)

MUSIC 253. Musical Information: An Introduction
1-4 units, Win (Selfridge-Field, E)

MUSIC 254. Applications of Musical Information: Query, Analysis, and Style Simulation
1-4 units, Spr (Selfridge-Field, E)

NBIO 206. The Nervous System
7-8 units, Win (Clandinin, T)

NBIO 218. Neural Basis of Behavior
4 units, Spr (Raymond, J; Knudsen, E), alternate years, not given next year

PHIL 20. Introduction to Moral Philosophy—(Same as ETHICSOC 20)
5 units, Spr (Schapiro, T)

PHIL 30. Introduction to Political Philosophy—(Same as ETHICSOC 30, POLISCI 3.)
5 units, Aut (Hussain, N)

PHIL 60. Introduction to Philosophy of Science—(Same as HPS 60)
5 units, Aut (Longino, H)

PHIL 80. Mind, Matter, and Meaning—WIM for Symbolic Systems majors.
5 units, Win (Lawlor, K), Spr (Burgess, A)

PHIL 102. Modern Philosophy, Descartes to Kant
4 units, Aut (Dunlop, K)

PHIL 150/250. Basic Concepts in Mathematical Logic
4 units, Aut (Wasow, T)

PHIL 150X. Basic Concepts in Mathematical Logic
2 units, Aut (Wasow, T)

PHIL 151. First-Order Logic—(Same as PHIL 251)
4 units, Win (Pauly, M)

PHIL 152/252. Computability and Logic
4 units, Spr (Pauly, M)

PHIL 154/254. Modal Logic
4 units, Aut (Mints, G)

PHIL 162/262. Philosophy of Mathematics—(Same as MATH 161.)
4 units, Spr (Feferman, S)

PHIL 164/264. Central Topics in the Philosophy of Science: Theory and Evidence
4 units, Aut (Ryckman, T)

PHIL 167B/267B. Philosophy, Biology, and Behavior
4 units, Win (Longino, H)

PHIL 181/281. Philosophy of Language
4 units, Win (Føllesdal, D)

PHIL 184/284. Theory of Knowledge
4 units, Spr (Lawlor, K)

PHIL 186/286. Philosophy of Mind
4 units, Win (Perry, J)

PHIL 358. Rational Agency and Intelligent Interaction—(Same as CS 222.)
3 units, Spr (Shoham, Y; van Benthem, J)

PSYCH 30. Introduction to Perception
3 units, Win (Grill-Spector, K)

PSYCH 45. Introduction to Learning and Memory
3 units, Spr (Wagner, A)

PSYCH 55. Introduction to Cognition and the Brain
4 units, Win (Boroditsky, L)

PSYCH 70. Introduction to Social Psychology
4 units, Spr (Tormala, T)

PSYCH 120. Cellular Neuroscience: Cell Signaling and Behavior—(Same as BIOSCI 153.)
4 units, Aut (Wine, J)

PSYCH 131/262. Language and Thought
4 units, Aut (Clark, H)

PSYCH 137/239A. Birds to Words: Cognition, Communication, and Language—(Same as HUMBIO 145.)
4 units, Aut (Fernald, A; Ramscar, M)

PSYCH 143. Developmental Anomalies
3 units, Spr (Johnson, S)

PSYCH 202. Cognitive Neuroscience
3 units, Spr (Wandell, B; Grill-Spector, K)

PSYCH 204A. Computational Neuroimaging
1-3 units, Spr (Wandell, B)

PSYCH 250. High-level Vision
1-3 units, Spr (Grill-Spector, K), alternate years, not given next year

PSYCH 251. Affective Neuroscience
3 units, Win (Knutson, B)

PSYCH 252. Statistical Methods for Behavioral and Social Sciences—(Same as NENS 202.)
1-6 units, Aut (Thomas, E)

PSYCH 272. Special Topics in Psycholinguistics
1-3 units, Spr (Clark, H)

SOC 126/226. Introduction to Social Networks
5 units, Aut (Hillmann, H)

STATS 110. Statistical Methods in Engineering and the Physical Sciences
4-5 units, Aut (Srinivasan, B), Sum (Staff)

STATS 116. Theory of Probability
3-5 units, Aut (Donoho, D), Spr (Wong, W), Sum (Staff)

STATS 191. Introduction to Applied Statistics
3-4 units, Win (Zhang, N)

STATS 200. Introduction to Statistical Inference
3 units, Win (Romano, J), Sum (Staff)

PROGRAM ON URBAN STUDIES

Director: Doug McAdam (Sociology)
Associate Director: Michael Kahan (Lecturer, Urban Studies)
Executive Committee: Albert Camarillo (History), Karen Cook (Sociology), Milbrey McLaughlin (Education), Walter Scheidel (Classics), Jeff Wachtel (President's Office)
Affiliated Faculty: Lawrence Bobo (Sociology), Scott Bukatman (Art and Art History), Albert Camarillo (History), Prudence Carter (Education), Samuel Chiu (Management Science and Engineering), Karen Cook (Sociology), Paulla Ebron (Anthropology), Charlotte Fonrobert (Religious Studies), Richard Ford (Law), Zephyr Frank (History), Steven Gorelick (Geological and Environmental Sciences), David Grusky (Sociology), Miyako Inoue (Anthropology), Sarah Jain (Anthropology), Raymond Levitt (Civil and Environmental Engineering), Carolyn Lougee (History), Monica McDermott (Sociology), Raymond McDermott (Education), Daniel McFarland (Education), Milbrey McLaughlin (Education), William McLennan (Office of Religious Life), Ian Morris (Classics), Josiah Ober (Classics, Political Science), Susan Olzak (Sociology), Leonard Ortolano (Civil and Environmental Engineering), Rob Reich (Political Science), Ian Robertson (Anthropology), Michael Rosenfeld (Sociology), Rebecca Sandefur (Sociology), Walter Scheidel (Classics), Karen Seto (Geological and Environmental Sciences), Jennifer Trimble (Classics), Nancy Brandon Tuma (Sociology, Hoover Institution), Paul Turner (Art and Art History), Barbara Voss (Anthropology)
Lecturers: Karin Cotterman, Melanie Edwards, Dehan (Danno) Glanz, Michael Kahan, Patricia Karlin-Neumann, Michael Kieschnick, Joseph Kott, Joanne Sanders, Laura Scher, Jackie Schmidt-Posner, Frederic Stout
Visiting Associate Professor: Gerald Gast

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Courses given in the Program on Urban Studies have the subject code URBANST. For a complete list of subject codes, see Appendix.

The Urban Studies program treats urbanism as an interdisciplinary field; it brings together students, faculty, and outside specialists concerned with cities, and the impacts of cities on society and people's lives. The Urban Studies major encourages students to inquire deeply into the nature of cities and the techniques used to modify urban environments. It prepares students to address urbanization, and gives students a knowledge base and theoretical, analytical, and practical skills to understand urban social systems and effect social change.

A major in Urban Studies prepares students for careers and advanced academic pursuits in fields including architecture, community service, education, environmental planning, real estate development, urban design, and urban planning; many have obtained graduate degrees in architecture, business, law, public policy, urban design, and urban planning from major universities across the country. Information on careers and graduate programs pursued by Urban Studies alumni is available from the Urban Studies program office.

UNDERGRADUATE PROGRAMS

The Urban Studies major requires students to complete four types of courses totaling at least 73 units: 19 units in the core; at least 8 units of skills courses; at least 25 units in an area of concentration; and 13 units in the capstone sequence. If units in these categories total less then 73, the remaining units may be fulfilled by courses in other concentrations or in Urban Studies courses numbered 100 or higher (except URBANST 198 and 199). Majors must also complete two prerequisites: ECON 1A, Introductory Economics A; and SOC 1, Introduction to Sociology; the units for these prerequisite courses do not count toward the 73 units required for the major. URBANST 198, URBANST 199, and prerequisites for required courses and for electives also do not count towards the 73-unit minimum.

Urban Studies students interested in graduate school in business or urban planning are advised to obtain basic quantitative skills by completing MATH 19, 20, and 21, or MATH 41 and 42, preferably before the junior year. A course in statistical methods, such as STATS 60, ECON 102A, POLISCI 150A or 151B, or SOC 181B, is recommended for students interested in business or urban planning.

Urban Studies students carry out an internship in an urban organization in the public or private sector, typically by enrolling in URBANST 201A during Winter Quarter of the junior year. This internship, or an appropriate substitution where necessary, should be arranged no later than Autumn Quarter of the junior year. Urban Studies majors who wish to receive academic credit for additional internship work may enroll once in URBANST 194. Students can consult the Haas Center for Public Service for other courses with internship placements at community organizations.

Urban Studies students are encouraged to spend at least one quarter studying overseas to learn how cities vary across societies. Some Urban Studies core course requirements, as well as electives, can be satisfied at Stanford overseas campuses. Courses offered overseas vary from year to year, and students should check in advance with Overseas Studies and Urban Studies concerning which courses meet Urban Studies requirements. Students may arrange to fulfill the internship requirement through a summer placement at one of Stanford's overseas locations.

Courses counted toward the 73-unit graduation requirement for the major (except URBANST 201A) must be taken for a letter grade, and a minimum grade of 'C' is required. Qualified students may write a senior honors thesis and graduate with honors; see details in "Honors Program" below. Students interested in declaring Urban Studies as a major are required to meet first with the student services administrator and one of the program's advisers; they then declare the Urban Studies major on Axess.

URBAN STUDIES CORE

Urban Studies majors should complete URBANST 110, Introduction to Urban Studies, before Spring Quarter of the junior year. The following courses, totaling 19 units, are required:

URBANST 110. Introduction to Urban Studies
URBANST 112. The Urban Underclass
URBANST 113. Introduction to Urban Design
URBANST 114. Cities in Comparative Perspective

SKILLS

A minimum of 8 units are required. The following courses may be used to fulfill the skills requirement; consult an adviser to determine if additional courses may be available:

GES 144. Fundamentals of Geographic Information Systems
SOC 180A. Foundations of Social Research

CONCENTRATIONS

Students must complete at least 25 units in one of the following concentrations. Courses may not be double counted. Students should consult an adviser to develop a program that meets their intellectual goals; relevant courses not listed here, including research methods courses taken in preparation for the capstone project, may be counted toward the concentration with the prior consent of an adviser.

These concentrations are declared to the department; they are not declared on Axess, and they do not appear on the transcript or the diploma.

CITIES IN COMPARATIVE AND HISTORICAL PERSPECTIVE

Focus is on how cities have evolved over time, and how they are continuing to change today in societies around the world, drawing on disciplinary approaches including anthropology, archaeology, art history, geography, and history. By placing urban issues in perspective, students improve their comprehension of the present as well as the past.

Students in this concentration are encouraged to study off campus, and preferably overseas, for at least one quarter. Many courses offered through the Overseas Studies Program can be counted toward the concentration. Similarly, internships offered at many of Stanford's overseas locations can be used to fulfill the Urban Studies internship requirement. Students should also consider enrolling in one of the Stanford Overseas Seminars, intensive courses taught in September in locations which do not have overseas campuses.

The following course is required for the cities in comparative and historical perspective concentration:

CASA 112. The Archaeology of Modern Urbanism

The following courses may be counted toward the cities in comparative and historical perspective concentration:

ANTHSCI 128B. Globalization and Japan
ANTHSCI 142. Incas and their Ancestors: Peruvian Archaeology
ANTHSCI 144. Urbanism in the Prehispanic New World
ANTHSCI 145B. Evolution of Civilizations
ANTHSCI 146A. The Aztecs and their Ancestors: Introduction to Mesoamerican Archaeology
ANTHSCI 151. Anthropology and Demography
ARTHIST 3. Introduction to the History of Architecture
ARTHIST 141. The Invention of Modern Architecture
ARTHIST 212. Renaissance Florence 1400-1540
ARTHIST 252A. Place: Making Space Now
CASA 36. Life on the Streets: Anthropology of U.S. Urban Life
CASA 133. City and Sounds
CASA 134. Archaeology of Architecture
CASA 137E. Excavation at Catalhoyuk, Turkey
CLASSGEN 36. Projecting Rome
CLASSGEN 60. The Life and Death of a Roman City: Pompeii
CLASSHIS 60. The Romans
CLASSHIS 101. The Greeks
CLASSHIS 105. History and Culture in Ancient Egypt
GES 138. Urbanization, Global Change, and Sustainability
GES 142. Remote Sensing of Land Use and Land Cover
HISTORY 106A. Global Human Geography: Asia and Africa
HISTORY 106B. Global Human Geography: Europe and Americas
HISTORY 110C. Introduction to Modern Europe
HISTORY 150C. The United States in the 20th Century
HISTORY 234. Paris and Politics, 1600-2008
HISTORY 252G. Environmental History of Urban America
HISTORY 260. Race and Ethnicity in the American Metropolis: Cities of Color – Los Angeles and East Palo Alto
HISTORY 267F. Cities in the North American West, 1840-1940
HISTORY 276. Modern Brazil
HISTORY 291B. The City in Imperial China
ME 120. History and Philosophy of Design
OSPBER 11. The Vanishing City: Lost Architecture and the Art of Commemoration in Berlin
OSPBER 60. Cityscape as History: Architecture and Urban Design in Berlin
OSPFLOR 36. Introduction to the International Economy: The State, the Firm, and the Region
OSPFLOR 115Y. The Duomo and the Piazza della Signoria: Symbols of a Civilization
OSPKYOTO 28. Kyoto: History of Urban and Architectural Space
OSPOXFRD 65. Oxford: The City as a Work of Art
OSPPARIS 25. Literature and the City
OSPPARIS 92. Building Paris: Its History, Architecture, and Urban Design
POLISCI 110A. Sovereignty and Globalization
POLISCI 110C. America and the World Economy
RELIGST 237. Jewish and Christian Rome in the 1st to 6th Centuries
URBANST 161. American Urban History since 1920
URBANST 164. Utopia and Reality in Modern Urban Planning
URBANST 175. Global Cities and the Transnational Economy

URBAN EDUCATION

The purpose of this concentration is to prepare students for a career in educational policy and practice in diverse settings. This concentration is a useful basis for graduate study in educational policy, law, or business, and for students who have been admitted by the School of Education to pursue a coterminal master's degree in the Stanford Teacher Education Program (STEP) or the Policy, Organization, and Leadership Studies Program (POLS). Students planning to pursue a coterminal master's should take one of the three practica: EDUC 103A, B, and C (for the STEP elementary coterm); EDUC 101X (for the STEP secondary coterm); or EDUC 270A (for the POLS coterm). Application and admission to a coterminal degree in these programs occurs during the Autumn Quarter of the junior year and is handled by the School of Education.

Opportunities to obtain teaching and advising experience are available in nearby schools through Upward Bound and other programs administered by the Haas Center for Public Service and through courses offered by the School of Education.

Students who choose this concentration may be eligible for the undergraduate honors program of the School of Education, in which case they should enroll in EDUC 199A,B, or C during their senior year.

The following course is required for the urban education concentration:

EDUC 212X. Urban Education

The following courses may be counted toward the urban education concentration:

AFRICAST 211. Education for All? The Global and Local in Public Policy Making in Africa
EDUC 101. Undergraduate Teaching Practicum
EDUC 103A/SOC 103A. Tutoring: Seeing a Child through Literacy
EDUC 103B. Race, Ethnicity, and Linguistic Diversity in Classrooms: Sociocultural Theory and Practices
EDUC 103C. Educational Policy, Diversity, and English Learners
EDUC 104X. Conduct of Research with and in Communities
EDUC 115Q. Identities, Race, and Culture in Urban Schools
EDUC 116X. Service Learning as an Approach to Teaching
EDUC 177. Education of Immigrant Students: Psychological Perspectives
EDUC 179. Urban Youth and Their Institutions: Research and Practice
EDUC 198X. Tutoring with Adolescents: Ravenswood Writes
EDUC 201. History of Education in the United States
EDUC 201A. History of African American Education
EDUC 201B. Education for Liberation
EDUC 202. Introduction to Comparative and International Education
EDUC 204. Introduction to the Philosophy of Education
EDUC 220A. Introduction to the Economics of Education
EDUC 220B. Introduction to the Politics of Education
EDUC 220C. Education and Society
EDUC 220D. History of School Reform: Origins, Policies, Outcomes, and Explanations
EDUC 221A. Policy Analysis in Education
EDUC 233A, B. Adolescent Development and Mentoring in the Urban Context
EDUC 287. Culture and Learning
HUMBIO 142. Adolescent Development
or PSYCH 60: Introduction to Developmental Psychology
SOC 132. Sociology of Education: The Social Organization of Schools

URBAN SOCIETY AND SOCIAL CHANGE

Focus is on issues in contemporary urban society and the tools and concepts that planners, policy makers, and citizens use to address those issues. Topics include environmental challenges, racial and class inequality, and the provision of adequate urban infrastructure. Students learn how community action, urban planning and design, and organizations in nonprofit, for-profit, and government sectors address urban social and environmental problems. This concentration prepares students to enter graduate programs concerned with urban affairs, community service, and public policy, and to work with local governmental agencies and for-profit and nonprofit organizations engaged in community service and development.

The following course is required for the urban society and social change concentration:

POLISCI 133. Ethics and Politics of Public Service

The following courses may be counted toward the urban society and social change concentration:

CASA 88. Theories in Race and Ethnicity
CASA 115. Race and the American City
CEE 64. Air Pollution: From Urban Smog to Global Change
CEE 100. Managing Sustainable Building Projects
CEE 131. Architectural Design Process
CEE 142A. Sustainable Development
CEE 171. Environmental Planning Methods
CEE 172. Air Quality Management
EARTHSYS 124. Environmental Justice: Local, National, and International Dimensions
ECON 150. Economic Policy Analysis
ECON 155. Environmental Economics and Policy
EDUC 270A. Learning to Lead in Public Service Organizations
ENGR 150. Social Innovation and Entrepreneurship
GES 138. Urbanization, Global Change and Sustainability
GES 142. Remote Sensing of Land Use and Land Cover Change
HISTORY 105. Gandhi, King and Non-Violence
HISTORY 252G. Environmental History of Urban America
HISTORY 255. Martin Luther King, Jr.: The Social Gospel and the Struggle for Justice
HISTORY 260. California's Minority-Majority Cities
MS&E 196. Transportation Systems and Urban Development
POLISCI 143. Nongovernmental Organizations and Development in Poor Countries
POLISCI 221F. Race and American Politics
POLISCI 236. Theories of Civil Society, Philanthropy, and the Nonprofit Sector
PUBLPOL 180. Social Innovation
PUBLPOL 183. Philanthropy and Social Innovation
PUBLPOL 185. Managing Public Policy
SOC 118. Social Movements and Collective Action
SOC 137. Homelessness: Its Causes, Consequences, and Policy Solutions
SOC 140. Introduction to Social Stratification
SOC 141. Controversies About Inequality
SOC 141A. Social Class, Race, Ethnicity, Health
SOC 143. Prejudice, Racism, and Social Change
SOC 144. Race and Crime in America
SOC 145. Race and Ethnic Relations
SOC 160. Formal Organizations
  or MS&E 180. Organizations: Theory and Management
URBANST 111. Urban Politics
URBANST 126. Spirituality and Nonviolent Urban and Social Transformation
URBANST 131. Social Innovation and the Social Entrepreneur
URBANST 132. Concepts and Analytic Skills for the Social Sector
URBANST 133. Social Entrepreneurship Collaboratory
URBANST 162. Managing Local Governments
URBANST 163. Land Use Control
URBANST 165. Sustainable Urban and Regional Transportation Planning
URBANST 171. Urban Design Studio

SELF-DESIGNED

Students who wish to concentrate in an area of urban studies other than one of the above concentrations must complete the Urban Studies core, skills, and capstone requirement, and design additional units to bring the total to at least 73 units. The self-designed portion of the major should concentrate on a particular area of urban study, such as urban health care or urban environmental management. Additional units must be approved by both the Director of Urban Studies and an academic adviser who is a member of the Academic Council and has expertise in the particular area of interest to the student. Proposals for courses in the self-designed portion of the concentration should include a list of courses and a description of how each course meets the student's educational objectives. A proposal for a self-designed concentration must be accompanied by a letter to the Director of Urban Studies indicating that the academic adviser has examined and approved the student's plan.

Students pursuing a self-designed concentration must submit proposals for approval by the Director of Urban Studies by the middle of the second quarter of the student's junior year. Applications received after that deadline are not considered. Students interested in designing their own concentration are strongly encouraged to meet with the Director of Urban Studies before the end of their sophomore year.

CAPSTONE

All majors are required to complete an internship and a sequence of two seminars, totaling 13 units, in which students participate in the work of an urban organization related to their area of interest, design a senior project, and write the results of their project. The capstone seminars can be used to satisfy the Writing in the Major requirement and to complete some work on an honors thesis. URBANST 201A and 201 or 202 should be taken in the junior year, and URBANST 203 in the senior year.

URBANST 201. Preparation for Senior Project (WIM)
  or URBANST 202. Preparation for Honors Thesis (WIM)
URBANST 201A. Capstone Internship in Urban Studies
URBANST 203. Senior Seminar

MINOR

The minor in Urban Studies is designed to introduce students to several disciplinary approaches to the study of cities, and provides the opportunity to explore one of three specialized options: cities in comparative and historical perspective; urban education; or urban society and social change.

The minor in Urban Studies requires completion of seven courses for a letter grade, including the four core courses, the required course in the student's chosen concentration area, and two additional courses in that option as listed above.

HONORS PROGRAM

The honors program offers qualified students an opportunity to conduct independent research and to write a thesis summarizing the results. Before being accepted to the honors program in Urban Studies, a student must

1. declare a major in Urban Studies and complete at least 30 of the 73 required units including all prerequisites and core classes
2. complete URBANST 201 or 202 (offered Winter Quarter)
3. have an overall GPA of 3.3 and a GPA of at least 3.5 in Urban Studies
4. submit an application, including a one-page abstract and the signatures of an adviser and, if applicable, a second reader. If the adviser is not a member of Stanford's Academic Council, the student must have a second reader who is an Academic Council member. The application must be submitted to the program office no later than the last day of classes in Spring Quarter of the junior year, and it must then be approved by the Director of the Urban Studies honors program.

Honors students are expected to complete a portion of their honors work in URBANST 203, Senior Seminar, in Autumn Quarter. Additionally, they must register for 5-10 units total in URBANST 199, Senior Honors Thesis, over the course of their senior year. The units of URBANST 199 do not count towards the 73-unit requirement for graduating with a B.A. in Urban Studies. Honors work is considered to be above and beyond regular graduation standards.

URBANST 201 or 202 should be taken during the junior year. Students who plan to be away during Winter Quarter of their junior year are advised to take URBANST 201 or 202 in the Winter Quarter of their sophomore year. All honors students are required to present their theses at the Senior Colloquium in Spring Quarter of senior year.

To graduate with honors, students must receive a grade of at least 'A-' in the honors work and have a GPA of at least 3.5 in courses for the Urban Studies major at the time of graduation.

COTERMINAL PROGRAMS

Undergraduates in Urban Studies may enter coterminal master's degree programs in a number of departments and schools in the University. In recent years, Urban Studies majors have developed coterminal programs with the departments of Civil and Environmental Engineering, Communications, and Sociology, and with the School of Education. Information and applications for coterminal degree programs are available at Undergraduate Advising and Research. Students should discuss the coterminal program with a program director during their junior year.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

COURSES

Further descriptions and details of current courses offered by the Program on Urban Studies may be obtained from the program office before each quarter.

URBANST 10. Documenting the Urban Community: Image and Text—Cities as forces in the development of society, culture, and individual personality.What is community and how does it serve the needs of individuals and the whole population? How does community affect educational development, jobs, neighborhood sociability, and democratic self-governance? How do community values intersect with market and government values?

1 unit, Sum (Staff)

URBANST 110. Introduction to Urban Studies—The study of cities and urban civilization. History of urbanization and current issues such as suburbanization, racial discrimination, globalization, terrorism, and the environment. Public policies designed to address these issues. GER:DB-SocSci, EC-AmerCul

4 units, Aut, Win (Stout, F)

URBANST 111. Urban Politics—(Same as POLISCI 121, SOC 149X/249X.) The major actors, institutions, processes, and policies of sub-state government in the U.S., emphasizing city general-purpose governments through a comparative examination of historical and contemporary politics. Issues related to federalism, representation, voting, race, poverty, housing, and finances. Prerequisite: POLISCI 2 or consent of instructor.

5 units, Aut (Bischoff, K)

URBANST 112. The Urban Underclass—(Same as SOC 149/249; graduate students register for 249.) Recent research and theory on the urban underclass, including evidence on the concentration of African Americans in urban ghettos, and the debate surrounding the causes of poverty in urban settings. Ethnic/racial conflict, residential segregation, and changes in the family structure of the urban poor. GER:DB-SocSci, EC-AmerCul

5 units, Aut (Rosenfeld, M)

URBANST 113. Introduction to Urban Design: Contemporary Urban Design in Theory and Practice—Issues in urban development and conservation. Neighborhood livability, central city revitalization, historic preservation, and regional growth through comparative case studies from N. America and abroad. Projects focus on neighborhood, downtown, and regional issues in San Francisco and the Bay Area. Two Saturday field workshops in San Francisco. GER:DB-SocSci

5 units, Win (Gast, G)

URBANST 114. Cities in Comparative Perspective—(Same as CASA 111.) Core course for Urban Studies majors. The city as interdisciplinary object. Discourses about cities such as the projects, practices, plans, representations, and sensibilities that combine to create what people know about urban spaces. Local, national, and transnational spatial scales. Conversations across regional boundaries; geographies of difference. Case studies.

3-5 units, Aut (Ebron, P)

URBANST 121. Civil Society and the Nonprofit Sector—(Same as POLISCI 232.) Development of the idea of civil society from early Enlightenment Europe to the contemporary U.S. Historical and theoretical foundations. Contemporary features of the nonprofit sector including its legal, economic, political, and ethical dimensions. Structure and operation of modern philanthropy and challenges of the 21st century.

2-4 units, not given this year

URBANST 123. Approaching Research and the Community—How experience with community organizations provides a starting point for developing community-based senior theses or independent research projects. Principles and practice of doing community-based research as a collaborative enterprise between academic researchers and community members; how academic scholarship can be made useful to community organizations. Guest speakers from community organizations, faculty, and alumni of the Public Service Scholars Program.

2 units, Aut (Cotterman, K)

URBANST 126. Spirituality and Nonviolent Urban and Social Transformation—A life of engagement in social transformation is often built on a foundation of spiritual and religious commitments. Case studies of nonviolent social change agents including Rosa Parks in the civil rights movement, César Chávez in the labor movement, and William Sloane Coffin in the peace movement; the religious and spiritual underpinnings of their commitments. Theory and principles of nonviolence. Films and readings. Service learning component includes placements in organizations engaged in social transformation. GER:DB-SocSci

5 units, Win (Karlin-Neumann, P; Mclennan, W; Sanders, J)

URBANST 131. Social Innovation and the Social Entrepreneur—Invited lecture series. Perspectives and endeavors of thought leaders and entrepreneurs who address social needs in the U.S. and internationally through private for-profit and nonprofit organizations, nongovernmental organizations, or public institutions.

1 unit, Aut (Staff)

URBANST 132. Concepts and Analytic Skills for the Social Sector—Analytical methods, marketing, language, organizational mission, strategy, and finance in the for-profit and nonprofit social sectors. Focus is on the integration of theory and application. Opportunities and limits of methods from the profit sector to meet social goals. Enrollment limited to 20. Prerequisite: ECON 1A. GER:DB-SocSci

4 units, Win (Kieschnick, M)

URBANST 133. Social Entrepreneurship Collaboratory—Interdisciplinary student teams create and develop U.S. and international social entrepreneurship initiatives. Proposed initiatives may be new entities, or innovative projects, partnerships, and/or strategies impacting existing organizations and social issues in the U.S. and internationally. Focus is on each team's research and on planning documents to further project development. Project development varies with the quarter and the skill set of each team, but should include: issue and needs identification; market research; design and development of an innovative and feasible solution; and drafting of planning documents. In advanced cases, solicitation of funding and implementation of a pilot project. Enrollment limited to 30. May be repeated for credit. Prerequisites: 131 and 132, or consent of instructor.

4 units, Aut (Edwards, M), Spr (Scher, L)

URBANST 161. U.S. Urban History since 1920—Possible topics include: the end of European immigration and its impact on cities; the rise of the automobile; mass culture and consumerism; the Depression and cities; WW II and the martial metropolis; de-industrialization; suburbanization; African American migration; urban renewal; riots, race, and the narrative of urban crisis; the impact of immigration from Asia, Latin America, and Africa; homelessness; the rise of the Sunbelt cities; gentrification; globalization and cities. GER:DB-SocSci, EC-AmerCul

5 units, Spr (Kahan, M)

URBANST 162. Managing Local Governments—In-the-trenches approach. Issues in leading and managing local governments in an era of accelerating and discontinuous change. Focus is on practical strategies related to financing, public services impacted by increasing demand and revenue constraints, the politics of urban planning, private-public partnerships, public sector marketing, entrepreneurial problem solving, promoting a learning and risk-taking organizational culture, and developing careers in local government. Enrollment limited to 25; preference to Urban Studies majors. GER:DB-SocSci

3-4 units, not given this year

URBANST 163. Land Use Control—Methods of land use control related to the pattern and scale of development and the protection of land and water resources. Emphasis is on the relationship between the desired land use goal and geographical landscape, physical externalities, land use law, and regulatory agencies. Topics include the historical roots of modern land use controls; urban reforms of the 19th century; private ownership of land; zoning; local, state, and federal land use regulation; and land trusts preservation. Smart growth, environmental impact consideration, private property rights, and special purpose agencies are related to current issues. GER:DB-SocSci

4 units, not given this year

URBANST 164. Utopia and Reality in Modern Urban Planning—(Same as ARTHIST 254.) Primarily for Urban Studies and Art majors. Utopian urbanist thinkers such as Ebenezer Howard, Le Corbusier, and Frank Lloyd Wright who established the conceptual groundwork of contemporary urban planning practice. Research paper. GER:DB-Hum

5 units, Spr (Stout, F; Turner, P)

URBANST 165. Sustainable Urban and Regional Transportation Planning—Environmental, economic, and equity aspects of urban transportation in 21st-century U.S. Expanded choices in urban and regional mobility that do not diminish resources for future generations. Implications for the global environment and the livability of communities. GER:DB-SocSci

4-5 units, Spr (Kott, J)

URBANST 171. Urban Design Studio—The practical application of urban design theory. Projects focus on designing neighborhood and downtown regions to balance livability, revitalization, population growth, and historic preservation.

5 units, Spr (Glanz, D)

URBANST 175. Global Cities and the Transnational Economy—(Same as SOC 175/275.) How key cities command and coordinate the global economy. Why a division of labor exists amongst a global hierarchy of cities. How economic globalization creates a need for sophisticated information analysis and decision making capabilities. Why corporate headquarters and advanced services are concentrated in a handful of cities. Cluster-oriented development strategies. Case studies. Concepts, theories, and tools from economic sociology and regional economics.

5 units, Spr (Choi, J)

URBANST 190. Urban Professions Seminar—Workshop. Contemporary practice of urban design and planning, community development, urban education, public service law, and related fields. Topics depend partly on student interests. Bay Area professionals lecture and respond to questions concerning their day-to-day work, impressions of their field, and the academic background recommended for their work.

1 unit, not given this year

URBANST 194. Internship in Urban Studies—For Urban Studies majors only. Students organize an internship in an office of a government agency, a community organization, or a private firm directly relevant to the major. Reading supplements internship. Paper summarizes internship experience and related readings.

2-4 units, Aut, Win, Spr (Staff)

URBANST 195. Special Projects in Urban Studies

1-5 units, Aut, Win, Spr (Staff)

URBANST 197. Directed Reading

1-5 units, Aut, Win, Spr (Staff)

URBANST 198. Senior Research in Public Service—Limited to seniors approved by their departments for honors thesis, and admitted to the year-round Public Service Scholars Program sponsored by the Haas Center for Public Service. What standards in addition to those expected by the academy apply to research conducted as a form of public and community service? How can communities benefit from research? Theory and practice of research as a form of public service. Readings in research theory and methods of participatory action research; presentations on research as service; workshops on each participant's thesis work-in-progress; public presentation of completed research; and thesis evaluation by a community-based reader. May be repeated for credit. Corequisite: 199.

1-3 units, Aut, Win, Spr (Schmidt-Posner, J)

URBANST 199. Senior Honors Thesis

1-10 units, Aut, Win, Spr (Staff)

URBANST 200A. Choosing a Topic and Questions for a Senior Project—For juniors and sophomores majoring in Urban Studies or Sociology. Students choose a topic and narrow it to a manageable research question. Preparation for URBANST 201 or 202.

1-2 units, not given this year

URBANST 201. Preparation for Senior Project—(Same as SOC 201.) First part of capstone experience for Urban Studies majors pursuing an internship-based research project or honors thesis. Individually arranged internship beginning in Winter Quarter, 8 hours per week. Prospective students must consult with internship coordinator early in Autumn Quarter to plan placement. Reflections and assignments culminate in a research proposal, which may submitted for funding. Internship normally continues in Spring Quarter; research proposed in the final assignment may be carried out in Spring or Summer Quarter; consent required for Autumn Quarter research. Corequisite: URBANST 201A. WIM

5 units, Win (Kahan, M)

URBANST 201A. Capstone Internship in Urban Studies—Restricted to Urban Studies majors. Students work at least 80 hours with a supervisor, establish learning goals, and create products demonstrating progress. Reflection on service and integration of internship with senior research plans. Must be completed by start of Winter Quarter senior year. May continue for additional quarter as 194. Corequisite: 201 or consent of instructor.

3 units, Aut, Win, Spr (Staff)

URBANST 202. Preparation for Honors Thesis—(Same as SOC 202.) Primarily for juniors in Sociology or Urban Studies, sophomores who plan to be off-campus Winter Quarter of their junior year may register with consent of instructor. First part of capstone experience for Urban Studies majors pursuing a non-internship based research project or honors thesis. Urban Studies majors enrolling in 202 rather than 201 must arrange an alternative way of fulfilling the internship requirement. Students write a research prospectus and grant proposal, which may be submitted for funding. Research proposal in final assignment may be carried out in Spring or Summer Quarter; consent required for Autumn Quarter research. WIM

5 units, Win (McAdam, D)

URBANST 203. Senior Seminar—Conclusion of capstone sequence. Students write a substantial paper based on the research project developed in 201 or 202. Students in the honors program may incorporate paper into their thesis. Guest scholar chosen by students.

5 units, Aut (Kahan, M)

OVERSEAS STUDIES

Courses approved for the Urban Studies major and taught overseas can be found in the "Overseas Studies" section of this bulletin, in the Overseas Studies office, 126 Sweet Hall, or at http://osp.stanford.edu/.

BERLIN

OSPBER 11. The Vanishing City: Lost Architecture and the Art of Commemoration in Berlin
4-5 units, Spr (Ebeling, K)

OSPBER 60. Cityscape as History: Architecture and Urban Design in Berlin
4-5 units, Aut (Pabsch, M)

FLORENCE

OSPFLOR 36. Introduction to the International Economy: The State, the Firm and the Region
5 units, Spr (Di Minin, A)

OSPFLOR 115Y. The Duomo and Palazzo della Signoria: Symbols of a Civilization
4 units, Aut (Verdon, T)

KYOTO

OSPKYOTO 28. Kyoto: History of Urban and Architectural Space
4-5 units, Spr (Langner-Teramoto, B)

OXFORD

OSPOXFRD 65. Oxford: The City as a Work of Art
2 units, Win, Spr (Chance, H)

PARIS

OSPPARIS 25. Literature and the City
4 units, Win (Rullier, F)

OSPPARIS 92. Building Paris: Its History, Architecture, and Urban Design
4 units, Spr (Halevi, E)

STANFORD IN WASHINGTON

Director: Adrienne Jamieson

Stanford in Washington provides highly-qualified undergraduates with an opportunity to work and study in the nation's capital. In addition to providing students with an understanding of public policymaking, the program offers an opportunity to take advantage of the city's unique cultural resources.

Central in the student's educational experience is an internship. Students serve as interns at such institutions and agencies as the Senate, the House of Representatives, the Office of Management and Budget, the White House, the National Institutes of Health, the Smithsonian Institution, CNN, the departments of State, Justice, Education, and Health and Human Services.

In addition to the internship, students must also complete an academic course of study consisting of small tutorials taught by policy experts (5 units), and weekly policy seminars taught by Stanford faculty members (5 units). Frequently, speakers from the Washington policy community join students and faculty for discussions. Students usually write a major paper related to their internship for 3-5 units of credit. Course and seminar topics vary according to student and faculty interest.

Stanford in Washington offers stretch quarters in the Autumn and Spring (early September to mid-December, and late March to the end of June) and a regular quarter in Winter, which focuses on environmental and health policy. The program is designed for students in their junior year or the first quarter of their senior year. Applications must be completed two quarters in advance. For Autumn Quarter, apply early Winter Quarter of the previous year. For Winter Quarter, apply early Spring Quarter of previous year. For Spring Quarter, apply early Autumn Quarter. Students interested in the program should contact the Public Policy Program, Encina Hall West, room 204, (650) 725-0109, or publicpolicy@stanford.edu.

SCHOOL OF LAW

Emeriti: (Professors) Barbara Allen Babcock, Wayne G. Barnett, John H. Barton, Paul Brest, William Cohen, Lance E. Dickson, Marc A. Franklin, Jack H. Friedenthal, Robert A. Girard, William B. Gould IV, Thomas C. Grey, John Henry Merryman, Margaret Jane Radin, David Rosenhan, Kenneth E. Scott, Byron D. Sher, William H. Simon, Michael S. Wald, Howard R. Williams

Dean: Larry D. Kramer

Vice Dean: Mark G. Kelman

Associate Dean for Curriculum: Norman W. Spaulding

Associate Dean for Graduate Studies: Deborah R. Hensler

Associate Dean for Public Interest and Clinical Education: Lawrence C. Marshall

Senior Associate Dean and Chief Financial Officer: Frank Brucato

Associate Deans: Faye Deal, Catherine Glaze, Sabrina Johnson, Catherine Nardone, Susan Robinson

Professors: Janet Cooper Alexander, Joseph Bankman, R. Richard Banks, Gerhard Casper (on leave), Joshua Cohen, G. Marcus Cole, Richard Craswell, Mariano-Florentino Cuéllar, Robert M. Daines, Michele Landis Dauber, George Fisher, Richard T. Ford, Barbara H. Fried, Lawrence M. Friedman, Ronald J. Gilson (on leave Autumn), Paul Goldstein, Henry T. Greely, Joseph A. Grundfest, Thomas C. Heller, Deborah R. Hensler, Pamela S. Karlan, Mark G. Kelman, Michael Klausner (on leave Spring), Larry D. Kramer, Mark A. Lemley, Lawrence Lessig, Lawrence C. Marshall, Miguel A. Méndez, A. Mitchell Polinsky, Robert L. Rabin (on leave) , Deborah L. Rhode, Jane Schacter, Norman W. Spaulding, James F. Strnad II, Kathleen M. Sullivan (on leave), Alan O. Sykes, Barton H. Thompson Jr., David G. Victor, Robert Weisberg

Associate Professors: Amalia D. Kessler (on leave), Jenny S. Martinez, Alison D. Morantz

Assistant Professors: Daniel Ho, Barbara van Schewick

Professor (Teaching): William S. Koski (on leave Spring)

Associate Professors (Teaching): Juliet M. Brodie, Jeffrey L. Fisher, Jayashri Srikantiah

Courtesy Professors: Daniel P. Kessler, Maureen F. McNichols, Paul C. Pfleiderer, Madhav Rajan, Jack Rakove

Senior Lecturers: Margaret R. Caldwell, Janet Martinez, David W. Mills, Helen Stacy, Allen S. Weiner

Visiting Professors: John Harrison, Timothy Holbrook, Yifat Holzman-Gazit, Barbara Olshansky, Rogelio Perez-Perdomo, William H. Taft, IV, Jennifer Urban, Joanthan Zittpain

Legal Research and Writing Instructors: Brooke Coleman, John Greenman, Stephen Lee, Hillel Levin, Beth McLellan, Jeanne Merino, Nirej Sekhon

Lecturers: Simao J. Avila, James Baer, Marilyn Bautista, Karen Biestman, Gary Born, Scott Bristol, Andrew Coan, Susan Diamond, Michael Dickstein, Robert Fairbank,Randee G. Fenner, Jeremy Fogel, David Forst, Larry Franklin, Edward Frueh, James Fuller, Miei Gechlik, Thomas C. Goldstein, Jennifer Granick, Jonathan Greenberg, Lucas Guttentag, Timothy H. Hallahan, Brad Handler, Amy Howe, Erik Jensen, David Johnson, Danielle Jones, Julie Kennedy, Jeffery Kobrick, Charles Koob, Paul Lomio, John Lyons, Amichai Magen, Michael McConnell, Jay Mitchell, Richard Morningstar, Roberta J. Morris, Tom Nolan, Jessica Notini, Ralph Pais, B. Howard Pearson, Lisa M. Pearson, Brian Quinn, Stephan Ray, Melissa Rodgers, Michael Romano, Matthew Rossiter, Kevin Russell, Richard Salgado, Derek Shaffer, Dan Siciliano, Rachelle Silberberg, Deborah A. Sivas, Stephanie Smith, Jamie Staples-King, Tara Twomey, Roland Vogl, Fred von Lohmann, Bruce Wagman, Michael Wara, Erika Wayne, Dana Weintraub, Robert Wexler, Kate Wilko, George D. Wilson, Katherine C. Wright

Affiliated Faculty: Alexandria Boehm (Engineering), Judith Goldstein (Political Science, SIEPR), Joy Ishii (GSB), Stephen Krasner (Political Science, SIEPR), Erica Plambeck (GSB), Robert Staiger (Economics, SIEPR)

Courses given in Law have the subject code LAW or LAWGEN. For a complete list of subject codes, see Appendix.

The School of Law, established 1893, provides a legal education for students who are fitted by their maturity and academic training to pursue professional study under University methods of instruction. The curriculum leading to the first professional degree in law, the Doctor of Jurisprudence (J.D.), constitutes an adequate preparation for the practice of law in any English-speaking jurisdiction. Graduate work leading to the degrees of Master of Laws (L.L.M.), Master of the Science of Law (J.S.M.), and Doctor of the Science of Law (J.S.D.), and a non-professional degree, Master of Legal Studies (M.L.S.), is also offered. For the full curriculum, see http://lawreg.stanford.edu. Stanford Law School offers joint or dual degree options in combination with other Stanford graduate departments and universities across the country; see the "Joint and Dual Degree" section below.

The school is on a two-term academic calendar: Autumn term classes begin for first-year students August 27, 2007 and on September 4, 2007 for all other students; the term ends on December 5, 2007. Winter term classes begin on January 8, 2008, and the term ends on April 23, 2008. In addition, the Law School offers classes on the quarter schedule. Law classes taught on the Autumn Quarter schedule begin September 24, 2007 and end on December 7, 2007; Law classes taught on the Winter Quarter schedule begin January 8, 2008 and end on March 14, 2008.

For further information about admission, programs, curriculum, and faculty, see http://www.law.stanford.edu/.

JOINT AND DUAL DEGREES

Formal admission to both the Law School and to the other cooperating school or department in accordance with the established admission standards of each school or department is required. In addition to the formal joint degree programs offered, the school considers requests for a dual program on an individually designed basis. For additional information on Law School joint or dual degree programs, see http://www.law.stanford.edu/program/degrees/. See relevant web sites or department sections of this bulletin for degree requirements.

Formal joint degree programs at Stanford:

School of Business—See http://www.gsb.stanford.edu/mba/.

J.D./M.B.A. Master of Business Administration

School of Earth Sciences—

J.D./M.S. Interdisciplinary Graduate Program in Environment and Resources (IPER)

J.D./Ph.D. Interdisciplinary Graduate Program in Environment and Resources (IPER)

School of Education—

J.D/M.A. Policy, Organization, and Leadership Studies (POLS)

School of Engineering—

J.D./M.S. Management Science and Engineering (MS&E)
J.D./Ph.D. Management Science and Engineering (MS&E)

School of Humanities and Sciences—

J.D./M.A. Economics
J.D./Ph.D. Economics
J.D./M.A. History
J.D./Ph.D. History

J.D./M.A. in degree granting programs in the Division of International Comparative and Area Studies (ICA): African Studies, East Asian Studies, International Policy Studies, Latin American Studies, and Russian, East European and Eurasian Studies

J.D./Ph.D. Philosophy
J.D./Ph.D. Political Science
J.D./Ph.D. Psychology
J.D./M.A. Sociology
J.D./Ph.D. Sociology

School of Medicine—

J.D./M.S. Health Research and Policy (HRP)

Formal joint degree programs with other Universities—

J.D./M.P.A. with the Woodrow Wilson School of Public and International Affairs at Princeton University

J.D./M.A. with the Paul H. Nitze School of Advanced International Studies at Johns Hopkins University

COURSES

Courses listed in this section are open to Stanford non-Law students with consent of instructor. Each course indicates whether it is on the quarter or semester schedule. Non-Law students who register for courses with a LAW subject code are awarded quarter units upon completion of the course; semester unit values are converted into quarter unit values for non-Law students at the time of enrollment. (Courses with non-LAW subject codes that are crosslisted with LAW courses have quarter-based units, and no conversion is performed for undergraduates or graduate students. See the respective department's section of this bulletin for such unit values.)

Students intending to enroll in any course with a LAW subject code must consult the School of Law Registrar's Office in the Stanford Law School Administration Building, room 100, or see http://www.law.stanford.edu/school/offices/registrar/.

For additional detailed course information, see the Office of the Law School web site at http://www.law.stanford.edu/program/courses/.

NONPROFESSIONAL: UNDERGRADUATE AND GRADUATE

The following courses may not be counted toward professional degrees in Law. Unit values listed in LAWGEN courses are quarter-based.

LAWGEN 106. Introduction to American Law—(Same as AMSTUD 179, POLISCI 122.) For undergraduates. The structure of the American legal system including the courts; American legal culture; the legal profession and its social role; the scope and reach of the legal system; the background and impact of legal regulation; criminal justice; civil rights and civil liberties; and the relationship between the American legal system and American society in general.

3-5 quarter units, Aut quarter schedule (Friedman, L)

LAWGEN 107Q. Legal Craft and Moral Intuitions—(Same as POLISCI 33Q.) Stanford Introductory Seminar. Preference to sophomores. The conflict between translating rules for social interaction into legal practices versus deciding what constitutes impermissible harm-causing, coercion, or discrimination. Approaches to this conflict through cases such as: can government forbid wetland development without compensating property owners; why might private nurses or Playboy bunnies but not flight attendants be selected on the basis of gender; why is gender equality in resource distribution provided for college athletes but not math graduate students? GER:DB-SocSci, EC-EthicReas

4 quarter units, Win quarter schedule (Kelman, M)

LAWGEN 109Q. The History of Punishment and Sentencing in California—Stanford Introductory Seminar. Preference to sophomores. From the passage of the first criminal statute in 1850 through present-day sentencing and prison reform efforts. The 1976 Determinate Sentencing Act and subsequent problems in the sentencing system. This course will trace the history of California's criminal sentencing system in an attempt to uncover possible explanations for this remarkable evolution. The 1994 Three Strikes Law in 1994. Sources include historical documents and policy analysis. Interdisciplinary historical inquiry. Final research paper.

3 quarter units, Aut quarter schedule (Weisberg, R; Dansky, K)

LAWGEN 206. Core Legal Concepts: Thinking Like a Lawyer—(Same as GSBGEN 382.) Restricted to graduate students. Core concepts of the law; how lawyers analyze and structure their work. Topics such as contracts, litigation, intellectual property, securities, and employment law.

3 quarter units, Aut quarter schedule (Kelman, M; Kramer, L)

LAWGEN 209. Stanford Community Police Academy—For graduate students. Practical experience. The duties, responsibilities, decisions, and constraints that face law enforcement officers. Prerequisites: minimum 18 years of age; valid driver's license; background check.

1 quarter unit, Win quarter schedule (Wilson, L)

GRADUATE

The following courses are open to qualified graduate students in other departments of the University with consent of instructor.

LAW 220. Regulated Industries—Major theories and cases studies from electricity and utilities, oil and gas, telecommunications, and food and drugs. Regulatory oversight; how regulators contend with their often limited ability to obtain accurate information; and the effects of regulation on technological innovation. Procedures for public engagement in regulatory decision making; the relationship between regulators and political authorities. Comparisons with other countries and the role of international institutions such as the World Trade Organization that constrain national regulation.

2.5 semester or 3.75 quarter units, Win quarter schedule (Victor, D)

LAW 229. Race and the Law—Historical and contemporary issues. Sources include judicial opinions, psychology, sociology, history, and legal scholarship.

2.5 semester or 3.75 quarter units, Win quarter schedule (Banks, R)

LAW 233. Antitrust—Legal and economic concepts of competition and monopoly; policy and judicial interpretations of the Sherman and Clayton acts and their applications to business practices and industrial structure. Ethical considerations.

3.4 semester units or 5.1 quarter units, Aut quarter schedule (Koob, C)

LAW 236. Art and the Law—International law and the fate of works of art in wartime. International trade in stolen and illegally exported art and antiquities. Artist rights such as moral right, copyright, and resale right. Artistic freedom and its limits. Artist relationships with dealers, commissions, live-work space, toxic hazards, taxes, estate planning, and legal services . The collector. Counterfeit art. The legal character and obligations of museums, and their trustees, directors, and staff. The National Endowment for the Arts and Humanities. Guest lecturers.

2.5 semester or 3.75 quarter units, Win quarter schedule (Merryman, J)

LAW 238. Administrative Law and Regulatory Policy—What government agencies do; constitutional rules and political pressures; statutes including the Administrative Procedure Act; how the executive branch tries to control agency actions; how bureaucracies make judgments about costs and benefits of regulatory policies; and how courts review agency action. Cases and examples from: separation of powers doctrine; constitutional law of due process; health, safety, and environmental policy; criminal justice; and national security law. Political pressures that the law seeks to regulate effectively; and lawyers' roles as litigators, lobbyists, institutional designers, and political actors.

3.4 semester or 5.1 quarter units, Win quarter schedule (Cuellar, M)

LAW 243. Bayesian Statistics and Econometrics—Linear and nonlinear regression, covariance structures, panel data, qualitative variable models, nonparametric and semiparametric methods, time series, Bayesian model averaging and variable selection. Bayesian methodology including Markov chain Monte Carlo methods, hierarchical models, model checking, mixture models, empirical Bayes approaches, approximations, and computational issues and foundations. Prerequisite: graduate-level econometrics or equivalent.

2-4 semester or 3-6 quarter units, Aut quarter schedule (Strnad, J)

LAW 245. Chinese Law and Business—Chinese legal rules and principles that regulate business. Foreign investment laws, securities regulation, intellectual property, labor, and dispute resolution. Case studies. Recommended: 549.

3.4 semester or 5.1 quarter units, Win quarter schedule (Gechlik, M)

LAW 246. Creating the American Republic—(Same as HISTORY 251/352, POLISCI 321.) Concepts and developments in the late 18th-century invention of American constitutionalism; the politics of constitution making and ratifying; emergence of theories of constitutional interpretation including originalism; early notions of judicial review. Primary and secondary sources.

1.7 semester or 2.55 quarter units, Win quarter schedule (Rakove, J)*

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*See respective department course listings for unit values of crosslisted offerings.

LAW 248. Corporate Reorganization—Reorganization of a fictitious, financially distressed company under chapter 11 of the Bankruptcy Code, including: out-of-court workout; chapter 11 filing; chapter 11 operating issues; and the negotiation, formulation, and confirmation of a plan of reorganization. Developments in actual pending chapter 11 cases, through media reports. Cases previously considered include Adelphia, Delta Airlines, Enron, PG&E, Refco, and United Airlines.

2.5 semester or 3.75 quarter units, Aut quarter schedule (Ray, S)

LAW 262. Corporate Finance I—For those with little background in finance; not open to J.D. or M.B.A. students. Financial concepts and analytical tools needed to make financial decisions and value securities. Capital structures, the design of corporate securities, corporate transactions, executive compensation, and bankruptcy proceedings. Focus is on problem solving.

2.5 semester or 3.75 quarter units, Win quarter schedule (Ishii, J)

LAW 277. Economic Analysis of Law—Core course for Public Policy master's students. How legal rules and institutions can correct market failures.The economic function of contrasts; role of legal remedies to resolve disputes when contracts fail. The choice between encouraging private parties to initiate legal actions to correct externalities and governmental actors such as regulatory authorities. Economics of litigation; how private incentives to bring lawsuits differ from the social value of litigation. Economic motives to commit crimes; optimal governmental response to crime. Prerequisites: intermediate-level microeconomics; some calculus.

2.8 semester or 4.2 quarter units, Win quarter schedule (Polinsky, M)

LAW 291. Evidence, Advanced—Goal is to develop witness interrogation skills. Direct and cross examination of lay and expert witnesses, introduction of documentary evidence, and use of illustrative evidence in California and federal courts. The art of examining friendly and hostile witnesses. Enrollment limited to six. Prerequisite: 290, application.

2.5 semester or 3.75 quarter units, Win quarter schedule (Mendez, M)

LAW 306. Law, Economics, and Politics of International Trade—(Same as POLISCI 216.) Legal architecture of the WTO system; questions about its design and wisdom. Economics and politics of international cooperation on trade; the WTO as an institution and its obligations. Topics may include: the choice between regional and global approaches to trade cooperation; interface between international trade obligations and domestic regulation of health, safety and the environment; regulation of subsidies; dispute settlement system; and differential treatment of developing countries. Recommended: ECON 51 or POLISCI 110C or X.

3.4 semester or 5.1 quarter units, Win quarter schedule*
(Sykes, A; Staiger, R; Goldstein, J)

LAW 307. Gender, Law, and Public Policy—Topics include equal protection standards, employment, reproductive rights, sexual harassment, rape, domestic violence, pornography, sexual orientation, feminist legal theory, and the family. Non-law students require consent of instructor.

3 semester or 4.5 quarter units, Win semester schedule (Rhode, D)

LAW 313. Health Law and Policy I—(Same as HRP 210.) Open to Law and medical students and undergraduates by consent of instructor. Introduction to the American health care system; its legal and policy problems. Topics: special characteristics of medical care compared to other goods and services, the difficulties of assuring quality care, the complex patchwork of the financing system, and the ethical problems the system raises.

2.5 semester or 3.75 quarter units, Aut quarter schedule (Greely, H)*

LAW 318. History of American Law—(Same as HISTORY 352B). From the colonial period to the present. Topics include: slavery and race relations; the evolution of criminal justice and correctional systems; the growth of the legal profession; and the role of the legal system in the development of the economy. The relationship between developments in law and in the larger society. Undergraduates by consent of instructor.

3 semester or 4.5 quarter units, Win semester schedule (Friedman, L)*

LAW 319. Legislation—Statutes and legislative institutions. Laws governing access to legislative power; procedures for producing statutes; and how agencies, courts, and legislatures interpret statutes. Bribery laws, lobbying and indirect influence on legislative activity, and campaign finance regulations. Framework laws for organizing the legislature, federal budget process, rules governing intelligence oversight and national security functions; and Homeland Security Act as a case study. How legislatures in other countries and international institutions make collective decisions. Statutory interpretation process in courts, agencies, and legislatures.

2.5 semester or 3.75 quarter units, Win quarter schedule (Cuellar, M)

LAW 330. International Human Rights Clinic—Emphasis on international human rights treaties and agreements, international and regional human rights courts and tribunals, and governmental and nongovernmental international human rights organizations. The postwar emergence of civil and political human rights, development of social and economic human rights, and articulation of collective and group human rights. Normative justifications for enforcing human rights beyond the bounds of national sovereignty, and challenges to these justifications under the forces of globalization.

2.5 semester or 3.75 quarter units, Win quarter schedule (Martinez, J)

LAW 333. Judgment and Decision Making—(Same as PUBLPOL 205A, IPS 207A.) Theories and research on heuristics and biases in human inference, judgment, and decision making. Experimental and theoretical work in prospect theory emphasizing loss and risk aversion. Support theory. Challenges that psychology offers to the rationalist expected utility model; attempts to meet this challenge through integration with modern behavioral economics. Decision making biases and phenomena of special relevance to public policy such as group polarization, group think, and collective action.

3.4 semester or 5.1 quarter units, Aut quarter schedule (Brest, P)*

LAW 336. International Jurisprudence—Ideas underpinning modern international law such as sovereignty, self-determination, legitimate war, humanitarian intervention, economic aid, and human rights; the influence of industrialization, postcolonialism, and globalization. Current issues such as the globalization of trade, human trafficking and child labor, Darfur and Kosovo, the U.S. invasions of Afghanistan and Iraq, the international organizations such as the International Criminal Court and the World Trade Organization. Writers such as Grotius, Hobbes, Kant, Marx, Rawls, Hart, Sen, and Okin.

2.5 semester or 3.75 quarter units, Aut quarter schedule (Stacy, H)

LAW 338. Land Use—Pragmatic rather than theoretical aspects of contemporary land use law and policy. Nuisance as a land use tool and foundation for modern land use law; use and abuse of the police power and the legal basis for land use control; zoning flexibility; vested property rights, development agreements, and takings; redevelopment; growth control; and direct democracy. How land use decisions affect environmental quality and how land use decision making addresses environmental impacts. Balancing legal, political, economic, and public interest considerations in land use advocacy and decision making.

3.4 semester or 5.1 quarter units, Aut quarter schedule
(Caldwell, M; Diamond, S)

LAW 342. Law and Development in India—Connections among law, legal institutions, and growth in India against disparities in growth. Institutions and their role in economic growth, including general and specialized courts, general bureaucracy, and specialized regulatory authorities. Intellectual property, information technology, and services outsourcing; labor entry and exit; capital markets and bankruptcy; and business and infrastructure development. Federalism and the Indian legal system. Challenges in conducting empirical research on legal systems. Case studies and working papers in conjunction with an ongoing rule of law research project.

2.5 semester or 3.75 quarter units, Win quarter schedule
(Heller, T; Jensen, E)

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*See respective department course listings for unit values of crosslisted offerings.

LAW 343. Scientific Evidence and Expert Testimony: Patent Litigation—How to explain science to judge and jury; how litigators determine which legal issues to argue. Patent and expert testimony law. Student teams choose patents for final simulation projects, prepare claim charts, devise a design-around, and present oral arguments or summaries of expert declarations for a Markman claim construction hearing.
3 semester or 4.5 quarter units, Aut semester schedule (Morris, R)

LAW 351. International Development—How do political institutions determine economic policy choices; how do economic structures affect political processes? Micro- and macro-level political and economic processes shaping prospects for development. Case studies illustrate how markets function, why inefficient institutions survive, and why governments can adopt policies detrimental to development. Topics include: political economy of corruption; role of foreign aid; efficacy of governance reforms; and relationship between democracy and development.
2.5 semester or 3.75 quarter units, Aut quarter schedule (Singh, S)

LAW 357. Current Issues in International Economics Law and Policy—(Same as ECON 164.) Legal architecture of the World Trade Organization system; questions about its design and wisdom. Economics and politics of international cooperation on trade. The WTO as an institution and its core obligations. Topics may include: choice between regional and global approaches to trade cooperation; interface between international trade obligations and domestic regulation of health, safety, and environment; regulation of subsidies; design and operation of dispute settlement system; and special and differential treatment of developing countries. Prerequisite: ECON 51 or equivalent.
1.7 semester or 2.55 quarter units, Win quarter schedule*
(Sykes, A; Staiger, R)

LAW 364. Law, Litigation, and Educational Policy—(Same as EDUC 326.) Restricted to Education and Law students. Interplay among educational law and policy, administrative decision making, and practice. Issues include the relationship between schooling and the state, nature and scope of students' substantive and procedural rights inside the schoolhouse, and how law and litigation have advanced or stymied the goal of equality of educational opportunity.
2.66 semester or 3.99 quarter units, Aut quarter schedule (Koski, W)*

LAW 365. Minority Rights in Israel—Seminar. Comparative context of minority rights in divided Western democracies such as N. Ireland and Canada. Topics such as: status of the Arabic language in Israel; right to vote and be elected; allocation of state funds to minority projects and municipalities; representation in decision making institutions; land allocation and land rights; economic subsidy schemes such as for housing; military service; and the Arab educational system. The status of the Bedouin community under Israeli law.
2 semester or 3 quarter units, Win semester schedule (Holzman-Gazit, Y)

LAW 366. Principles of Research Design and Analysis: Tools—(Same as PUBLPOL 203B, IPS 205B.) Policy analysis tools for government, research institutes, and academic settings, and for empirical issues in litigation, investment banking, consulting, and finance. Multiple regression analysis, multilevel modeling, and Bayesian analysis. Topics include hypothesis testing, regression specification, logistic regression, probit, heteroscedasticity, serial correlation, errors in the variables, instrumental variables, simultaneous equations, generalized linear models, simulation, model checking, causal inference, and missing data imputation. Hands-on analysis using popular statistical packages.
3 semester or 4.5 quarter units, Win quarter schedule (Strnad, J)

LAW 367. Principles of Research Design and Analysis: Advanced Mathematical and Computational Methods—Adjunct to 366 for students who wish to work at a deeper mathematical level. Corequisite: 366.
1 semester or 1.5 quarter units, Win quarter schedule (Strnad, J)

LAW 368. Law and the Biosciences—(Same as HRP 211.) For medical students; graduate students by consent of instructor. Legal, social, and ethical issues arising from advances in the biosciences. Focus is on human genetics; also advances in assisted reproduction and neuroscience. Topics include forensic use of DNA, genetic testing, genetic discrimination, eugenics, cloning, pre-implantation genetic diagnosis, neuroscientific methods of lie detection, and genetic or neuroscience enhancement.
2 semester or 3 quarter units, Win semester schedule (Greely, H)*

LAW 407. International Deal Making—Open to Law, GSB, and graduate students. The application of legal and business knowledge to real world international transactions. Deal structuring, identifying and resolving legal and business concerns, negotiations, documentation, and deal closing. Case studies. Legal issues that arise in cross-border transactions. How to read the documents which describe a business transaction. The role of a legal adviser. Students strategize, structure, and negotiate real world, substantive, international business deals. Prerequisite: consent of instructor.
1.7 semester or 2.55 quarter units, Aut quarter schedule (Franklin, L)

LAW 409. Introduction to Intelletual Property—For non-specialists and first-year Law students. Patents, copyrights, trademarks, and trade secrets. Commonalities and differences among systems of intellectual property protection.
3.4 semester or 5.1 quarter units, Win quarter schedule (Lemley, M)

LAW 414. Corruption, Governance, and the International System—Research workshop. International efforts to improve the quality of governance, reduce corruption, and foster the rule of law. Effects and capacities on behavior and institutions in domestic systems of programs such as the Millennium Challenge Account, Extractive Industries Transparency Initiative, and World Bank Rule of Law Assistance Funding. Impacts of such programs on incentives for economic growth and democratic forms of national governance. Research design.
2.5 semester or 3.75 quarter units, Win quarter schedule
(Heller, T; Krasner, S)

LAW 428. Local Initiatives—Two-part, year-long research. Local policy and rights initiatives and problems that may give rise to innovative problem solving that influences broader policy. Local government law, sociological case studies, and political theory. Students work individually on a local initiative in a specific town or city. Library and field research; refining research agendas; and performing research on campus and in the field including local archives and interviews. Final reports of publishable quality. Enrollment limited to 10. May be repeated once for credit. Prerequisite: application including research proposal.
2 semester or 3 quarter units, Aut, Win semester schedule (Ford, R)

LAW 429. Corporate Fraud—Open to Law, GSB, and graduate students. Real world issues in civil and criminal corporate fraud. Focus is on case studies: Enron and Homestore.com. Attention to other corporate frauds such as WorldCom and AOL Time Warner. Stock options backdating; the implementation of Sarbanes Oxley; the Thompson and McNulty memoranda and attorney-client and work-product waiver issues; pretexting; and the KPMG tax scheme. Guest lecturers. Students teams present results of their independent investigation of a major corporate fraud to a hypothetical Board of Directors. Research paper. Prerequisite: consent of instructor.
2.5 semester or 3.75 quarter units, Aut quarter schedule (Fairbank, R)

LAW 431. Luck, Law, and Morality—(Same as POLISCI 436R.) The role of luck in moral and political theory and the law. Possible topics include: luck in legal liability and punishment (strict liability, attempts, risk regulation versus harm regulation); the possibility that rightness of conduct or worth of character might depend on luck; whether the point of egalitarianism is to correct for the impact of luck on fate; and whether there is anything left to the person after the impact of luck on life. Readings include Rawls, Williams, Nussbaum, Dworkin, Roemer, Cohen, Nagel, Hart, and Waldron. Prerequisite: graduate standing.
3 semester or 4.5 quarter units, Win quarter schedule*
(Cohen, J; Fried, B)

LAW 458. FDA's Regulation of Health Care—(Same as HRP 209.) Open to law or medical students; graduate students by consent of instructor. The FDA's regulatory authority over drugs, biologics, medical devices, and dietary supplements. The nature of the pharmaceutical, biotech, medical device, and nutritional supplement industries.
2.5 semester or 3.75 quarter units, Win quarter schedule (Greely, H)*

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*See respective department course listings for unit values of crosslisted offerings.

LAW 467. Quantitative Methods: Finance—The time value of money. Present and future value analysis; discounting; net present value; IRR; bond valuations; and a critique of other project valuation methods. Diversification, the risk-return trade-off, portfolio performance measurement, and market efficiency. Arbitrage and tax considerations. Emphasis is on applications in legal settings.

1.7 semester or 2.55 quarter units, Win quarter schedule (Siciliano, F)

LAW 501. Modern Traditions I—(Same as MTL 334A.) The development over the modern period of ideas about state regulatory power and legal rationality; recent critiques of those ideas. Focus is on justice, legal interpretation, individual agency and moral choice, equality, punishment, legislation, the nation state, and international society. Readings from Sophocles, Grotius, Kant, Rousseau, Hegel, Montesquieu, Wollstonecraft, Austin, Bentham, Marx, Weber, Arendt, Foucault, Said, Spivak, Butler, Habermas, MacKinnon, Rose, and Kennedy.

3.33 semester or 4.99 quarter units, Aut quarter schedule (Stacy, H)*

LAW 514. The California Coast: Science, Policy, and Law—(Same as CEE 175A/275A, EARTHSYS 175/275.) Interdisciplinary. Legal, science, and policy dimensions of managing California's coastal resources. Coastal land use and marine resource decision making. Physics, chemistry, and biology of the coastal zone, tools for exploring data from the coastal ocean, and institutional framework shaping public and private decision making. How experts from different disciplines work to resolve coastal policy questions.

3.4 semester or 5.1 quarter units, Win quarter schedule (Caldwell, M; Boehm, A; Sivas, D)*

LAW 538. Sociology of Law—(Same as SOC 136/236.) Historical perspectives on the origins of law; rationality and legal sanctions; normative decision making and morality; cognitive decision making; crime and deviance; law in action versus law on the books; organizational responses to law in the context of labor and employment; roles of lawyers, judges, and juries; and law and social change emphasizing the American civil rights movement.

2.5 semester or 3.75 quarter units, Aut quarter schedule (Dauber, M)*

LAW 539. Law and Policy of the European Union—From the 1951 European Coal and Steel Community (ECSC) to the crafting of a constitution. Nature and sources of EU law; single market and supranational judicial system; community powers; legislation and adjudication; goods, services, capital, and workers; corporate and competition policy; and human rights law. The EU as a foreign policy actor; U.S.-EU trade and antitrust issues; regulatory requirements for American business; and U.S.-EU cooperation in defense, development, and promoting the rule of law.

3 semester or 4.5 quarter units, Win quarter schedule (Morningstar, R; Magen, A)*

LAW 549. Chinese Legal System—Legal institutions, major areas of substantive and procedural law, and the gap between law on the books and in action. Topics include the World Trade Organization, the Communist Party's recognition of private property, and reforms of financial system and human rights protection mechanisms.

2.5 semester or 3.75 quarter units, Aut quarter schedule (Gechlik, M)

LAW 577. Regulation of Political Process—Restrictions on the franchise. Constitutional and statutory constraints on apportionment under the equal protection clause emphasizing: one person, one vote; political gerrymandering; the Voting Rights Act; and judicial remedies for elections gone bad. Topics may include regulation of political parties and direct democracy.

2 semester or 3 quarter units, Aut quarter schedule (Karlan, P)

LAW 581. Workshop in Sociology of Law—(Same as SOC 338.) Required for joint degree J.D./Ph.D. students in Sociology in the first three years of program; open to Ph.D. students in Sociology and related disciplines. Empirical, sociological study of law and legal institutions. The relation of law to inequality and stratification, social movements, organizations and institutions, political sociology and state development, and the social construction of disputes and dispute resolution processes. Research presentations. Career development issues. May be repeated for credit.

.66-3.33 semester or 1-5 quarter units, Win quarter schedule (Dauber, M; Friedman, L; Sandefur, R)*

LAW 586. Classical Islamic Law—(Same as RELIGST 201/301.) Emphasis is on methods of textual interpretation. History of premodern Islamic law, including origins, formation of schools of law, and social and political contexts.

3.33 semester or 4.99 quarter units, Win quarter schedule (Sadeki, B)*

LAW 604. Environmental Law Workshop: Water Policy—Current research. Guest academics, practitioners, and policy. Students lead discussions. May be repeated for credit.

2.5 semester or 3.75 quarter units, Win quarter schedule (Caldwell, M)

LAW 605. International Environmental Law: Climate Change—Legal, scientific, political, economic, and organizational issues. Climate change, emphasizing current regimes and post-Kyoto negotiations. The Montreal Protocol for Ozone Depleting Substances, International Convention for Regulation of Whaling, and U.N. Convention on Straddling Fish Stocks and Highly Migratory Fish Stocks. Interactions among law, science, and economics in shaping choice of treaty instrument and implementation of environmental regimes. Environmental markets as solutions to global commons problems. Sustainable development, common heritage of mankind, and common but differentiated responsibilities of nations.

2.5 semester or 3.75 quarter units, Aut quarter schedule (Wara, M)

LAW 608. Environmental Science for Managers and Policy Makers—(Same as IPER 335, OIT 338.) Core course for joint J.D. or M.B.A. and M.S. in Environment and Resources. How to apply scientific understanding to business operations, strategy, and the design of market-based environmental policy. Fundamentals of earth systems and environmental science. Spreadsheet modeling, optimization, and Monte Carlo simulation.

2.66 semester or 3.99 quarter units, Win quarter schedule (Plambeck, E; Caldwell, M; Palumbi, S; Daily, G; Kennedy, D; Field, C; Masters, G)*

LAW 611. International Conflict Resolution Colloquium—(Same as POLISCI 403, PSYCH 283.) Interdisciplinary. Theoretical insights and practical experience in managing and resolving inter-group and international conflicts. Personal, strategic, and structural barriers that can impede the achievement of efficient solutions to conflicts. Sources include social psychology, political science, game theory, and international law. Themes derived from faculty affiliation and research with the Stanford Center of International Conflict and Negotiation (SCICN).

1 semester or 1.5 quarter units, Win quarter schedule (Weiner, A)*

LAW 615-01. Negotiation—Representation, ethics, and the place of negotiation in our legal system. Role play. Enrollment limited to 20.

3 semester or 4.5 quarter units, Win quarter schedule (Dickstein, M)

LAW 615-02. Negotiation—Representation, ethics, and the place of negotiation in our legal system. Role play. Enrollment limited to 20.

4 semester or 6 quarter units, Win semester schedule (Martinez, J)

LAW 628. Interpersonal Influence and Leadership—(Same as GSB-GEN 374.) Open to Law, GSB, and graduate students. How to build working relationships; foundational skills of face-to-face leadership. Factors that increase or decrease influence and the ability to work effectively with others. How to work through difficult issues; feedback; and group work. Learning from experience; leading organizations through a changing environment. Prerequisite: consent of instructor.

3.4 semester or 5.1 quarter units, Win quarter schedule (Bristol, S)

LAW 656. International Conflict: Management and Resolution—(Same as IPS 250, POLISCI 210R.) Interdisciplinary. Theoretical insights and practical experience in resolving inter-group and international conflicts. Sources include social psychology, political science, game theory, and international law. Personal, strategic, and structural barriers to solutions. How to develop a vision of a mutually bearable shared future, trust in the enemy, and acceptance of loss that a negotiated settlement may produce. Spoilers who seek to sabotage agreements. Advantages and disadvantages of unilateral versus reciprocal measures. Themes from the Stanford Center of International Conflict and Negotiation (SCICN).

1.5 semester or 2.25 quarter units, Win quarter schedule (Holloway, D; Weiner, A)*

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*See respective department course listings for unit values of crosslisted offerings.

SCHOOL OF MEDICINE

Dean: Philip Pizzo
Senior Associate Dean for Graduate Education and Postdoctoral Affairs: John Pringle
Senior Associate Dean for Medical Student Education: Charles Prober

The School of Medicine offers courses of study leading to the M.S., Ph.D., and M.D. degrees.

UNDERGRADUATE PROGRAMS

At the undergraduate level, a number of the school's courses are open to any registered Stanford student who has fulfilled the prerequisites, subject to the usual limits of course enrollment and faculty approval. In the classroom, the school offers courses targeted to undergraduates as well as graduate-level courses where advanced undergraduates with a strong background in the life sciences are welcome. Among these offerings are many Stanford Introductory Seminars for freshmen and sophomores; interested students are encouraged to peruse the complete list of these offerings in the "Stanford Introductory Seminars" section of this bulletin or at http://www.stanford.edu/group/introsems/.

GRADUATE PROGRAMS

M.S. AND PH.D. PROGRAMS

The School of Medicine is home to graduate programs covering a broad range of disciplines within biomedicine leading to Ph.D. or M.S. degrees. These programs focus on interdisciplinary training with in-depth investigation of an original problem of fundamental importance to bioscience. Each degree program sets its own curriculum, but many courses are taught by groups of faculty from multiple programs and departments. Flexibility is a priority to ensure that all students obtain the best possible training for pursuing careers in their areas of interest. Admission is through one of about 15 home programs. These home programs enable students to carry out dissertation research and training with School of Medicine faculty, as well as investigators in the departments of Biological Sciences and Biophysics in the School of Humanities and Sciences. Detailed information on School of Medicine M.S. and Ph.D. programs, curricula, and research can be found at http://med.stanford.edu/ms/ and http://med.stanford.edu/phd/. Application information may be obtained from Graduate Admissions, Office of the University Registrar, Stanford University, 630 Serra Street, Suite 120, Stanford, CA 94305-6032, or at http://gradadmissions.stanford.edu/.

M.D. PROGRAM

The School of Medicine seeks to attract students who are passionate about scholarship and wish to improve the health of the world's people through research, innovation, and leadership. The Stanford M.D. curriculum provides education in biomedical and clinical sciences along with study and independent research through scholarly concentrations. Emphasis is placed on interdisciplinary learning, with streamlined content and melding of basic science and clinical instruction across the curriculum. Blocks of unscheduled time allow for individual or group study, participation in elective courses, research, and reflection. Alternative pathways through the curriculum include an option of a fifth or sixth year of study as well as opportunities for pursuing a second degree, such as an M.P.H. or Ph.D.

Broad clinical science education occurs throughout the curriculum with exposure to patient care and the practice of medicine beginning on the first day of medical school. Students may begin clinical clerkships as early as May of the second year. A population health course combines classroom and experiential learning to provide understanding of the socioeconomic determinants of the health of patients and communities.

Scholarly concentrations offer opportunities for developing skills that enhance basic science and clinical training, fostering opportunities for research and innovation in areas such as bioengineering, biomedical ethics and medical humanities, biomedical informatics, clinical research, community health, health services and policy research, and the molecular basis of medicine. Study in a scholarly concentration typically includes course work and research activities. There are structured opportunities to link scholarly concentration study with programs in clinical areas housed within centers at Stanford such as the Comprehensive Cancer Center, the Cardiovascular Institute, the Neuroscience Institute, the Institute of Immunity, Transplantation, and Infection, and Women's Health at Stanford. Traveling scholars projects may also be conducted overseas.

Students with interests in medical research as a career are encouraged to investigate opportunities available through the Medical Scientist Training Program (MSTP). Stanford also collaborates with the University of California, Berkeley, to offer students opportunities for M.D./M.P.H. training. Details about these programs may be found at http://med.stanford.edu/combined_degree/.

Stanford is committed to representing the diversity of the U.S. and California populations by seeking a diverse body of students who are interested in the intellectual substance of medicine and committed to advancing the field of health care, broadly defined. Provided an applicant to the school has completed basic courses in physics, chemistry, and biology, the choice of an undergraduate major may reflect other interests, including the arts and humanities. Course work in advanced biology such as biochemistry, molecular biology, or genetics and the behavioral sciences is recommended because of their importance in understanding health care. Breadth of interests and depth of experiences play an important role in the selection of students from among those applicants having superior academic records.

The M.D. degree requires 13 quarters of full tuition; the joint M.D./Ph.D. degree requires 16 quarters. All additional quarters are charged at the reduced Terminal Medical Registration (TMR) tuition rate, which is $2,081 per quarter in 2007-08. Completion of the M.D. degree must be achieved within six years, unless a petition is granted to extend this time frame. For further details on the M.D. degree, including admission requirements, see http://med.stanford.edu/md/.

MULTIPLE-DEGREE PROGRAMS

MEDICAL SCIENTIST TRAINING PROGRAM

The Medical Science Training Program (MSTP) provides medical students with an opportunity to pursue an individualized program of research and course work leading to both the M.D. and Ph.D. degrees. It is designed to equip students for careers in academic investigative medicine, and emphasizes individualization of curricular and research programs for each trainee. Training for a combined M.D./Ph.D. should include the same content encountered by students who pursue each degree separately, but the total training time should be less than the sum of the time normally required for each degree. The flexible curriculum at Stanford University School of Medicine allows each student, in consultation with a preceptor and other advisers, to pursue a plan of study that satisfies the requirements for the M.D. degree and allows performance of doctoral-level research leading to the Ph.D. Students interested in joining the MSTP are considered for admission at the time of their application to the School of Medicine M.D. program and are asked to provide supplemental information relevant to their research background. Current Stanford M.D. students may also apply for admission to the MSTP. Further information regarding admission may be obtained from the MSTP administrator; details about the MSTP may be found at http://mstp.stanford.edu.

MASTER OF SCIENCE IN MEDICINE PROGRAM

The Master of Science in Medicine program admits Ph.D. students who have a commitment to translational research, but are not interested in becoming clinicians. The goal of the program is to train researchers in human biology and disease so they are more able to translate new scientific discoveries into useful medical advances. Students offered admission into any Ph.D. program at Stanford may apply for admission to the master's program. During their first five quarters, students take basic biomedical science courses with Stanford M.D. students. The School of Medicine M.D. curriculum is presented in a succinct format that allows time for students to concurrently complete their Ph.D. course requirements and lab rotations. By early in their second year, students choose a lab for their Ph.D. thesis research and complete their medical course work. They also elect a clinical mentor to discuss translational research needs and help to arrange a short clinical experience. Upon completion of the Ph.D., participating students receive an M.S. in Medicine. Details about the program can be found at http://msm.stanford.edu.

COURSES

The following courses are open to undergraduates or graduate students. Additional courses may also be available; see http://www.med.stanford.edu/education/ for more information.

STANFORD INTRODUCTORY SEMINARS

MED 70Q. Cancer and the Immune System—Stanford Introductory Seminar. Preference to sophomores. Myths and facts surrounding the idea that the immune system is capable of recognizing malignant cells. The biological basis and function of effector arms of the immune system; how these mechanisms may be used to investigate the biological basis and potential therapy of cancer. How the immune system functions. Write-2

3 units, Spr (Negrin, R)

MED 86Q. Seeing the Heart—Stanford Introductory Seminar. Preference to sophomores. Introduction to biomedical technology, science, clinical medicine, and public policy through cardiovascular imaging. Invasive and noninvasive techniques to detect early stage heart disease and to see inside the heart and blood vessels. Topics include: common forms of heart disease, how they develop, and why they affect so many people; imaging technologies such as ultrasound, CT, MRI, PET, and optical; a cost-effective public screening program. Field trips to Stanford Medical Center imaging centers.

1-2 units, Win (McConnell, M)

MED 87Q. Women and Aging—(Same as HUMBIO 87Q.) Stanford Introductory Seminar. Preference to sophomores. Biology, clinical issues, social and health policies of aging; relationships, lifestyles, and sexuality; wise women and grandmothers. Sources include scientific articles, essays, poetry, art, and film. Service-learning experience with older women. GER:EC-Gender

5 units, Win (Winograd, C)

MED 88Q. Dilemmas in Current Medical Practice—Stanford Introductory Seminar. Preference to sophomores. Social, political, scientific, and economic forces influencing medical practice. Spiraling costs, impaired access to health care, and disillusionment toward the health care system. Attempts by government and medical insurers to control costs through managed care and health maintenance organizations. Medical education and how it has affected the practice of medicine. Alternative health care, preventive medicine, and the doctor-patient relationship. The paradox of health in America: why do so many people who are healthy feel unhealthy? Optional observation of instructors in their medical practices.

3 units, Aut (Croke, J; Jones, H)

MED 108Q. Human Rights and Health—Stanford Introductory Seminar. Preference to sophomores. History of human-rights law. Topics such as: the health status of refugees and internally displaced persons; child labor; trafficking in women and children; torture; poverty, the environment, and health; access to clean water; domestic violence and sexual assault; and international availability of drugs. International conventions on human rights as background for social and political changes that could improve the health of groups and individuals. Optional opportunities to observe at sites where human rights and health are issues.

3 units, Win (Laws, A)

MED 120Q. Pathophysiology of Diseases of the Heart and Blood Vessels—Stanford Introductory Seminar. Preference to sophomores. Anatomic, physiologic, and pathologic states that comprise cardiovascular medicine. Anatomy and physiology of the heart and blood vessels as an introduction to pathologic states such as heart attack, stroke, congestive heart failure, rhythm disturbances of the heart, and sudden cardiac death. Underlying principles of diagnosis and treatment of the disease.

3 units, Spr (Stertzer, S)

UNDERGRADUATE AND GRADUATE

INDE 183I/283I. Early Clinical Experience in International Family and Community Medicine—(Graduate students register for 283I.) For preclinical medical students; undergraduates by special arrangement. Interactive early clinical experience with physicians, community leaders, health care workers, and patients in Mexico, India, China, or Tibet. Emphasis is on community health from local and global perspectives. Social, political, historical, and economic backgrounds of the country and local region. Non-western attitudes, beliefs and practices regarding health care, including herbal and other complementary medicine; local institutions and infrastructure including schools, social services, and the public health care system; and policies that impact health and the provision of care. Prerequisites: conversational Spanish for Mexico; for medical students, completion of first year; for undergraduates, junior standing or higher. Undergraduates apply through International Alliance in Service and Education (IASE) for Mexico; Volunteers in Asia (VIA) for Asian sites. Medical students apply through the Center for Education in Family and Community Medicine.

6-12 units, Aut, Win, Spr, Sum (LeBaron, S)

INDE 199. Undergraduate Directed Reading and Research in Family and Community Medicine—Interested students should contact the Center for Education in Family and Community Medicine administration. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

INDE 244. Ethnicity and Medicine—Weekly lecture series introduces basic information about ethnic and cultural factors that impact patient care. Presents information about culturally sensitive health care services and addresses contemporary research issues involving minority and underserved populations. Topics include health care issues and indigenous medical practices of African Americans, Asians, Latinos, Native Americans, immigrants and refugees in both urban and rural settings. One unit for weekly lectures only; two units require additional discussions facilitated by course director; three units (non-medical graduate students and undergraduates) require weekly response papers and a research paper.

1-3 units, Spr (Garcia, R)

INDE 245. Women and Health Care—Lecture and seminar series. Topics of interest to women as health care consumers and providers. The historical role of women in health care; current and future changes.

1-2 units, Aut (Grudzen, M; LeBaron, S; Massion, C)

INDE 247. The Theater of Illness—The immediacy of disease and illness through descriptions of the human condition by playwright and actor. Mental illness, infectious disease, high technology, and end-of-life issues through plays and films from *King Lear* to *Angels in America*.

2 units, Spr (Zaroff, L)

INDE 253. Rural Health with a Global Perspective—Health status of the population, availability of health services and institutions, personal and environmental factors affecting health and medical care, and present and future models for change. Three-day field trip to San Joaquin Valley and mountain sites.

3-5 units, Spr (LeBaron, S; Jones, E)

INDE 256. Current Controversies in Women's Health—(Same as HUMBIO 125.) Interdisciplinary. Focus is on the U.S. Topics include: health research; bioethical, legal, and policy issues; sex and gender differences; scientific and cultural perspectives; social influences; environmental and lifestyle effects on health; and issues related to special populations. Prerequisite: Human Biology core or equivalent, or consent of instructor.

3 units, Spr (Jacobson, M; Stefanick, M)

MED 147/247. Methods in Community Assessment, Evaluation, and Research—(Graduate students register for 247.) Development of pragmatic skills for design, implementation, and analysis of structured interviews, focus groups, survey questionnaires, and field observations. Topics include: principles of community-based participatory research, including importance of dissemination; strengths and limitations of different

study designs; validity and reliability; construction of interview and focus group questions; techniques for moderating focus groups; content analysis of qualitative data; survey questionnaire design; and interpretation of commonly-used statistical analyses.
3 units, Win (Fortmann, S; Kiernan, M)

MED 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

MED 207. History of Medicine—The development of Western medical tradition from Babylonian, Egyptian, and Greek cultures to the present.
1 unit, Win (Camargo, C)

MED 217. Technological Frontiers in Digestive Diseases—For engineering, bioengineering, and physical sciences students. Topics include: endoscopes to detect and remove cancer; minimally invasive surgery to treat obesity; measurements of propulsion through the intestine; and technologies to detect and stop internal bleeding. Observations in the clinical setting; visits to laboratories engaged in the development of new technologies. Technologies used in the clinical setting. 1 unit for lecture and observation only; 2-3 units for design and production of a medical device using Stanford's Product Realization Laboratory.
1-3 units, Spr (Lowe, A; Milroy, C)

MED 228. Physicians and Social Responsibility—Social and political context of the roles of physicians and health professionals' role in social change; policy, advocacy, and shaping public attitudes. How physicians have influenced governmental policy on nuclear arms proliferation; environmental health concerns; domestic violence; health and human rights; physicians in government; activism through research; the effects of poverty on health; and gun violence.
1 unit, Aut (Laws, A)

MED 230. Rethinking International Health—Issues and players that shape international health today. A road map for thoughtful, responsible action. Topics include: the role of the physician and health care worker; health as a human right; successful interventions; children's and women's health; issues in immunization; economic development; and NGOs. Online interviews with influential leaders in international health.
2-3 units, Win (Wise, P)

MED 236. Psychosocial and Behavioral Health Interventions—For medical students, graduate students and undergraduates with senior standing in Human Biology or Psychology. Contemporary theory and conceptual frameworks for psychosocial and behavioral change interventions as applied in the context of contemporary models of community medicine. The trans-theoretical model of behavioral change, contemporary behavioral, cognitive behavioral, social cognitive and acceptance-based models of behavioral change. Current models of emotion regulation, goal setting and attainment, and the impact of personality and characterological features on behavior and behavioral change. Application of theory in practicum based community clinic settings. Prerequisite: Stanford HIPAA training.
1 unit, not given this year

MED 242. Physicians and Human Rights—How human rights violations affect health. Topics include torture, domestic violence, regional conflict and health, sweat shops, rape, and war. Guest speakers.
1 unit, Win (Laws, A)

MED 249. Medical Interpreting in Community Clinics—Open to medical students, graduate and undergraduate students. Practical training to serve as a medical interpreter in the Arbor or Pacific Free Clinics, or in other area community health centers. Students must be bilingual. This is not language instruction, but instruction and discussion about the unique role of the medical interpreter in a community-based health care setting, required training in patient privacy, and skill-building. Unit credit also given for service hours in area clinics.
1-2 units, Aut, Win, Spr, Sum (Osterberg, L)

MED 254. Applied Skill-Building in Clinical and Community-Based Research—Skill-building via detailed individualized feedback from instructor on all aspects of research projects. Topics include: grant proposal preparation; study design; field implementation; data entry, analysis and interpretation; and conference abstract/manuscript preparation.
1-6 units, Aut, Win, Spr, Sum (Kiernan, M; Fortmann, S)

MED 255. The Responsible Conduct of Research—Forum. How to identify and approach ethical dilemmas that commonly arise in biomedical research. Issues in the practice of research such as in publication and interpretation of data, and issues raised by academic/industry ties. Debates at the interface of biomedical science and society regarding research on stem cells, bioweapons, genetic testing, human subjects, and vertebrate animals. Completion fulfills NIH/ADAMHA requirement for instruction in the ethical conduct of research. Recommended: research experience.
1 unit, Aut, Win, Spr (Karkazis, K)

MED 256. Global HIV/AIDS—(Same as HUMBIO 156.) Public health, policy, and research issues. Resources at Stanford and institutions such as government, NGOs, and pharmaceutical, advocacy, and international organizations. Sources include biomedical, social, and behavioral sciences. Student projects. Guest lectures.
3 units, Aut (Katzenstein, D)

MED 257A,B,C. Patient Advocacy in Community Clinics—Early clinical experience for pre-medical and medical students. Structured training and shadowing in preparation for a clinical role working with patients in community health clinics; the context of the work, populations served, and social role of physicians. Regular shifts at one of the course-affiliated clinic sites throughout the academic year. 1-2 units for students attending class meetings and performing clinic shifts. 3-4 units for a year-long, clinic-based project. Prerequisite: application.
1-4 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Garcia, G; Banchoff, A)*

MED 258. Advanced Patient Advocacy in Community Clinics—Continuation of 257A,B,C for second-year students in Patient Advocacy Program; open to students who have worked in a clinical capacity in a community clinic setting. Skills training in areas such as health education counseling and group facilitation. Regular shifts at partner clinics. Students partner with clinic staff in developing and carrying out a service-learning or research project designed to meet the clinic's needs. May be repeated for credit. Prerequisites: 257A,B,C or consent of instructor.
1-3 units, Aut, Win, Spr, Sum (Garcia, G; Banchoff, A)

MED 262. Economics of Health Improvement in Developing Countries—(Same as ECON 127, HUMBIO 121.) Application of economic paradigms and empirical methods to health improvement in developing countries. Emphasis is on unifying analytic frameworks and evaluation of empirical evidence. How economic views differ from public health, medicine, and epidemiology; analytic paradigms for health and population change; the demand for health; the role of health in international development. Prerequisites: background in economics and statistics, and consent of instructor.
5 units, Win (Miller, N)

MED 272A. Biodesign Innovation: Needs Finding and Concept Creation—(Same as BIOE 374A, OIT 384, ME 374A.) Two quarter sequence. Strategies for interpreting clinical needs, researching literature, and searching patents. Clinical and scientific literature review, techniques of intellectual property analysis and feasibility, basic prototyping, and market assessment. Student entrepreneurial teams create, analyze, and screen medical technology ideas, and select projects for development.
3-4 units, Win (Yock, P; Zenios, S; Milroy, J; Brinton, T)

MED 272B. Biodesign Innovation: Concept Development and Implementation—(Same as BIOE 374B, OIT 385, ME 374B.) Two quarter sequence. Concept development and implementation. Early factors for success; how to prototype inventions and refine intellectual property. Lectures, guest medical pioneers, and entrepreneurs about strategic planning, ethical considerations, new venture management, and financing and licensing strategies. Cash requirements; regulatory (FDA), reimbursement, clinical, and legal strategies, and business or research plans.
3-4 units, Spr (Yock, P; Zenios, S; Milroy, J; Brinton, T)

MED 275. Introduction to Biopharmaceutical Innovation—Open to all students. Biotechnology and the pharmaceutical industry. Topics include the biopharmaceutical industry, historical trends, and experiences; research and development; intellectual property; drug approval: regulatory issues and agencies; business development; marketing; manufacturing; capital structure and financing; careers in biopharmaceutical industry. 3 units requires team project and final presentation. May be repeated for credit.
2-3 units, Win (Gardner, P)

MED 276. Careers in Medical Technology—Career tracks in biomedical technology for medical, life science, engineering, business, and law students. Guest industry professionals.
1 unit, Spr (Yock, P; Popp, R)

MED 279Y. Interdisciplinary Design for Agile Aging—(Same as CS 379Y, HUMBIO 131.) First of two quarter sequence; students may take 279Y without 279Z; offered by the d.school. Perspectives from computer science, design, social and behavioral sciences, physiology, geriatrics, and biodesign to develop projects that address the potential of people to maintain vitality and mobility as they age. New ways to integrate computer and device technologies with behavioral and social interventions. Focus is on small projects. Prerequisite: background in one of design, computing, medicine, behavioral sciences, communications, or business.
3-4 units, Win (Winograd, C; Winograd, T; Friedlander, A; Yock, P)

MED 279Z. Design Project for Agile Aging—(Same as CS 379Z.) Second of two quarter sequence; students may take 279Y without 279Z; offered by the d.school. Small teams develop projects that can have an impact in the world through products, programs, and practices that affect people's health on a broad scale. Technical interventions, social and contextual design, organizational contexts, and business and distribution issues. Limited enrollment. Prerequisites: 279Y, and master's level skills in one of design, computing, medicine, behavioral sciences, communications, or business.
3-4 units, Spr (Winograd, T; Winograd, C; Friedlander, A; Yock, P)

MED 289. Introduction to Bioengineering Research—(Same as BIOE 390.) Preference to medical and bioengineering graduate students. Bioengineering is an interdisciplinary field that leverages the disciplines of biology, medicine, and engineering to understand living systems, and engineer biological systems and improve engineering designs and human and environmental health. Topics include: imaging; molecular, cell, and tissue engineering; biomechanics; biomedical computation; biochemical engineering; biosensors; and medical devices. Limited enrollment.
1-2 units, Aut, Win (Taylor, C)

MED 299. Directed Reading in Medicine—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

MED 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

NSUR 278A. From Science to Business: Innovation in Neurologic Disease Beyond Neurosurgery—For medical, business, and engineering students. The process of innovation and company building in the medical field, emphasizing the neurosciences. Overview of neurological diseases; business and regulatory aspects of device and biotech product development. Guest speakers on healthcare entrepreneurship. Venture capital and entrepreneurial mentors guide interdisciplinary student teams in evaluating a solution to an unmet clinical need or a project within a biotech company. May be taken for 2 units without the team project.
2-4 units, Win (Kallmeyer, V)

NSUR 279. Concepts in Drug Delivery and Drug Device Combinations—Open to all graduate students. Issues relating to drug-device combination products, including review of recently approved products such as cardiac stent), and development, regulatory, and reimbursement issues. Emphasis is on market evaluation, product development, and regulatory strategies. Lecture only for 2 units; project for 4 units.
2-4 units, (Kallmeyer, V) alternate years, not given this year

ORTHO 222. Anatomy of Movement—Perspectives include orthopedic surgery, neurology, mechanical engineering, computer science, anthropology, and art. Anatomy and pathology affecting the human locomotor system. Normal function and functional deficit from disease or injury. Engineering dilemmas that assist or emulate human movement, such as design of an artificial joint or simulation of tendon transfers for nerve palsy. The expression of human movement in art masterpieces and photography. The evolution of the hand as it became an instrument of purpose. Student team projects. Lecture only for 2 units; project for 4 units.
2-4 units, Win (Ladd, A; Rose, J)

ORTHO 260. Tissue Engineering—Biological principles underlying the use of engineering strategies and biocompatible materials for tissue repair and regeneration. Structure, physiology, and mechanics of articular cartilage, bone, and dense soft connective tissues. Current ideas, approaches, and applications being implemented as therapeutic regimens for arthritis, spinal deformities, and limb salvage. Multidisciplinary constraints on the design and creation of tissue constructs. Prerequisite: familiarity with basic cell and molecular mechanisms underlying tissue differentiation.
3 units, Win (Smith,R)

PEDS 105/215. Health Promotion and the Campus Culture—Multidisciplinary perspectives of public health and health psychology. The prevalence of health risk behaviors on the contemporary college campus and the challenges of risk reduction. Students apply theoretical frameworks to peer health promotion campus projects. Limited enrollment. Prerequisite: consent of instructor following first meeting.
4 units, Win, Spr (Friedman, I; Pertofsky, C)

PEDS 216. Alcohol Issues and the Campus Culture—Multidisciplinary perspectives of public health, health psychology, and sociology. The prevalence and scope of alcohol-related problems; challenges of risk reduction and intervention strategies. Students apply theoretical frameworks to alcohol-related research topics and projects. Limited enrollment. Prerequisite: consent of instructor following first meeting.
4 units, Win (Castro, R)

PSYC 135/235. Sleep and Dreams—Current research on how sleep affects our daily lives. Physiology of non-REM and REM sleep, dreams and dreaming, content, psychophysiological cause, lucid dreaming, sleep need, sleep debt, daytime alertness, and performance; biological clock and circadian rhythms; sleep disorders, insomnia, narcolepsy, sleep apnea, sleepwalking, jet lag, sleeping pills, sleep and mental illness, sleep and memory, and the impact of sleep deprivation and sleep disorders on academic and social life. Multimedia presentations, guest lectures, and projects.
3 units, Win (Dement, W)

PSYC 230. Freud, Human Behavior, and Medical Care—Seminar; applicable to all human behavior disciplines. The role of the unconscious in mental and physical functioning. Freudian psychology on mental functioning and its effect on the body and group behaviors. Topics include Freud's model of the mind, dreams, neurosis and psychosis, psychosomatic illness, eating disorders and addiction, and treatment options.
2 units, Win (Fisk, S)

BIOCHEMISTRY

Emeriti: (Professors) Robert L. Baldwin, Paul Berg, David S. Hogness, Arthur Kornberg, A. Dale Kaiser, I. Robert Lehman
Chair: Mark A. Krasnow
Professors: Patrick O. Brown, Douglas L. Brutlag, Gilbert Chu, Ronald W. Davis, James E. Ferrell, Jr., Daniel Herschlag, Mark A. Krasnow, Suzanne R. Pfeffer, James A. Spudich
Associate Professors: Pehr A. B. Harbury, Julie A. Theriot
Assistant Professor: Aaron F. Straight
Courtesy Professors: Chaitan S. Khosla, Sharon Long

Department Offices: Beckman Center, B400
Mail Code: 94305-5307
Phone: (650) 723-6161
Web Site: http://biochemistry.stanford.edu/

Courses given in Biochemistry have the subject code BIOC. For a complete list of subject codes, see Appendix.

Biochemistry is a department within the School of Medicine, with offices and labs located in the Beckman Center for Molecular and Genetic Medicine at the Stanford Medical Center. Courses offered by the department may be taken by undergraduate, graduate, and medical school students.

Advanced courses offered in more specialized areas emphasize recent developments in biochemistry, cell biology, and molecular biology. These courses include the physical and chemical principles of biochemistry, enzyme reaction mechanisms, membrane trafficking and biochemistry, molecular motors and the cytoskeleton, mechanisms and regulation of nucleic acid replication and recombination, the biochemistry of bacterial and animal viruses, the molecular basis of morphogenesis, the molecular and cell biology of yeast, and the structure and function of both eukaryotic and prokaryotic chromosomes.

Opportunities exist for directed reading and research in biochemistry and molecular biology, utilizing the most advanced research facilities, including those for light and electron microscopy, chromatography and electrophoresis, protein and nucleic acid purification, rapid kinetic analysis, synthesis and analysis, single molecule analyses using laser light traps, microarray generation and analysis and computer graphic workstation facilities for protein and nucleic acid structural analysis. Ongoing research utilizes a variety of organisms, from bacteria to animal cells.

GRADUATE PROGRAM

DOCTOR OF PHILOSOPHY

Requirements for the M.S. and Ph.D. degrees are described in the "Graduate Degrees" section of this bulletin. The department does not offer undergraduate degrees.

The Department of Biochemistry offers a Ph.D. program which begins in the Autumn Quarter of each year. The program of study is designed to prepare students for productive careers in biochemistry; its emphasis is training in research, and each student works closely with members of the faculty. In addition to the requirement for a Ph.D. dissertation based on original research, students are required to complete six advanced courses in biochemistry and related areas among the 135 total units required for the Ph.D. Selection of these courses is tailored to fit the background and interests of each student. A second requirement involves the submission of two research proposals which are presented by the student to a small committee of departmental faculty members who are also responsible for monitoring the progress of student curricular and research programs, and a journal club presentation. All Ph.D. students are expected to participate actively in the department's seminar program, and students are encouraged to attend and to present papers at regional and national meetings in cellular biochemistry and molecular biology. Teaching experience is an integral part of the Ph.D. curriculum and is required for the degree.

The Department of Biochemistry offers an M.S. degree only to students already enrolled in the Ph.D. program. Students should contact the Graduate Studies adviser for more details.

Those applying for graduate study should have at least a baccalaureate degree and should have completed work in cell and developmental biology, basic biochemistry and molecular biology, and genetics. Also required are: at least one year of university physics; differential and integral calculus; and analytical, organic, inorganic, and physical chemistry. The department is especially interested in those applicants who have research experience in biology or chemistry. Students must submit an application, including transcripts and letters of recommendation, by December 12.

Applications should be submitted at http://gradadmissions.stanford.edu/. Applicants are notified by March 24 of decisions on their applications. Stanford University requires scores from the Graduate Record Examination (GRE) (verbal, quantitative, and analytical), and applicants are encouraged to submit scores from the GRE Subject Test in either biochemistry, biology, or chemistry. Applicants should take the October GRE exam.

All applicants are urged to compete for non-Stanford fellowships or scholarships, and U.S. citizens should complete an application for a National Science Foundation Predoctoral Traineeship. Students are provided with financial support to cover normal living expenses; Stanford tuition costs are paid. Applicants for admission to the department are considered without regard to race, color, creed, religion, sex, age, national origin, or marital status.

Postdoctoral research training is available to graduates who hold a Ph.D. or an M.D. degree. Qualified individuals may write to individual faculty members for further information.

At present, the primary research interests of the department are the structure and function of proteins and nucleic acids, the biochemistry and control of development processes, molecular motors and the cytoskeleton, the trafficking of proteins between membrane-bound organelles, the control and regulation of gene expression, bioinformatics/protein structure design, and the application of microarrays to problems in human health and disease.

COURSES

BIOC 118Q. Genomics and Medicine—Stanford Introductory Seminar. Preference to sophomores. Knowledge gained from sequencing human, bacterial, and viral genomes and implications for medicine and biomedical research. Novel diagnoses (chips, SNPs and gene expression) and treatment of diseases including gene therapy, stem cell therapy, and rational drug design. Ethical implications of stem cell therapy and uses of genetic information. Use of genome and disease databases to determine gene function in disease, diagnosis, and potential treatments. See http://biochem118.stanford.edu/. GER:DB-EngrAppSci
3 units, Spr (Brutlag, D)

BIOC 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

BIOC 201. Advanced Molecular Biology—Literature-based lectures and discussion on rapidly developing frontiers in chromosome structure and function and modern insights into the control of gene expression. Emphasis is on experimental approaches and insights. Topics include chromosome organization, novel modes of transcriptional control, RNA-based mechanisms for controlling gene expression and emerging translational regulatory mechanisms. Prerequisite: undergraduate molecular biology.
5 units, not given this year

BIOC 202. Metabolic Biochemistry: Structure, Metabolism, and Energetics—(Review course for medical students only). Structure and function of biological molecules, enzyme kinetics and mechanisms, bioenergetics, pathways of intermediary metabolism and their control, and membrane structure and function. Course offered via online lectures and problem sets, with weekly small-group review sessions.
1-3 units, Aut (Brutlag, D)

BIOC 205. Molecular Foundations of Medicine—Topics include: DNA structure, replication, repair, and recombination; chromosome structure and function; gene expression including mechanisms for regulating transcription and translation; and methods for manipulating DNA, RNA, and proteins. Patient presentations illustrate how molecular biology affects the practice of medicine.
3 units, Aut (Brown, P; Chu, G; Krasnow, M)

BIOC 210. Advanced Topics in Membrane Trafficking—The structure, function, and biosynthesis of cellular membranes and organelles. Current literature. Prerequisite: consent of instructor.

3 units, Spr (Pfeffer, S)

BIOC 215. Frontiers in Biological Research—(Same as DBIO 215, GENE 215.) Literature discussion in conjunction with the Frontiers in Biological Research seminar series hosted by Biochemistry, Developmental Biology, and Genetics in which distinguished investigators present current work. Students and faculty meet beforehand to discuss papers from the speaker's primary research literature. Students meet with the speaker after the seminar to discuss their research and future direction, commonly used techniques to study problems in biology, and comparison between the genetic and biochemical approaches in biological research.

1 unit, Aut, Win (Harbury, P; Brunet, A; Villeneuve, A)

BIOC 218. Computational Molecular Biology—(Same as BIOMEDIN 231.) Via Internet. For molecular biologists and computer scientists. Representation and analysis of genomes, sequences, and proteins. Strengths and limitations of existing methods. Course work performed on web or using downloadable applications. See http://biochem218.stanford.edu/. Prerequisites: introductory molecular biology course at level of BIOSCI 41 or consent of instructor.

3 units, Aut, Win, Spr (Brutlag, D)

BIOC 220. Chemistry of Biological Processes—(Same as CSB 220.) The principles of organic and physical chemistry as applied to biomolecules. Goal is a working knowledge of chemical principles that underlie biological processes, and chemical tools used to study and manipulate biological systems. Prerequisites: organic chemistry and biochemistry, or consent of instructor.

4 units, Aut (Herschlag, D; Chen, J; Bogyo, M; Wandless, T)

BIOC 221. The Teaching of Biochemistry—Required for teaching assistants in Biochemistry. Practical experience in teaching on a one-to-one basis, and problem set design and analysis. Familiarization with current lecture and text materials; evaluations of class papers and examinations. Prerequisite: enrollment in the Biochemistry Ph.D. program or consent of instructor.

3 units,Aut, Win, Spr, Sum (Staff)

BIOC 224. Cell Biology of Physiological Processes—(Same as BIOSCI 214.) For Ph.D. students. Current research on cell structure, function, and dynamics. Topics include complex cell phenomena such as cell division, apoptosis, compartmentalization, transport and trafficking, motility and adhesion, differentiation, and multicellularity. Current papers from the primary literature. Prerequisite for advanced undergraduates: BIOSCI 129A,B, and consent of instructor.

2-5 units, Win (Theriot, J; Nelson, W; Straight, A; Bogyo, M; Pfeffer, S)

BIOC 225. Interdisciplinary Approaches to Cell Biology: the Role of the Cytoskeleton—The molecular basis of energy transduction leading to movements generated by microfilament-based and microtubule-based motors. Forms of myosin, dynein, and kinesin and their roles in the cell as a model for understanding the structural, biochemical, and functional properties of biological machines. Topics: structure of the molecular motors and their accessory proteins; regulation of the function of motile assemblies; functions of molecular motors in cells; spatial and temporal controls on the formation of motile assemblies in cells. Experimental approaches: genetic analysis, DNA cloning and expression, reconstitution of functional assemblies from purified proteins, x-ray diffraction, three-dimensional reconstruction of electron microscope images, spectroscopic methods, high-resolution light microscopy, and computational approaches. Prerequisites: basic biochemistry and cell biology.

3 units, Spr (Spudich, J)

BIOC 228. Computational Genomic Biology—Application of computational genomics methods to biological problems. Topics include: assembly of genomic sequences; genome databases; comparative genomics; gene discovery; gene expression analyses including gene clustering by expression, transcription factor binding site discovery, metabolic pathway discovery, functional genomics, and gene and genome ontologies; and medical diagnostics using SNPs and gene expression. Recent papers from the literature and hands-on use of the methods. Prerequisites: introductory course in computational molecular biology or genomics such as BIOC 218 or GENE 211. Via Internet in Winter and Spring.

3 units, Aut, Win, Spr (Brutlag, D)

BIOC 230. Molecular Interventions in Human Disease—For M.D. students who intend to declare a concentration in molecular basis of medicine, MSTP students, and Ph.D. students. Advanced medical biochemistry focusing on cases where molecular-level research has led to new medical treatments or changes in the understanding of important diseases. Different topics each week explore the underlying molecular basis of a variety of diseases and the reasons for success and failure in molecular approaches to treatment. Student-led discussions dissect papers from the primary medical and scientific research literature.

2-3 units, Aut (Theriot, J; Harbury, P)

BIOC 238. Computational Proteomic Biology—Application of computational protein analysis to biological problems. Topics include: protein sequence analysis and comparison including protein sequence databases, amino acid composition, protein alignment, protein motifs, protein families, and probabilistic models of families; protein structure including structure comparison and superposition methods, structural motifs, and structure and domain databases; protein structure prediction including secondary structure, homology modeling, threading, and ab initio structure prediction; protein-protein interaction databases and protein-protein interaction prediction; and protein-DNA interaction motifs and protein-ligand docking. Prerequisite: BIOC 218 or SBIO/BIOPHYS 228. Via Internet in Spring.

3 units, Win, Spr (Brutlag, D)

BIOC 241. Biological Macromolecules—(Same as BIOPHYS 241, SBIO 241.) The physical and chemical basis of macromolecular function. Forces that stabilize biopolymers with three-dimensional structures and their functional implications. Thermodynamics, molecular forces, and kinetics of enzymatic and diffusional processes, and relationship to their practical application in experimental design and interpretation. Biological function and the level of individual molecular interactions and at the level of complex processes. Case studies. Prerequisites: introductory biochemistry and physical chemistry or consent of instructor.

3-5 units, Aut (Herschlag, D; Puglisi, J; Garcia, K; Ferrell, J; Block, S; Pande, V; Weis, W; Harbury, P)

BIOC 257. Currents in Biochemistry—Seminars by Biochemistry faculty on their ongoing research. Background, current advances and retreats, general significance, and tactical and strategic research directions.

1 unit, Aut (Spudich, J)

BIOC 299. Directed Reading in Biochemistry—Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

BIOC 399. Graduate Research and Special Advanced Work—Investigations sponsored by individual faculty members.

1-18 units, Aut, Win, Spr, Sum (Staff)

BIOC 459. Frontiers in Interdisciplinary Biosciences—(Same as BIOE 459, BIOSCI 459, CHEMENG 459, CHEM 459, PSYCH 459. Students register through their affiliated department; otherwise register for CHEMENG 459.) For specialists and non-specialists. Sponsored by the Stanford BioX Program. Three seminars per quarter address scientific and technical themes related to interdisciplinary approaches in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and the world present breakthroughs and endeavors that cut across core disciplines. Pre-seminars introduce basic concepts and background for non-experts. Registered students attend all pre-seminars; others welcome. See http://www.stanford.edu/group/biox/courses/459.html. Recommended: basic mathematics, biology, chemistry, and physics.

1 unit, Aut, Win , Spr (Robertson, C)

COGNATE COURSES

See respective department listings for course description. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CHEMENG 450. Advances in Biotechnology
3 units, Spr (Hwang, L; Swartz, J)

SBIO 242. Methods in Molecular Biophysics—(Same as BIOPHYS 242.)
3 units, alternate years, not given this year

CENTER FOR BIOMEDICAL ETHICS

Director: David C. Magnus
Director Emeritus: Thomas A. Raffin
Associate Director: Mildred K. Cho
Participating Faculty and Staff: Clarence H. Braddock, Julie A. Collier, LaVera M. Crawley, Maren Grainger-Monsen, Henry Greely, Agnieszka Jaworska, Katrina A. Karkazis, Sandra S. Lee, Jose R. Maldonado, Christopher T. Scott, Audrey Shafer, Sara L. Tobin, Lawrence I. Zaroff
Center Offices: 701 Welch Road, Building A, Suite 1105
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Phone: (650) 723-5760
Web Site: http://bioethics.stanford.edu/

The Stanford University Center for Biomedical Ethics (SCBE) is dedicated to interdisciplinary research and education, and provides clinical and research ethics consultation. SCBE serves as a scholarly resource on emerging ethical issues raised by medicine and biomedical research.

SCBE offers a scholarly concentration in Biomedical Ethics and Medical Humanities to medical students. This program allows medical students to study in depth the ethical and humanistic dimensions of research and practice. Additional information on requirements for the scholarly concentration, and a comprehensive list of other related courses is available at http://bioethics.stanford.edu/education/bemh/.

COURSES

MEDICINE

INDE 212. The Human Condition: Medicine, Arts, and Humanities—The interdisciplinary field of medical humanities: the use of the arts and humanities to examine medicine in personal, social, and cultural contexts. Topics include the doctor/patient relationship, the patient perspective, the meaning of doctoring, and the meaning of illness. Sources include visual and performing arts, film, and literary genres such as poetry, fiction, and scholarly writing. For medical students in the Biomedical Ethics and Medical Humanities Scholarly Concentration; all students welcome.
2 units, Aut (Zaroff, L; Shafer, A)

INDE 226. History of Medicine Online—Topics include: ancient medicine, Egypt and Babylonia, ancient Greece and Rome, Europe in the Middle Ages and the Renaissance, 18th-century schools of thought, and technological medicine. Sources include Kleinman's core clinical functions, and text, pictures, hypertext links, and sound clips.
1 unit, Aut, Win, Spr, Sum (Shafer, A)

INDE 238. Current Concepts and Dilemmas in Genetic Testing—(Same as GENE 238.) Issues arising from the translational process from research to commercialization. Diagnostic inventions and applications, community implications, newborn screening, cancer genetics, and pharmacogenomics. Guest experts. For M.D., biomedical graduate, and genetic counseling students.
2 units, Spr (Tobin, S; Schrijver, I; Cowan, T; Magnus, D)

INDE 247. The Theater of Illness—The immediacy of disease and illness through descriptions of the human condition by playwright and actor. Mental illness, infectious disease, high technology, and end-of-life issues through plays and films from *King Lear* to *Angels in America*.
2 units, Spr (Zaroff, L)

MED 250A. Medical Ethics I—Required for Scholarly Concentration in Biomedical Ethics and Medical Humanities. The field of bioethics, including theoretical approaches to bioethical problems. Contemporary controversies and clinical cases. Values that arise in different situations and clinical encounters. Issues include: genetics and stem cell research, rationing, ethical issues in care at the end of life, organ transplantation issues.
2 units, Win (Magnus, D)

MED 250B. Medical Ethics II—The integration of ethical theory with applications of theory or conceptual issues in medicine, health care, and the life and social sciences. Topic varies by year. Possible topics include: ethical issues in stem cell research; death and dying; genetics and ethics; concepts of health and disease; the ethics of international research; and ethical implications of new reproductive technology.
2 units, Spr (Magnus, D)

MED 255. The Responsible Conduct of Research—Forum. How to identify and approach ethical dilemmas that commonly arise in biomedical research. Issues in the practice of research such as in publication and interpretation of data, and issues raised by academic/industry ties. Contemporary debates at the interface of biomedical science and society regarding research on stem cells, bioweapons, genetic testing, human subjects, and vertebrate animals. Completion fulfills NIH/ADAMHA requirement for instruction in the ethical conduct of research. Recommended: research experience.
1 unit, Aut, Win, Spr, Sum (Karkazis, K)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CASA 160/260. Race, Genetics, and Interpreting Difference
5 units, Aut (Lee, S)

HRP 209. FDA's Regulation of Health Care—(Same as LAW 458.)
3-4 units, Win (Greely, H)

HRP 210. Health Law and Policy I—(Same as LAW 313.)
3-4 units, Aut (Greely, H)

HRP 211. Law and the Biosciences—(Same as LAW 368.)
3 units, Win (Greely, H)

HUMBIO 99Q. Becoming a Doctor: Readings from Medical School, Medical Training, Medical Practice
4 units, Aut (Zaroff, L)

HUMBIO 174. Foundations of Bioethics
3 units, Win (Magnus, D)

HUMBIO 175. Health Care as Seen Through Medical History, Literature, and the Arts
3 units, Aut (Zaroff, L)

HUMBIO 175S. Novels and Theater of Illness
4 units, Spr (Zaroff, L)

PHIL 78. Medical Ethics—(Same as ETHICSOC 78.)
4 units, Win (Jaworska, A)

PHIL 170/270. Ethical Theory—(Same as ETHICSOC 170.)
4 units, Aut (Jaworska, A)

BIOMEDICAL INFORMATICS PROGRAM

Committee: Russ B. Altman *(Chair and Program Director)*; Mark A. Musen *(Co-Director)*; Betty Cheng, Lawrence M. Fagan *(Associate Directors)*; Atul Butte, Amar K. Das, Parvati Dev, Teri E. Klein, David Paik

Participating Faculty and Staff by Department:

Reserach opportunities are not limited to faculty and departments listed.

Anesthesia: David M. Gaba (Professor)

Biochemistry: Douglas L. Brutlag (Professor), Ron Davis (Professor), Julie Theriot (Associate Professor)

Biological Sciences: Dmitri Petrov (Associate Professor)

Bioengineering: Russ B. Altman (Professor), Markus Covent (Assistant Professor)

Chemistry: Vijay Pande (Associate Professor)

Chemical and Systems Biology: James Ferrell (Professor)

Civil and Environmental Engineering: Raymond E. Levitt (Professor)

Computer Science: Serafim Batzoglou (Assistant Professor), Gill Bejerano (Assistant Professor), Leo Guibas (Professor), Daphne Koller (Associate Professor), Jean-Claude Latombe (Professor), Gio Wiederhold (Professor, Research, emeritus)

Developmental Biology: Gill Bejerano (Assistant Professor), Stuart Kim (Professor)

Genetics: Russ B. Altman (Professor), Mike Cherry (Associate Professor, Research), Stanley N. Cohen (Professor), Teri E. Klein (Senior Research Scientist), Richard M. Myers (Professor), Gavin Sherlock (Assistant Professor)

Health Research and Policy: Mark A. Hlatky (Professor), Richard A. Olshen (Professor), Robert Tibshirani (Professor)

Management Science and Engineering: Margaret Brandeau (Professor), Ross D. Shachter (Associate Professor)

Mathematics: Samuel Karlin (Professor, emeritus)

Medicine: Russ B. Altman (Professor), Terrance Blaschke (Professor, emeritus), Atul Butte (Assistant Professor), Robert W. Carlson (Professor), Amar K. Das (Assistant Professor), Parvati Dev (Senior Research Scientist), Lawrence M. Fagan (Associate Director), Alan M. Garber (Professor), Mary Goldstein (Professor), Michael Higgins (Consulting Associate Professor), Peter D. Karp (Consulting Assistant Professor), David Katzenstein (Professor, Research), John Koza (Consulting Professor), Henry Lowe (Associate Professor, Research; Senior Associate Dean for Information Resources and Technology), Mark A. Musen (Professor), Douglas K. Owens (Associate Professor), Robert W. Shafer (Assistant Professor, Research), P.J. Utz (Associate Professor)

Microbiology and Immunology: Karla Kirkegaard (Professor), Garry Nolan (Associate Professor)

Obstetrics and Gynecology: W. LeRoy Heinrichs (Professor, emeritus)

Pathology: Arend Sidow (Assistant Professor)

Pediatrics: Atul Butte (Assistant Professor)

Psychiatry and Behavioral Sciences: Amar K. Das (Assistant Professor)

Radiation Oncology: Lei Xing (Assistant Professor, Research)

Radiology: Sam Gambhir (Professor), Gary H. Glover (Professor), Sandy A. Napel (Professor), David Paik (Assistant Professor), Norbert J. Pelc (Professor), Sylvia Plevritis (Associate Professor), Geoffrey Rubin (Associate Professor)

Statistics: Trevor J. Hastie (Professor), Susan Holmes (Professor), Art Owen (Professor), Balaji Srinivasan (Lecturer)

Structural Biology: Michael Levitt (Professor)

Surgery: Thomas Krummel (Professor), Charles Taylor (Assistant Professor, Research)

Program Offices: MSOB 215
Mail Code: 94305-5479
Phone: (650) 723-6979
Web Site: http://bmi.stanford.edu

Courses given in Biomedical Informatics Program have the subject code BIOMEDIN. For a complete list of subject codes, see Appendix.

The program in Biomedical Informatics emphasizes research to develop novel computational methods that can advance biomedicine. Students receive training in the investigation of new approaches to conceptual modeling and to development of new algorithms that address challenging problems in the biological sciences and clinical medicine. Students with a primary interest in developing new informatics methods and knowledge are best suited for this program. Students with a primary interest in the biological or medical application of existing informatics techniques may be better suited for training in the application areas themselves.

GRADUATE PROGRAMS

The Biomedical Informatics Program is interdepartmental and offers instruction and research opportunities leading to M.S. and Ph.D. degrees in Biomedical Informatics. All students are required to complete the core curriculum requirements outlined below, and also to elect additional courses to complement both their technical interests and their goals in applying informatics methods to clinical settings, biology, or imaging. Candidates must maintain a 3.0 GPA in each of the five core areas, and an overall GPA of 3.0. If the candidate's GPA does not meet the minimum requirement, the executive committee may require corrective courses of action. In addition, prior to being formally admitted to candidacy for the Ph.D. degree, the student must demonstrate knowledge of biomedical informatics fundamentals and a potential for research by passing a qualifying exam.

The core curriculum is common to all degrees offered by the program but is adapted or augmented depending on the interests and experience of the student. Deviations from the core curriculum outlined below must be justified in writing and approved by the student's Biomedical Informatics academic adviser and the chair of the Biomedical Informatics Committee. It should be noted, however, that the program is intended to provide flexibility and to complement other opportunities in applied medical research that exist at Stanford. Although most students are expected to comply with the basic program of study outlined here, special arrangements can be made for those with unusual needs or those simultaneously enrolled in other degree programs within the University. Similarly, students with prior relevant training may have the curriculum adjusted to eliminate requirements met as part of prior training.

CORE CURRICULUM

Students are expected to participate regularly in the Biomedical Informatics Student Seminar (201) and Colloquia (200), regardless of whether they register for credit in those courses. In addition, all students are expected to fulfill requirements in the following five categories:

1. *Core Biomedical Informatics* (17 units): students are expected to understand current applications of computers in biology and medicine and to develop a broad appreciation for research in the management of biomedical information. Required courses are: BIOMEDIN 200, 201, 210, 211, 212, 214, and 217, all of which should be taken during the first and second year in the program. BIOMEDIN 200 and 201 are required courses but are not counted toward the core or elective units. Students must also take an additional 3 units of Biomedical Informatics course work (which may include crosslisted courses from other departments, but not including BIOMEDIN 200, 201, 299, 302, 303, or 305), selected in consultation with the academic adviser.
2. *Computer Science* (9 units): the student is expected to acquire a knowledge of the use of computers, computer organization, programming, and symbolic systems. It is assumed that students have had by matriculation computing experience at least equivalent to a course introducing the fundamentals of data structures and algorithms such as CS 103A,B, 103X, 106A,B, 106X, or other courses approved by academic adviser or executive committee. Students are required to take a minimum of 9 units of courses in the Department of Computer Science. If similar courses have not been taken previously, these units must include CS 121 or 221, 161, and a course that requires significant programming and knowledge of machine architectures (for example,

CS 108, or the CS 193 series). For those who have taken such courses previously, replacement units may be taken from any other course in CS selected by the student and approved by the academic adviser. A course in databases is especially recommended. With the exception of CS 108, all other courses applied to the degree requirements must be numbered 137 or higher.

3. *Probability, Statistics, and Decision Science* (9 units): students are required to take at least three courses that span the following five topics: basic probability theory, Bayesian statistics, decision analysis, machine learning, and experimental-design techniques. Prior courses in statistics at least equivalent to STATS 60 and calculus equivalent to MATH 42 are prerequisites. A prior course in linear algebra equivalent to MATH 103 or 113 is recommended. For the probability requirements, students may, for example, take MS&E 120, STATS 116, or MS&E 221. For the statistics requirements, students should take STATS 141, if they have not had an equivalent class prior to entry to the program. Otherwise, sequences (taken after STATS 116) may include STATS 200 followed by a course in stochastic modeling, machine learning or data mining, such as STATS 202 or 315A,B, or CS 228 or 229. Options for decision analysis include MS&E 152 or 252, or cost effectiveness analysis (BIOMEDIN 432). Specific courses should be chosen in consultation with the student's academic adviser. Also recommended is a course in the psychology of human problem solving.
4. *Biomedical Domain Knowledge* (6 units): students are expected to acquire an understanding of pertinent life sciences and how to analyze a domain of application interest. Prior courses in biology at least equivalent to BIOSCI 41 and 42 are prerequisites. All students must have completed a course in basic biochemistry, molecular biology, or genetics. Other areas of basic biology may be an acceptable alternative. Exposure to laboratory methods in biology is encouraged. All students without formal health care training are encouraged to take IMMUNOL 230 (formerly BIOMEDIN 207).
5. *Social and Ethical Issues* (4 units): candidates are expected to be familiar with issues regarding ethics, public policy, financing, organizational behavior, management, and pertinent legal topics. Students may choose at least 3 units from suitable courses, including BIOMEDIN 432; CS 201; MS&E 284, 197; HRP 391, 392; or any other advanced course in policy and social issues proposed by the student and approved by the Biomedical Informatics academic adviser.

The core curriculum generally entails a minimum of 45 units of course work for master's students and 54 units of course work for Ph.D. students, but can require substantially more or less depending upon the courses selected and the previous training of the student. All courses must be taken for a letter grade. Students may request an elective course be taken for a grade of credit/no credit by submitting a petition to the BMI executive committee. BIOMEDIN 299 and BIOMEDIN 802 may be taken for satisfactory/no credit (S/NC). The varying backgrounds of students are well recognized and no one is required to take courses in an area in which he or she has already been adequately trained; under such circumstances, students are permitted to skip courses or substitute more advanced work. Students design appropriate programs for their interests with the assistance and approval of their Biomedical Informatics academic adviser. At least 27 units of formal course work are expected.

PROGRAM REQUIREMENTS FOR THE ACADEMIC M.S., PROFESSIONAL M.S., AND COTERMINAL DEGREES

Students enrolled in any of the M.S degrees must complete the program requirements in order to graduate. Programs of at least 45 units that meet the following guidelines are normally approved:

1. Completion of the core curriculum.
2. A minimum of 6 additional units of courses in Computer Science numbered 135 or higher, courses in Management Science and Engineering or Statistics numbered 200 or higher, PSYCH 256 or 225, or relevant courses in other departments approved by the student's academic adviser.
3. Electives: additional courses to bring the total to 45 or more units.

The University requirements for the M.S. degree are described in the "Graduate Degrees" section of this bulletin.

MASTER OF SCIENCE (ACADEMIC)

This degree is designed for individuals who wish to undertake in-depth study of biomedical informatics with research, typically supported with fellowship funding. Normally, a student spends two years in the program and implements and documents a substantial project during the second year. The first year involves acquiring the fundamental concepts and tools through course work and research project involvement. All first- and second-year students are expected to devote 50 percent or more of their time participating in research projects. Research rotations are not required, but can be done with approval of the academic adviser or training program director. Graduates of this program are prepared to contribute creatively to basic or applied projects in biomedical informatics. This degree requires a written research paper to be approved by two faculty members.

MASTER OF SCIENCE (HONORS COOPERATIVE PROGRAM)

This degree is primarily designed for the working professional who already has advanced training in one discipline and wishes to acquire interdisciplinary skills. All classes necessary for the degree are available online. The professional M.S. is offered in conjunction with Stanford Center of Professional Development (SCPD), which establishes the rates of tuition and fees. The program uses the honors cooperative model (HCP), which assumes that the student is working in a corporate setting and is enrolled in the M.S. on a part-time basis. The student has up to five years to complete the program. Research projects are optional and the student must make arrangements with program faculty. Graduates of this program are prepared to contribute creatively to basic or applied projects in biomedical informatics.

MASTER OF SCIENCE (COTERMINAL)

The coterminal degree program allows undergraduates to study for a master's degree while completing their bachelor's degree(s) in the same or a different department. Please refer to the "Coterminal Bachelor's and Master's Degrees" section under "Undergraduate Degrees and Programs" in this bulletin for additional information.

The coterminal Master of Science program follows the same program requirements as the Master of Science (Professional), except for the requirement to be employed in a corporate setting. The coterminal degree is only available to current Stanford undergraduates. Coterminal students are enrolled full-time and courses are taken on campus. Research projects are optional and the student must make arrangements with program faculty. Graduates of this program are prepared to contribute creatively to basic or applied projects in biomedical informatics.

For University coterminal degree program rules and University application forms, see http://registrar.stanford.edu/shared/publications.htm#Coterm.

DOCTOR OF PHILOSOPHY

The University's basic requirements for the doctorate (residence, dissertation, examination, and so on) are discussed in the "Graduate Degrees" section of this bulletin.

Individuals wishing to prepare themselves for careers as independent researchers in biomedical informatics, with applications experience in bioinformatics, clinical informatics, or imaging informatics, should apply for admission to the doctoral program. The following are additional requirements imposed by the Biomedical Informatics Interdisciplinary Committee:

1. A student plans and completes a coherent program of study including the core curriculum and additional requirements for the master's program. In addition, doctoral candidates are expected to take at least three more advanced courses (see categories under item '2' of the master's program requirements) and must complete a total of 54 units. In the first year, two or three research rotations are encouraged. The master's requirements should be completed by the end of the second year in the program (six quarters of study, excluding summers). Doctoral students are generally advanced to Ph.D. candidacy after passing the qualifying exam, which takes place during the end of the second year of training or early in the third year. A student's

academic adviser has primary responsibility for the adequacy of the program, which is regularly reviewed by the Biomedical Informatics executive committee.

2. To remain in the Ph.D. program, each student must attain a grade point average (GPA) of 3.0 (B) in each of the five core areas. The student must fulfill these requirements and apply for admission to candidacy for the Ph.D. by the end of six quarters of study (excluding summers). In addition, reasonable progress in the student's research activities is expected of all doctoral candidates.
3. During the third year of training, generally in the Winter Quarter, each doctoral student is required to give a preproposal seminar that describes evolving research plans and allows program faculty to assure that the student is making good progress toward the definition of a doctoral dissertation topic.
4. By the end of nine quarters (excluding summers), each student must orally present a written thesis proposal and an oral university defense of this proposal to a dissertation committee that generally includes at least one member of the Biomedical Informatics executive committee. The committee determines whether the student's general knowledge of the field and the details of the planned thesis are sufficient to justify proceeding with the dissertation.
5. As part of the training for the Ph.D., each student is required to be a teaching assistant for two courses approved by the Biomedical Informatics executive committee; one should be completed in the first two years of study.
6. The most important requirement for the Ph.D. degree is the dissertation. Prior to the oral dissertation proposal and defense, each student must secure the agreement of a member of the program faculty to act as dissertation adviser. The principal adviser need not be an active member of the Biomedical Informatics program faculty, but all committees should include at least one participating BMI faculty member.
7. No official additional oral examination is required upon completion of the dissertation. The oral defense of the dissertation proposal satisfies the University oral examination requirement. At the completion of training, the student should give a final talk describing their results.
8. The student is expected to demonstrate an ability to present scholarly material and research in a lecture at a formal seminar.
9. The student is expected to demonstrate an ability to present scholarly material in concise written form. Each student is required to write a paper suitable for publication, usually discussing his or her doctoral research project. This paper must be approved by the student's academic adviser as suitable for submission to a refereed journal before the doctoral degree is conferred.
10. The dissertation must be accepted by a reading committee composed of the principal dissertation adviser, a member of the program faculty, and a third faculty member chosen from anywhere within the University.

COURSES

BIOMEDIN 109Q. Genomics: A Technical and Cultural Revolution—(Same as GENE 109Q.) Stanford Introductory Seminar. Preference to sophomores. For non-science majors. Concepts of genomics, high-throughput methods of data collection, and computational approaches to analysis of data. The social, ethical, and economic implications of genomic science. Students may focus on computational or social aspects of genomics.

3 units, Win (Altman, R)

BIOMEDIN 156/256. Economics of Health and Medical Care—(Graduate students register for 256; same as ECON 126, HRP 256.) Graduate students with research interests should take ECON 248. Institutional, theoretical, and empirical analysis of the problems of health and medical care. Topics: institutions in the health sector; measurement and valuation of health; nonmedical determinants of health; medical technology and technology assessment; demand for medical care and medical insurance; physicians, hospitals, and managed care; international comparisons. Prerequisites: ECON 50 and ECON 102A or equivalent statistics, or consent of instructor. Recommended: ECON 51.

5 units, Aut (Bhattacharya, J)

BIOMEDIN 200. Biomedical Informatics Colloquium—Series of colloquia offered by program faculty, students, and occasional guest lecturers. Credit available only to students in a Biomedical Informatics degree program. May be repeated three times for credit.

1 unit, Aut, Win, Spr (Musen, M)

BIOMEDIN 201. Biomedical Informatics Student Seminar—Participants report on recent articles from the Biomedical Informatics literature or their research projects. Goal is to teach presentation skills. Credit available only to students in a Biomedical Informatics degree program. May be repeated three times for credit.

1 unit, Aut, Win, Spr (Musen, M)

BIOMEDIN 202. Introductory Biomedical Informatics—Via Internet. Current research problems and computational approaches to them. Topics include medical security and privacy, electronic medical records, controlled terminologies and biomedical ontologies, electronic retrieval, technology-assisted learning environments, medical decision making and support, sequence analysis, phylogenetics, biological networks and pathways, microarray analysis, natural language processing, and protein structural analysis and prediction. Graduate students in the Biomedical Informatics training program may not take this class for credit.

1 unit, Aut, Win, Spr, Sum (Altman, R)

BIOMEDIN 204. Pharmacogenomics—Via Internet. Genetically determined responses to drugs; applications focusing on the PharmGKB database, a publicly available Internet tool to aid researchers in understanding how genetic variation among individuals contributes to differences in reactions to drugs. Topics include: introduction to pharmacogenomics and pharmacology; the genome and genetics; human polymorphisms, frequencies, significance, and populations; informatics in pharmacogenomics; genotype to phenotype and phenotype to genotype approaches; drug discovery and validation; genomic variation discovery and genotyping; adverse drug reactions and interactions; pathways of drug metabolism; and cancer pharmacogenomics. Prerequisites: two of BIOSCI 41, 42, 43, and 44X,Y or consent of instructor.

1 unit, Aut, Win, Spr, Sum (Altman, R)

BIOMEDIN 205. Biomedical Informatics for Medicine—Primarily for M.D. students; open to others. Emphasis is on practical applications of bioinformatics and medical informatics for medicine, health care, clinicians, and medical research. Topics may include: methods to analyze genetic conditions; integrative methods for microarray, proteomic, and genomic data to understand the etiology of disease; clinical information systems in local healthcare facilities, and pharmacogenomics. Applications such as BLAST (sequence alignment), PharmGKB (matches allelic variation to drug response), and statistical packages such as R. Background in programming or medicine not required. May be repeated for credit.

2 units, Aut, Spr (Butte, A)

BIOMEDIN 210. Introduction to Biomedical Informatics: Fundamental Methods—(Same as CS 270.) Methods for modeling biomedical systems and for making those models explicit in the context of building software systems. Emphasis is on intelligent systems for decision support. Topics: knowledge representation, controlled terminologies, ontologies, reusable problem solvers, and knowledge acquisition. Recommended: exposure to object-oriented systems, basic knowledge of biology.

3 units, Aut (Musen, M)

BIOMEDIN 211. Biomedical Informatics: Biomedical Systems Engineering.—(Same as CS 271.) Focus is on undertaking design and implementation of computational and information systems for life scientists and healthcare providers. Case studies illustrate what design factors lead to success or failure in building systems in complex biomedical environments. Topics: requirements analysis, workflow and organizational factors, functional specification, knowledge modeling, data heterogeneity, component-based architectures, human-computer interaction, and system evaluation. Prerequisite: 210, or consent of instructor.

3 units, Win (Das, A)

BIOMEDIN 212. Introduction to Biomedical Informatics Research Methodology—(Same as BIOE 212, CS 272, GENE 212.) Hands-on software building. Student teams conceive, design, specify, implement, evaluate, and report on a software project in the domain of biomedicine. Creating written proposals, peer review, providing status reports, and preparing final reports. Guest lectures from professional biomedical informatics systems builders on issues related to the process of project management. Software engineering basics. Prerequisites: 210, 211 or 214, or consent of instructor.
3 units, Aut (Altman, R; Cheng, B; Klein, T)

BIOMEDIN 214. Representations and Algorithms for Computational Molecular Biology—(Same as BIOE 214, CS 274, GENE 214.) Topics: algorithms for alignment of biological sequences and structures, computing with strings, phylogenetic tree construction, hidden Markov models, computing with networks of genes, basic structural computations on proteins, protein structure prediction, protein threading techniques, homology modeling, molecular dynamics and energy minimization, statistical analysis of 3D biological data, integration of data sources, knowledge representation and controlled terminologies for molecular biology, graphical display of biological data, machine learning (clustering and classification), and natural language text processing. Prerequisites: programming skills; consent of instructor for 3 units.
3-4 units, Spr (Altman, R)

BIOMEDIN 216. Lectures on Representations and Algorithms for Molecular Biology—Lecture series for BIOMEDIN 214. Recommended: familiarity with biology.
1 unit, Spr (Altman, R)

BIOMEDIN 217. Translational Bioinformatics—(Same as CS 275.) Analytic, storage, and interpretive methods to optimize the transformation of genetic, genomic, and biological data into diagnostics and therapeutics for medicine. Topics: access and utility of publicly available data sources; types of genome-scale measurements in molecular biology and genomic medicine; analysis of microarray data; analysis of polymorphisms, proteomics, and protein interactions; linking genome-scale data to clinical data and phenotypes; and new questions in biomedicine using bioinformatics. Case studies. Prerequisites: programming ability at the level of CS 106A and familiarity with statistics and biology.
4 units, Win (Butte, A)

BIOMEDIN 218. Translational Bioinformatics—Same content as 217; for medical and graduate students who attend lectures and participate in limited assignments and final project.
2 units, Win (Butte, A)

BIOMEDIN 231. Computational Molecular Biology—(Same as BIOC 218.) Via Internet. For molecular biologists and computer scientists. Representation and analysis of genomes, sequences, and proteins. Strengths and limitations of existing methods. Course work performed on web or using downloadable applications. See http://biochem218.stanford.edu/. Prerequisites: introductory molecular biology course at level of BIOSCI 41 or consent of instructor.
3 units, Aut, Win, Spr (Brutlag, D)

BIOMEDIN 233. Intermediate Biostatistics: Analysis of Discrete Data—(Same as HRP 261, STATS 261.) The 2x2 table. Chi-square test. Fisher's exact test. Odds ratios. Sampling plans; case control and cohort studies. Series of 2x2 tables. Mantel Hantzel. Other tests. k x m tables. Matched data logistic models. Conditional logistic analysis, application to case-control data. Log-linear models. Generalized estimating equations for longitudinal data. Cell phones and car crashes: the crossover design. Special topics: generalized additive models, classification trees, bootstrap inference.
3 units, Win (Sainani, K)

BIOMEDIN 234. Biomedical Genomics—Genomic technologies, bioinformatics methods, and clinical and epidemiological applications for the study of human pathogens. DNA sequencing and gene expression and proteomics as applied to the genomes of humans and human pathogens. Core concepts in bioinformatics, molecular phylogenetics, and population genetics; how to retrieve, manipulate, and analyze sequence data; and use of web databases and online programs. Recommended for those with limited biology course work: consent of instructor.
3 units, Spr (Shafer, R)

BIOMEDIN 251. Outcomes Analysis—(Same as HRP 252.) Methods of conducting empirical studies which use large existing medical, survey, and other databases to ask both clinical and policy questions. Econometric and statistical models used to conduct medical outcomes research. How research is conducted on medical and health economics questions when a randomized trial is impossible. Problem sets emphasize hands-on data analysis and application of methods, including re-analyses of well-known studies. Prerequisites: one or more courses in probability, and statistics or biostatistics.
3 units, Spr (Bhattacharya, J)

BIOMEDIN 262. Computational Genomics—(Same as CS 262.) Applications of computer science to genomics, and concepts in genomics from a computer science point of view. Topics: dynamic programming, sequence alignments, hidden Markov models, Gibbs sampling, and probabilistic context-free grammars. Applications of these tools to sequence analysis: comparative genomics, DNA sequencing and assembly, genomic annotation of repeats, genes, and regulatory sequences, microarrays and gene expression, phylogeny and molecular evolution, and RNA structure. Prerequisites: 161 or familiarity with basic algorithmic concepts. Recommended: basic knowledge of genetics.
3 units, Win (Batzoglou, S)

BIOMEDIN 273A. A Computational Tour of the Human Genome—(Same as CS 273A, DBIO 273A.) Genomes as the ultimate biological information medium, carrying instructions for every organism's development, life cycle, and reproduction. Bioinformatics perspective. Advances in biology resulting from sequencing of human and related organisms. Genome sequencing: technologies, assembly, personalized sequencing. Functional landscape: genes, regulatory modules, repeats, RNA genes. Genome evolution: processes, comparative genomics, ultraconservation, exaptation. Topics may include population genetics and personalized genomics, ancient DNA, and metagenomics. Prerequisities: computational biology at the level of 262, 274, or BIOC 218.
3 units, Aut (Batzoglou, S; Bejerano, G)

BIOMEDIN 299. Directed Reading and Research—For students wishing to receive credit for directed reading or research time. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

BIOMEDIN 301. Special Topics in Biomedical Informatics
1-6 units, Sum (Staff)

BIOMEDIN 303. Statistics for Research—Statistical methods commonly used in research. Emphasis is on when and how to use the methods rather than on proofs. How to describe data and detect unusual values, compare treatment effects, interpret p-values, detect and quantify trends, detect and measure association and correlation, determine the sample size and power for an experiment, and choose statistical tests and software. Topics include descriptive statistics (mean, median, standard deviation, standard error), probability, paired and unpaired t-tests, analysis of variance, correlation, regression, chi-square, discriminant analysis, and power and sample size. Statistical analysis software including Excel and Statistica.
1 unit, Spr (Walker, M; Musen, M), alternate years, not given next year

BIOMEDIN 366. Computational Biology—(Same as STATS 166, STATS 366.) Methods to understand sequence alignments and phylogenetic trees built from molecular data, and general genetic data. Phylogenetic trees, median networks, microarray analysis, Bayesian statistics. Binary labeled trees as combinatorial objects, graphs, and networks. Distances between trees. Multivariate methods (PCA, CA, multidimensional scaling). Combining data, nonparametric inference. Algorithms used: branch and bound, dynamic programming, Markov chain approach to combinatorial optimization (simulated annealing, Markov chain Monte Carlo, approximate counting, exact tests). Software such as Matlab, Phylip, Seq-gen, Arlequin, Puzzle, Splitstree, XGobi.

2-3 units, Aut (Holmes, S)

BIOMEDIN 374. Algorithms in Biology—(Same as CS 374.) Algorithms and computational models applied to molecular biology and genetics. Topics vary annually. Possible topics include biological sequence comparison, annotation of genes and other functional elements, molecular evolution, genome rearrangements, microarrays and gene regulation, protein folding and classification, molecular docking, RNA secondary structure, DNA computing, and self-assembly. May be repeated for credit. Prerequisites: 161, 262 or 274, or BIOCHEM 218, or equivalents.

2-3 units, Spr (Batzoglou, S)

BIOMEDIN 390A,B,C. Curricular Practical Training—Provides educational opportunities in biomedical informatics research. Qualified biomedical informatics students engage in internship work and integrate that work into their academic program. Students register during the quarter they are employed and must complete a research report outlining their work activity, problems investigated, key results, and any follow-up on projects they expect to perform. BIOMEDIN 390A, B, and C may each be taken only once.

1 unit, Aut, Win (Staff), Spr, Sum (Musen, M)

BIOMEDIN 432. Analysis of Costs, Risks, and Benefits of Health Care—(Same as MGTECON 332, HRP 392.) For graduate students. The principal evaluative techniques for health care, including utility assessment, cost-effectiveness analysis, cost-benefit analysis, and decision analysis. Emphasis is on the practical application of these techniques. Group project presented at end of quarter. Guest lectures by experts from the medical school, pharmaceutical industry, health care plans, and government.

4 units, Aut (Garber, A; Owens, D)

COGNATE COURSES

See respective department listings for course descriptions and General Education Requirements (GER) information. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

CS 228. Probabilistic Models in Artificial Intelligence

3 units, Win (Koller, D)

CS 329. Topics in Artificial Intelligence

3 units, offered occasionally

CS 348B. Computer Graphics: Image Synthesis Techniques

3-4 units, Spr (Hanrahan, P)

CS 379. Interdisciplinary Topics

3 units, Aut (Staff)

MS&E 355. Influence Diagrams and Probabilistics Networks

3 units, Win (Shachter, R), alternate years, not given next year

CANCER BIOLOGY PROGRAM

Program Director: Amato Giaccia (Radiation Oncology)

Committee on Cancer Biology: Nicholas Denko (Radiation Oncology), Howard Chang (Dermatology), Jeffrey Axelrod (Pathology), Katrin Chua (Medicine, Endocrinology), Julien Sage (Pediatrics), Alexandro Sweet-Cordero (Pediatrics), Timothy Stearns (Biological Sciences, Genetics)

Program Office: Alway Building, 300 Pasteur Drive, Room M105I
Mail Code: 94305-5121
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Email: dalima@stanford.edu
Web Site: http://www.stanford.edu/group/cancerbio/

Courses given in Cancer Biology have the subject code CBIO. For a complete list of subject codes, see Appendix.

The Cancer Biology Program at Stanford University is an interdisciplinary program leading to the Ph.D. degree. During the past three decades, understanding of cancer has increased with the discovery of oncogenes, tumor suppressor genes, pathways of DNA damage and repair, chromatin remodeling, cell cycle regulation, angiogenesis and responses to hypoxia, and recent glimpses into the molecular basis of metastasis and cancer stem cell biology. In addition, methods of parallel analysis including gene expression arrays, protein arrays, and tissue arrays have begun to refine and redefine the taxonomy of cancer diagnosis. This explosion of basic and clinical science has resulted in the first successful cancer chemotherapies and immunotherapies based on the knowledge of specific molecular targets. Stanford presents a unique environment to pursue interdisciplinary cancer research because the schools of Medicine, Humanities and Sciences, and Engineering are located on a single campus

The goal of the Cancer Biology Ph.D. program is to provide students with education and training that enables them to make significant contributions to this field. Course work during the first year is designed to provide a broad understanding of the molecular, genetic, cell biological, and pathobiological aspects of cancer. Students also learn about the current state of the epidemiology, clinical diagnosis, treatment, and prevention of human cancers. Equally important during the first year is a series of three rotations in research laboratories chosen by each student. By the beginning of the second year, each student chooses a research adviser and begins work on the dissertation project. A qualifying examination must be completed by the end of the second year. An annual Cancer Biology conference at Asilomar on the Pacific Ocean provides students with an opportunity to present their research to one another and to faculty. The expected time to degree is four to five years.

Students are not limited to a single department in choosing their research adviser. The Cancer Biology Ph.D. program currently has approximately 60 graduate students located in basic science and clinical departments throughout the School of Medicine and the School of Humanities and Sciences.

GRADUATE PROGRAM

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described under the "Graduate Degrees" section of this bulletin.

A small number of applicants are admitted to the program each year. Applicants should have completed an undergraduate major in the biological sciences; applicants with undergraduate majors in physics, chemistry, or mathematics may be admitted if they complete background training in biology during the first two years of study. During the first year, each student is required to complete a minimum of three, one quarter laboratory rotations. Students must choose a dissertation adviser prior to the end of Summer Quarter, first year, but not before the end of Spring Quarter, first year.

The requirements for the Ph.D. degree are as follows:

1. Training in biology equivalent to that of an undergraduate biology major at Stanford.

2. Completion of the following courses:
   a) CBIO 241. Molecular, Cellular, and Genetic Basis of Cancer
   b) GENE 203. Advanced Genetics
   c) BIOSCI 214. Cell Biology of Physiological Processes
   d) CSB 210. Signal Transduction Pathways and Networks. Students can take GENE 211, Genomics, or SBIO 214, Biological Macromolecules in lieu of CSB 210.
   e) CBIO 280. Cancer Biology Journal Club; required for first- and second-year graduate students in Autumn, Winter, and Spring quarters.
   f) MED 255. Responsible Conduct in Research; with consent, may be audited.
3. At least 6 units of additional cancer biology-related, graduate-level courses. Course work taken is determined in consultation with the student's adviser and/or the Program Director.
4. Presentation of research results at the annual Cancer Biology Conference on at least three occasions, at least one being an oral presentation.
5. Completion of a qualifying examination in Cancer Biology is required for admission to Ph.D. candidacy. The exam consists of an NIH-style written grant proposal not to exceed ten pages (excluding references), and an oral examination. The examining committee consists of three faculty members from the Cancer Biology Program and does not include the student's dissertation adviser. The composition of this committee is chosen by the student and dissertation adviser and must be submitted to and approved by the program director prior to the end of Autumn Quarter, second year. The qualifying examination must be taken prior to the end of Spring Quarter, second year. If necessary, one retake is permitted prior to the end of Summer Quarter, second year. After the qualifying examination has been completed, the student is required to form a dissertation reading committee that includes the student's adviser and three other members of the Academic Council with appropriate expertise. Each student is required to arrange annual meetings (more frequently, if necessary) of the dissertation reading committee, at which time oral presentations of progress during the past year and a plan of study for the coming year are presented and discussed. Completion of each annual committee meeting must be communicated in writing to the program director by the adviser by the end of Spring Quarter each year.
6. The major accomplishment of each successful Ph.D. student is the presentation of a written dissertation resulting from independent investigation that contributes to knowledge in the area of cancer biology. An oral examination is also required for the Ph.D. degree. In the Cancer Biology Program, a public seminar (one hour) is presented by the Ph.D. candidate, followed by a closed-door oral examination. The oral examination committee consists of at least four examiners (the members of the doctoral dissertation reading committee) and a chair. The oral examination chair may not have a full or joint appointment in the adviser's or student's home department. However, a courtesy appointment does not affect eligibility. The oral examination chair may be from the same department as any other member(s) of the examination committee. All members of the oral examination committee are normally members of the Academic Council, as the oral examination chair must be. With the prior approval of the program director or school dean, one of the examiners may be a person who is not a member of the Academic Council if that individual contributes expertise not otherwise available. Official responsibility for selecting the oral examination chair rests with the program. Cancer Biology delegates this to the student and dissertation adviser.

COURSES

Course and lab instruction in the Cancer Biology Program conform to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

CBIO 101. Cancer Biology—(Same as PATH 101.) Experimental approaches to understanding the origins, diagnosis, and treatment of cancer. Focus on key experiments and discoveries with emphasis on genetics, molecular biology, and cell biology. Topics include carcinogens, tumor virology, oncogenes, tumor suppressor genes, cell cycle regulation, angiogenesis, invasion and metastasis, cancer genomics, cancer epidemiology, and cancer therapies. Discussion sections based on primary research articles that describe key experiments in the field. Prerequisite: Biological Sciences or Human Biology core or equivalent, or consent of instructor.
4 units, Spr (Lipsick, J)

CBIO 241. Molecular, Cellular, and Genetic Basis of Cancer—Core course required of first-year Cancer Biology graduate students. Focus is on key experiments and classic primary research papers in cancer biology. Letter grade required. Undergraduates require consent of course director.
5 units, Aut (Giaccia, A)

CBIO 260. Teaching in Cancer Biology—Practical experience in teaching by serving as a teaching assistant in a cancer biology course. Unit values are allotted individually to reflect the level of teaching responsibility assigned to the student.
1-10 units, Aut (Giaccia, A), Win (Staff), Spr (Lipsick, J)

CBIO 280. Cancer Biology Journal Club—Required of and limited to first- and second-year graduate students in Cancer Biology. Recent papers in the literature presented by graduate students. When possible, discussion relates to and precedes cancer-related seminars at Stanford. Attendance at the relevant seminar required.
1 unit, Aut, Win, Spr (Giaccia, A)

CBIO 299. Directed Reading in Cancer Biology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

CBIO 399. Graduate Research—Investigations sponsored by individual faculty members. Cancer Biology Ph.D. students must register as soon as they begin dissertation-related research work.
1-18 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

BIOSCI 203. Advanced Genetics—(Same as DBIO 203, GENE 203.)
4 units, Aut (Stearns, T; Barsh, G; Sidow, A; Kim, S)

BIOSCI 214. Cell Biology of Physiological Processes—(Same as BIOC 224.)
2-5 units, Win (Theriot, J; Nelson, W; Straight, A; Bogyo, M; Pfeffer, S)

CHEMICAL AND SYSTEMS BIOLOGY

Emeriti: (Professors) Robert H. Dreisbach, Avram Goldstein, Dora B. Goldstein, Tag E. Mansour, Oleg Jardetzky, James P. Whitlock
Chair: James E. Ferrell, Jr.
Professors: James E. Ferrell, Jr., Tobias Meyer, Daria Mochly-Rosen, Richard A. Roth
Associate Professor: Karlene A. Cimprich
Assistant Professors: James K. Chen, Thomas J. Wandless, Joanna K. Wysocka
Courtesy Professors: Beverly S. Mitchell, Paul A. Wender
Courtesy Assistant Professors: Matthew Bogyo, Jennifer J. Kohler, Calvin J. Kuo
Consulting Professor: Juan Jaen

Web Site: http://casb.stanford.edu

Courses given in Chemical and Systems Biology have the subject code CSB. For a complete list of subject codes, see Appendix.

In Autumn of 2006, the Department of Molecular Pharmacology changed its name to become the Department of Chemical and Systems Biology. The department has established a new Ph.D. program in Chemical and Systems Biology. Molecular Pharmacology Ph.D. students who enrolled prior to Autumn 2007 have the option of receiving their Ph.D. in either Molecular Pharmacology or Chemical and Systems Biology. Ph.D. students matriculating in Autumn 2007 and thereafter are admitted to Chemical and Systems Biology. Further details about degree requirements are available from the department.

GRADUATE PROGRAMS

MASTER OF SCIENCE

Students in the Ph.D. program may apply for an M.S. degree after having satisfactorily completed the course and laboratory requirements of the first two years. The degree also requires a written thesis based on literature or laboratory research. Postdoctoral research training is available to graduates having the Ph.D. or M.D. degree.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The Department of Chemical and Systems Biology offers interdisciplinary training to prepare students for independent careers in biomedical science. The main focus of the program is cell signaling, chemical biology, and systems biology.

The program leading to the Ph.D. degree includes formal and informal study in chemical biology, systems biology, drug discovery, biochemistry, and other areas of relevance to the interests of particular students. First-year students spend one quarter in each of three different laboratories, working closely with other graduate students, a professor, and postdoctoral fellows on various research projects. During the fourth quarter, the student chooses a faculty mentor with whom to undertake thesis research, based on available positions and the student's interest. During or before the eighth quarter of study, students must pass a qualifying exam which consists of an oral exam on general knowledge and a defense of a research proposal. Course requirements are fulfilled during the first two years of study; the later years of the four- to six-year program are devoted to full-time dissertation research. Close tutorial contact between students and faculty is stressed throughout the program.

Research opportunities also exist for medical students and undergraduates. The limited size of the labs in the department allows for close tutorial contact between students, postdoctoral fellows, and faculty.

The department participates in the four quarter Health and Human Disease sequence which provides medical students with a comprehensive, systems-based education in physiology, pathology, microbiology, and pharmacology.

COURSES

Course and lab instruction in the Department of Chemical and Systems Biology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www. stanford.edu/dept/DoR/rph/8-2.html.

Open to all University students; consent of instructor required prior to registration. Students should consult with the instructor about the adequacy of their preparation.

CSB 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

CSB 210. Signal Transduction Pathways and Networks—The molecular mechanisms through which cells receive and respond to external signals. Emphasis is on principles of cell signaling, the systems-level properties of signal transduction modules, and experimental strategies through which cell signaling pathways are being studied. Prerequisite: working knowledge of biochemistry and genetics.
4 units, Win (Ferrell, J; Meyer, T)

CSB 220. Chemistry of Biological Processes—(Same as BIOC 220.) The principles of organic and physical chemistry as applied to biomolecules. Goal is a working knowledge of chemical principles that underlie biological processes, and chemical tools used to study and manipulate biological systems. Prerequisites: organic chemistry and biochemistry, or consent of instructor.
4 units, Aut (Herschlag, D; Chen, J; Bogyo, M; Wandless, T)
alternate years, not given next year

CSB 240. Drug Discovery—The scientific principles and technologies involved in making the transition from a basic biological observation to the creation of a new drug emphasizing molecular and genetic issues. Prerequisite: biochemistry, chemistry, or bioengineering.
4 units, alternate years, not given this year

CSB 260. Quantitative Chemical Biology—Current topics including protein and small molecule engineering, cell signaling sensors and modulators, molecular imaging, chemical genetics, combinatorial chemistry, in vitro evolution, and signaling network modeling. Prerequisites: undergraduate organic chemistry, and biochemistry or cell biology.
4 units, Spr (Chen, J), alternate years, not given next year

CSB 270. Research Seminar—Guest speakers and discussion on current research in pharmacology.
1-2 units, not given this year (Staff)

CSB 278. Introduction to Systems Biology—(Same as CS 278.) For biologists, engineers, and computer scientists. Experimental and computational approaches to modeling and analysis of complex biological systems. Topics: biological noise; simple signaling circuits (cascades, feedback, and feed-forward circuits); bistability and oscillations; large scale models; synthetic biology; and analysis of omics-scale data sets. Computational approached include ODE modeling, stochastic simulation, boolean networks, Bayesian approaches, and hybrid modeling.
4 units, Spr (Dill, D; Brutlag, D; Koller, D; Covert, M; Ferrell, J)

CSB 299. Directed Reading in Chemical and Systems Biology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

CSB 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

COMPARATIVE MEDICINE

Chair: Linda C. Cork
Professor: Linda C. Cork
Associate Professors: Donna Bouley, Paul Buckmaster, Sherril Green, Shaul Hestrin
Assistant Professor: Corinna Darian-Smith

Department Offices: Edwards Building, Room R321
Mail Code: 94305-5342
Phone: (650) 498-5080
Web Site: http://med.stanford.edu/compmed/

Courses given in Comparative Medicine have the subject code COMPMED. For a complete list of subject codes, see Appendix.

The Department of Comparative Medicine is a clinical department that offers residency training in laboratory animal medicine for veterinarians, although it does not offer degrees. Its faculty offer courses at the undergraduate and graduate levels and participate in teaching in other departments. Both clinical faculty members, who are specialists in a veterinary medical specialty, and basic science faculty also accept students to participate in ongoing research projects within the department and assist students with special research projects.

The discipline of Comparative Medicine use the differences and similarities among species to understand biologic and disease mechanisms. It incorporates spontaneous or induced disease models as one of several approaches to research. The research interests of faculty are in neuroscience, infectious diseases, neuropathology, cancer, and molecular genetics.

COURSES

Course and lab instruction in the Department of Comparative Medicine conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

COMPMED 81N. Comparative Anatomy and Physiology of Mammals—Stanford Introductory Seminar. Preference to freshmen. Comparative approach to common mammals, laboratory, and domestic species. The unique adaptations of each species in terms of its morphological, anatomical, and behavioral characteristics. How these species interact with human beings and other animals. GER: DB-NatSci

3 units, Win (Bouley, D)

COMPMED 83Q. Horse Medicine—Stanford Introductory Seminar. Preference to sophomores. The most common equine diseases, ranging from colic to lameness. Equine anatomy and physiology relevant to topics in equine medicine. Equine infectious diseases, care of the newborn foal, medical emergencies, and neurological disorders.

1-2 units, Aut (Green, S)

COMPMED 106. A Primate Perspective on Brain Evolution—How to distinguish primate subgroups; how to place primates among mammals, and humans among primates, with respect to body structure, brain organization, and function. The unique characteristics of primates; what factors contributed to the evolution of primate groups, hominids, and modern human beings. The role of the hand in primate evolution. What extant primates reveal about language acquisition. How these changes are reflected in the sensorimotor organization of the primate brain. Prerequisite: freshman biology.

3 units, not given this year

COMPMED 107/207. Comparative Neuroanatomy—(Graduate students register for 207.) Functional organization and evolution of the vertebrate nervous system. Topics include paleoneurology, cladistic analysis, allometry, mosaic versus concerted evolution, and evolution of brain region structure, connectivity, and neurons. Comparisons between structure and function of vertebrate forebrains including hippocampi. Evolution of the primate visual and sensorimotor central nervous system as related to vocalization, socialization, and intelligence.

4 units, not given this year

COMPMED 110. Pre-Vet Advisory—For students interested in a career in veterinary medicine. Guest speakers present career options in veterinary medicine. Networking with other pre-vet students. How to meet the academic and practical experience prerequisites for admission to veterinary school. Prerequisite: consent of instructor.

1 unit, Aut, Win, Spr (Bouley, D)

COMPMED 198. Undergraduate Directed Reading in Comparative Medicine—May be taken as a prelude to research and may also involve participation in a lab or research group seminar and/or library research.

1-3 units, Aut, Win, Spr, Sum (Staff)

COMPMED 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-3 units, Aut, Win, Spr, Sum (Staff)

FOR GRADUATE STUDENTS

COMPMED 299. Directed Reading in Comparative Medicine—Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

COMPMED 399. Graduate Research—Investigations sponsored by individual faculty members.Opportunities are available in comparative medicine and pathology, immuno-histochemistry, electron microscopy, molecular genetics, quantitative morphometry, neuroanatomy and neurophysiology of the hippocampus, pathogenesis of intestinal infections, immunopathology, biology of laboratory rodents, anesthesiology of laboratory animals, gene therapy of animal models of neurodegenerative diseases, and development and characterization of transgenic animal models. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

DEVELOPMENTAL BIOLOGY

Emeriti: (Professors) David S. Hogness, A. Dale Kaiser
Chair: Roeland Nusse
Associate Chair: Lucy Shapiro
Professors: Ben Barres, Philip Beachy, Gerald Crabtree, Margaret Fuller, Stuart Kim, David Kingsley, Roeland Nusse, Matthew Scott, Lucy Shapiro, James Spudich, William Talbot, Irving Weissman
Associate Professors: Seung Kim, Anne Villeneuve
Assistant Professors: Gill Bejerano, Joanna Wysocka
Associate Professor (Teaching): Ellen Porzig
Professor (Research): Harley McAdams

Courses given in Development Biology have the subject code DBIO. For a complete list of subject codes, see Appendix.

A fundamental problem in biology is how the complex set of multicellular structures that characterize an adult animal is generated from the fertilized egg. Recent advances at the molecular level, particularly with respect to the genetic control of development, have been explosive. These advances represent the beginning of a major movement in the biological sciences toward the understanding of the molecular mechanisms underlying developmental decisions and the resulting morphogenetic processes. This new thrust in developmental biology derives from the extraordinary methodological advances of the past decade in molecular genetics, immunology, and biochemistry. However, it also derives from groundwork laid by the classical developmental studies, the rapid advances in cell biology and animal virology, and from models borrowed from prokaryotic systems. Increasingly, the work is directly related to human diseases, including oncogene function and inherited genetic disease.

The Department of Developmental Biology includes a critical mass of scientists who are leading the thrust in developmental biology and who can train new leaders in the attack on the fundamental problems of development. Department labs work on a wide variety of organisms from microbes to worms, flies, and mice. The dramatic evolutionary conservation of genes that regulate development makes the comparative approach of the research particularly effective. Scientists in the department labs have a very high level of interaction and collaboration. The discipline of developmental biology draws on biochemistry, cell biology, genetics, molecular biology, and genomics. People in the department have a major interest in regenerative medicine and stem cell biology.

The department is located in the Beckman Center for Molecular and Genetic Medicine within the Stanford University Medical Center.

GRADUATE PROGRAM

MASTER OF SCIENCE

University requirements for the M.S. are described in the "Graduate Degrees" section of this bulletin.

Students in the Ph.D. program in Developmental Biology may apply for an M.S. degree, assuming completion of their course requirements and preparation of a written proposal. The master's degree awarded by the Department of Developmental Biology does not include the possibility of minors for graduate students enrolled in other departments or programs.

Students are required to take, and satisfactorily complete, at least three lecture courses offered by the department, including 210, Developmental Biology. In addition, students are required to take three courses outside the department. Students are also expected to attend Developmental Biology seminars and journal clubs. In addition, the candidate must complete a research paper proposing a specific experimental approach and background in an area of science relative to developmental biology.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The graduate program in Developmental Biology leads to the Ph.D. degree. The department also participates in the Medical Scientists Training Program (MSTP) in which individuals are candidates for both the M.D. and Ph.D. degrees.

Students are required to complete at least six courses, including Developmental Biology (210); Advanced Genetics (203); Frontiers in Biological Sciences (215); and an advanced molecular biology, biochemistry, or biophysics course. Students are expected to attend Developmental Biology seminars and journal clubs.

Completion of a qualifying examination is required for admission to Ph.D. candidacy. The examination consists of two parts. One proposal is on a subject different from the dissertation research and the other proposal is on the planned subject of the thesis. The final requirements of the program include presentation of a Ph.D. dissertation as the result of independent investigation and constituting a contribution to knowledge in the area of developmental biology. The student must pass the University oral examination, taken only after the student has substantially completed research. The examination is preceded by a public seminar in which the research is presented by the candidate. The oral examination is conducted by a dissertation reading committee.

COURSES

Course and lab instruction in the Department of Developmental Biology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

DBIO 12Q. The Evolution and Development of the Human Hand—Stanford Introductory Seminar. Preference to sophomores. Evolution of the human hand in the context of primate evolution; roles of the human hand in tool use, manufacture, art, music, and communication. Development of the hand: embryonic axes, appearance of the digit program, roles of cell death, molecular bases of normal and abnormal hand patterns. Prerequisite: advanced placement biology.

3-4 units, Win (Porzig, E)

DBIO 156. Human Developmental Biology and Medicine—(Same as HUMBIO 141.) The biological, medical, and social aspects of normal and abnormal human development. Topics: in vitro fertilization and embryo transfer; gene and cell therapy; gametogenesis; pattern formation in the nervous system and limb development; gene and grand multiple pregnancies; prematurity, in utero effects of teratogens; sex determination and differentiation; growth control; gigantism and dwarfism; neural tube defects; cardiac morphogenesis; progress in the developmental biology of humans. Limited enrollment. Prerequisites: Human Biology or Biological Sciences core, or consent of instructor.

4 units, not given this year

DBIO 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

DBIO 201. Development and Disease Mechanisms—Mechanisms that direct human development from conception to birth. Conserved molecular and cellular pathways regulate tissue and organ development; errors in these pathways result in congenital anomalies and human diseases. Topics: molecules regulating development, cell induction, developmental gene regulation, cell migration, programmed cell death, pattern formation, stem cells, cell lineage, and development of major organ systems. Emphasis on links between development and clinically significant topics including infertility, assisted reproductive technologies, contraception, prenatal diagnosis, multiparity, teratogenesis, inherited birth defects, fetal therapy, adolescence, cancer, and aging.

4 units, Aut (Porzig, E; Kim, S; Kingsley, D; Scott, M)

DBIO 202. Assisted Reproductive Technologies—(Same as OBGYN 202.) Primary literature in basic and clinical science, and demonstrations of assisted reproductive technologies (ART). Techniques include in vitro fertilization covering micromanipulation procedures such as intracytoplasmic sperm injection and the culture of blastocysts, using mouse gametes, and pre-embryos. Class only may be taken for 1 unit. 2 units includes papers and attendance at clinical demonstrations. 3 units includes a term paper. Prerequisite: DBIO 201 recommended, or consent of instructors.

1-3 units, Win (Porzig, E; Behr, B)

DBIO 203. Advanced Genetics—(Same as BIOSCI 203, GENE 203.) For graduate students in Bioscience programs; may be appropriate for graduate students in other programs. The genetic toolbox. Examples of analytic methods, genetic manipulation, genome analysis, and human genetics. The use of genetic tools in dissecting complex biological pathways, developmental processes, and regulatory systems. Faculty-led discussion sections with evaluation of papers. Students with minimal experience in genetics should prepare by working out problems in college level textbooks.

4 units, Aut (Stearns, T; Barsh, G; Sidow, A; Kim, S)

DBIO 210. Developmental Biology—Current areas of research in developmental biology. How organismic complexity is generated during embryonic and post-embryonic development. The roles of genetic networks, induction events, cell lineage, maternal inheritance, cell-cell communication, and hormonal control in developmental processes in well-studied organisms such as vertebrates, insects, and nematodes. Team-taught. Students meet with faculty to discuss current papers from the literature. Prerequisite: graduate standing, consent of instructor. Recommended: familiarity with basic techniques and experimental rationales of molecular biology, biochemistry, and genetics.

5 units, Spr (Villeneuve, A; Fuller, M; Beachy, P)

DBIO 215. Frontiers in Biological Research—(Same as BIOC 215, GENE 215.) Literature discussion in conjunction with the Frontiers in Biological Research seminar series hosted by Biochemistry, Developmental Biology, and Genetics in which distinguished investigators present current work. Students and faculty meet beforehand to discuss papers from the speaker's primary research literature. Students meet with the speaker after the seminar to discuss their research and future direction, commonly used techniques to study problems in biology, and comparison between the genetic and biochemical approaches in biological research.

1 unit, Aut, Win (Harbury, P; Brunet, A; Villeneuve, A)

DBIO 221. Current Issues in Aging—(Same as GENE 221, NENS 221.) Current research literature on genetic mechanisms of aging in animals and human beings. Topics include: mitochondria mutations, insulin-like signaling, sirtuins, aging in flies and worms, stem cells, human progeria, and centenarian studies. Prerequisite: GENE 203.

1-2 units, Win (Kim, S; Brunet, A; Rando, T), Spr (Kim, S)

DBIO 232. Topics in Regenerative Medicine—(Same as MI 232.) Forum. Students and researchers discuss current developments in regenerative medicine at Stanford to spark collaboration. Topics include novel applications in biological and chemical engineering, stem cell biology, biotechnology, and human disease. May be repeated for credit.

2 units, Aut, Win, Spr (Blau, H; Fuller, M)

DBIO 257. The Stem Cell: Science, Ethics, and Politics—(Same as HUMBIO 157.) The biology of stem cells. Their role in human development and potential for treating disease. Guest lectures by biologists, ethicists, and legal scholars. Prerequisites: HUMBIO 2A,B, or consent of instructor.

3 units, Spr (Nusse, R; Fuller, M; Porzig, E)

DBIO 273A. A Computational Tour of the Human Genome—(Same as BIOMEDIN 273A, CS 273A.) Genomes as the ultimate biological information medium, carrying instructions for every organism's development, life cycle, and reproduction. Bioinformatics perspective. Advances in biology resulting from sequencing of human and related organisms. Genome sequencing: technologies, assembly, personalized sequencing. Functional landscape: genes, regulatory modules, repeats, RNA genes. Genome evolution: processes, comparative genomics, ultraconservation, exaptation. Topics may include population genetics and personalized genomics, ancient DNA, and metagenomics. Prerequisities: computational biology at the level of 262, 274, or BIOC 218.

3 units, Aut (Batzoglou, S; Bejerano, G)

DBIO 296. Stem Cell Biology and Regenerative Medicine—(Same as PATH 296.) For graduate and medical students. Embryonic and adult stem cells, including origin, regulation, self-renewal, differentiation, fate, and relationship to cancer; biological mechanisms and methods to translate findings to therapeutic applications. Medical students must enroll for 5 units; graduate students may choose to take only the basic science part for 3 units. Prerequisites: DBIO 201 and 210, or consent of instructor.

3-5 units, Win (Weissman, I; Fuller, M; Nusse, R)

DBIO 299. Directed Reading in Developmental Biology—Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

DBIO 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

EPIDEMIOLOGY PROGRAM

Director: Victor W. Henderson (Professor, Health Research and Policy, and Neurology and Neurological Sciences)

Advisory Committee: Stephen P. Fortmann (Professor, Medicine), John R. Huguenard (Professor, Neurology and Neurological Sciences), Charles C. Prober (Professor, Pediatrics, and Microbiology and Immunology), Robert Tibshirani (Professor, Health Research and Policy)

Core Faculty and Academic Teaching Staff: Raymond R. Balise (Lecturer, Health Research and Policy), Gary D. Friedman* (Consulting Professor, Health Research and Policy), Victor W. Henderson* (Professor, Health Research and Policy, and Neurology and Neurological Sciences), Abby C. King* (Professor, Health Research and Policy, and Medicine), Philip Lavori (Professor, Health Research and Policy), Yvonne A. Maldonado* (Associate Professor, Pediatrics), Lorene M. Nelson* (Associate Professor, Health Research and Policy), Julie Parsonnet* (Professor, Medicine, and Health Research and Policy), Rita A. Popat (Clinical Assistant Professor, Health Research and Policy), Kristin L. Sainani (Clinical Assistant Professor, Health Research and Policy), Dee W. West* (Professor, Health Research and Policy), Alice S. Whittemore* (Professor, Health Research and Policy)

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* Member of the program steering committee

Program Offices: HRP Redwood Building, Room T138C
Mail Code: 94305-5405
Phone: (650) 723-5456
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Web Site: http://www.stanford.edu/dept/HRP/epidemiology/

MASTER OF SCIENCE

The Graduate Interdisciplinary Program in Epidemiology offers instruction and interdisciplinary research opportunities leading to the M.S. degree in Epidemiology. Most core faculty and academic teaching staff are administratively housed within the Department of Health Research and Policy. Affiliated faculty come from a large number of Stanford University departments and centers, and from notable Bay Area research facilities. The program seeks students with the potential to be future leaders in clinical and translational research, epidemiology, and allied disciplines. The program provides researchers from diverse clinical backgrounds the knowledge and skills to become clinical investigators; it also offers an introduction to epidemiology for individuals with research experience in the behavioral and social sciences and for others without a clinical background. Research strengths include cancer epidemiology, cardiovascular disease epidemiology, infectious disease epidemiology, musculoskeletal disease epidemiology, neuroepidemiology, and aspects of epidemiologic methods, genetic epidemiology, reproductive epidemiology and women's health, and environmental and occupational epidemiology.

Two academic tracks lead to the M.S. degree; these tracks are not declared on Axess and they do not appear on the transcript or the diploma. The Clinical Research track is for physicians and others with specific interests in clinical and translational research. Students in this track receive training in epidemiologic methods, statistical analysis, and other areas essential to patient-oriented clinical research. These students are usually clinical investigators with an M.D. or comparable clinical degree, often in the fellowship stage of their postgraduate training, or in an early stage of faculty development. Typically, they are anticipating careers in academic medicine. The Traditional track serves students without prior clinical training. One category of such students consists of behavioral and social scientists who wish to bring an epidemiologic orientation to their research. Students pursuing a Ph.D. in these disciplines may wish to consider a concurrent master's degree in Epidemiology. The Traditional track also serves as an introduction to epidemiology for students with baccalaureate degrees who are considering careers in epidemiology or a related discipline.

University requirements for the M.S. degree are described in the "Graduate Degrees" section of this bulletin.

To receive the M.S. degree, students in both instructional tracks are expected to obtain a grounding in epidemiologic methods and applied biostatistics and to demonstrate research skills through the completion of a master's thesis. Required courses are HRP 225, Design and Conduct of Clinical and Epidemiologic Studies; HRP 226, Advanced Epidemiologic and Clinical Research Methods; HRP 236, Epidemiology Research Seminar, 3 units required); HRP 259, Introduction to Probability and Statistics for Epidemiology; HRP 261, Intermediate Biostatistics; HRP 262, Regression, Prediction, Survival Analysis; and a master's thesis with 12 or more units. Students in the Clinical Epidemiology track must also complete HRP 251, Design and Conduct of Clinical Trials; and MED 255, Responsible Conduct of Research. Students are required to select at least two other courses in Epidemiology. Students are assigned a methodology mentor, who is usually from the Department of Health Research and Policy, and a research mentor, who may be from another department. For the students in the Clinical Research Epidemiology track, the research mentor is often an affiliated faculty member from the department of the student's clinical specialty. Other programmatic requirements are described in *Graduate Program in Epidemiology, Information and Guidelines*, available from the educational coordinator in the Department of Health Research and Policy.

COURSES

The course listings of individual departments participating in the Graduate Interdisciplinary Program in Epidemiology should be consulted for complete descriptions.

GENETICS

Emeritus: (Professor) Luca Cavalli-Sforza, Leonard Herzenberg
Chair: Richard M. Myers
Professors: Russ Altman, Gregory Barsh, Stanley Cohen, Ronald Davis, Andrew Fire, Uta Francke, Margaret Fuller, Mark Kay, Stuart Kim, Joseph Lipsick, Richard Myers, John Pringle, Matthew Scott
Associate Professors: Michele Calos, Arend Sidow, Tim Stearns, Anne Villenueve, Douglas Vollrath
Assistant Professors: Laura Attardi, Julie Baker, Anne Brunet, James Ford, Julien Sage, Man-Wah Tan
Professor (Research): Leonore Herzenberg
Associate Professors (Research): J. Michael Cherry, Zijie Sun
Assistant Professor (Research): Gavin Sherlock
Courtesy Professor: Hank Greely
Consulting Professor: David Cox

Mail Code: 94305-5120
Phone: (650) 723-3335
Email: genetics-info@genome.stanford.edu
Web Site: http://genetics.stanford.edu/

Courses given in Genetics have the subject code GENE. For a complete list of subject codes, see Appendix.

GRADUATE PROGRAMS

University requirements for the Ph.D. degree are described in the "Graduate Degrees" section of this bulletin.

The Ph.D. program in the Department of Genetics offers graduate students the opportunity to pursue a discipline that encompasses both a set of tools and a coherent way of thinking about biology and medicine. All major areas of genetics are represented in the department, including human genetics (molecular identification of Mendelian traits and the pathophysiology of genetic disease, gene therapy, genetic epidemiology, analysis of complex traits, genetic anthropology, and human evolution), and application of model organisms such as bacteria, yeast, flies, worms, or mice to basic questions in biomedical research. The department is especially strong in genomic and bioinformatic approaches to genome biology and evolution, and includes several genome-scale databases such as the Saccharomyces Genome Database (SGD), the Stanford Microarray Database (SMD), and the Pharmacogenetics and Pharmacogenomics Knowledge Base (PharmGKB), the Stanford Human Genome Center (SHGC), and, administered through the Department of Biochemistry, the Stanford Genome Technology Center (SGTC).

Exposure to the intellectual scope of the department is provided by laboratory rotations, dissertation research, advanced courses in genetics and other areas of biomedical science, seminar series, journal clubs, and an annual three-day retreat of faculty, students, postdoctoral fellows, and staff scientists. Emphasis is placed on interactions and collaborations among students, postdoctoral students, and faculty within the department and throughout the campus.

During their first year, graduate students in the department take graduate courses and sample areas of research by doing rotations in three or four laboratories. At the end of the first three quarters, students may select a laboratory in which to do their dissertation research. While the dissertation research is generally performed in one laboratory, collaborative projects with more than one faculty member are encouraged. In addition to interacting with their faculty preceptor, graduate students receive advice regularly from other faculty members who serve as members of their dissertation committee. Study for the Ph.D. generally requires between four and five years of graduate work, most of which is focused on dissertation research.

Students are generally enrolled in the program to receive the Ph.D. degree, although a limited number of M.D. candidates can combine research training in genetics with their medical studies. Ph.D. candidates who have passed the qualifying exam in the second year can opt to receive the M.S. degree.

There are opportunities for graduate students to teach in graduate-level and professional-school courses. In addition, students are encouraged to participate in educational outreach activities coordinated by the department, which include opportunities to interact with secondary school students and teachers, lay groups, and local science museums.

Students who have recently received a bachelor's, master's, M.D., or Ph.D. degree in related fields may apply for graduate study. Prospective students must have a background in general biology, mathematics, physics, and chemistry. Decisions for admission are based on comparison of the relative merits of all the candidates' academic abilities and potential for research and the department's interest in promoting a diverse learning environment. Interviews take place in late February or early March and successful applicants are offered admission by early spring. Students who wish to pursue a combined M.D./Ph.D. degree are considered for admission into the graduate program in the Department of Genetics after they have been admitted to the M.D. program in the School of Medicine.

Students begin graduate studies in Autumn Quarter. Prospective students are encouraged to start the application process early to ensure that they are able to submit a complete application by the December deadline. All students accepted into the Ph.D. program in the Department of Genetics are provided with full tuition and a stipend. Two training grants from the National Institutes of Health provide major support for the graduate training program in the department. Other student support is provided by departmental funds and from research grants, both federal and private, of the faculty. In addition, a number of graduate students are funded by fellowships, including those from the National Science Foundation and the Stanford Graduate Fellows program.

COURSES

For further information on the availability of courses, consult the quarterly *Time Schedule*, or inquire at the departmental office. Additional courses in or related to genetics are included in the listings of the departments of Biological Sciences, Biochemistry, Developmental Biology, Microbiology and Immunology, Neuroscience, Biomedical Informatics, and Structural Biology.

GENE 106Q. The Heart of the Matter—(Same as BIOSCI 106Q.) Stanford Introductory Seminar. Preference to sophomores. The molecular and biochemical basis of life. Emphasis is on the methods and scientific logic that lead to advances in knowledge. The human heart and circulatory system is the unifying theme for topics such as the constituents and activities of cells, tissues, and organs; the chemicals and proteins that carry on life processes; the biotechnology revolution; the role of genes in human disease and normal functions; and the Human Genome Project. How scientific knowledge is built up through research; how biology initiates advances in medicine; and how science, engineering, and economics interact in biotechnology. Student presentations, demonstrations, and field trips. GER: DB-NatSci

3 units, Win (Myers, R; Simoni, R)

GENE 109Q. Genomics: A Technical and Cultural Revolution—(Same as BIOMEDIN 109Q.) Stanford Introductory Seminar. Preference to sophomores. For non-science majors. Concepts of genomics, high-throughput methods of data collection, and computational approaches to analysis of data. The social, ethical, and economic implications of genomic science. Students may focus on computational or social aspects of genomics. Write-2

3 units, Win (Altman, R)

GENE 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

GENE 202. Human Genetics—Theoretical and experimental basis for the genetics of human health and disease. Molecular, chromosomal, biochemical, developmental, cancer, and medical genetics, emphasizing the last. Clinical case discussions. Prerequisites: biochemistry; basic genetics.

4 units, Aut (Ford, J; Myers, R)

GENE 203. Advanced Genetics—(Same as BIOSCI 203, DBIO 203.) For graduate students in Bioscience programs; may be appropriate for graduate students in other programs. The genetic toolbox. Examples of analytic methods, genetic manipulation, genome analysis, and human genetics. Emphasis is on use of genetic tools in dissecting complex biological pathways, developmental processes, and regulatory systems. Faculty-led discussion sections with evaluation of papers. Students with minimal experience in genetics should prepare by working out problems in college level textbooks.

4 units, Aut (Stearns, T; Barsh, G; Sidow, A; Kim, S)

GENE 206. Epigenetics—(Same as PATH 206.) For graduate students; undergraduates by consent of instructor. Mechanisms by which phenotypes not determined by the DNA sequence are stably inherited in successive cell divisions. From the discovery of position-effect variegation in Drosophila in the 20s to present-day studies of covalent modifications of histones and DNA methylation. Topics include: position effect, gene silencing, heterochromatin, centromere identity, genomic imprinting, histone code, variant histones, and the role of epigenetics in cancer. Prerequisite: background in genetics and molecular biology.

2 units, Win (Lipsick, J)

GENE 211. Genomics—Genome evolution, organization, and function; technical, computational, and experimental approaches; hands-on experience with representative computational tools used in genome science; and a beginning working knowledge of PERL.

3 units, Win (Cherry, J; Myers, R; Sidow, A; Sherlock, G)

GENE 212. Introduction to Biomedical Informatics Research Methodology—(Same as BIOE 212, BIOMEDIN 212, CS 272.) Hands-on software building. Student teams conceive, design, specify, implement, evaluate, and report on a software project in the domain of biomedicine. Creating written proposals, peer review, providing status reports, and preparing final reports. Guest lectures from professional biomedical informatics systems builders on issues related to the process of project management. Software engineering basics. Prerequisites: 210, 211 or 214, or consent of instructor.

3 units, Aut (Altman, R; Cheng, B; Klein, T; Garten, Y)

GENE 214. Representations and Algorithms for Computational Molecular Biology—(Same as BIOE 214, BIOMEDIN 214, CS 274.) Topics: algorithms for alignment of biological sequences and structures, computing with strings, phylogenetic tree construction, hidden Markov models, computing with networks of genes, basic structural computations on proteins, protein structure prediction, protein threading techniques, homology modeling, molecular dynamics and energy minimization, statistical analysis of 3D biological data, integration of data sources, knowledge representation and controlled terminologies for molecular biology, graphical display of biological data, machine learning (clustering and classification), and natural language text processing. Prerequisites: programming skills; consent of instructor for 3 units.

3-4 units, Spr (Altman, R)

GENE 215. Frontiers in Biological Research—(Same as BIOC 215, DBIO 215.) Literature discussion in conjunction with the Frontiers in Biological Research seminar series hosted by Biochemistry, Developmental Biology, and Genetics in which distinguished investigators present current work. Students and faculty meet beforehand to discuss papers from the speaker's primary research literature. Students meet with the speaker after the seminar to discuss their research and future direction, commonly used techniques to study problems in biology, and comparison between the genetic and biochemical approaches in biological research.

1 unit, Aut, Win (Harbury, P; Brunet, A; Villeneuve, A)

GENE 221. Current Issues in Aging—(Same as DBIO 221, NENS 221.) Current research literature on genetic mechanisms of aging in animals and human beings. Topics include: mitochondria mutations, insulin-like signaling, sirtuins, aging in flies and worms, stem cells, human progeria, and centenarian studies. Prerequisite: GENE 203.

1-2 units, Win (Kim, S; Brunet, A; Rando, T), Spr (Kim, S)

GENE 222. Method and Logic in Experimental Genetics—For graduate students only. How experimental strategies are applied to biological questions irrespective of discipline boundaries. Examples include purifying activities from complex mixtures, localizing molecules in space and time, discovering macromolecular interactions, inferences from sequence similarity, using structure to elucidate function, and applying genomics to biological problems. Weekly discussion of two representative papers selected by faculty and a student presentation of a third paper which illustrate principles of biochemistry and cell and molecular biology, and the historical context of important scientific advances.

3 units, Win (Baker, J; Brunet, A)

GENE 233. The Biology of Small Modulatory RNAs—(Same as MI 233, PATH 233.) Open to graduate and medical students. How recent discoveries of miRNA, RNA interference, and short interfering RNAs reveal potentially widespread gene regulatory mechanisms mediated by small modulatory RNAs during animal and plant development. Required paper proposing novel research.

2 units, Aut (Fire, A; Chen, C), alternate years, not given next year

GENE 235. *C. Elegans* Genetics—Genetic approaches to *C. elegans*, practice in designing experiments and demonstrations of its growth and anatomy. Probable topics include: growth and genetics, genome map and sequence, mutant screens that start with a desired phenotype, reverse genetics and RNAi screens, genetic duplications, uses of null phenotype non-null alleles, genetic interactions and pathway analysis, and embryogenesis and cell lineage. Focus of action, mosaic analysis, and interface with embryological and evolutionary approaches.

2 units, Win (Fire, A), not given next year

GENE 238. Current Concepts and Dilemmas in Genetic Testing—(Same as INDE 238.) Issues arising from the translational process from research to commercialization. Diagnostic inventions and applications, community implications, newborn screening, cancer genetics, and pharmacogenomics. Guest experts. For M.D., biomedical graduate, and genetic counseling students.

2 units, Spr (Tobin, S; Schrijver, I; Cowan, T; Magnus, D)

GENE 244. Introduction to Statistical Genetics—Statistical methods for analyzing human genetics studies of Mendelian disorders and common complex traits. Probable topics include: principles of population genetics; epidemiologic designs; familial aggregation; segregation analysis; linkage analysis; linkage-disequilibrium-based association mapping approaches; and genome-wide analysis based on high-throughput genotyping platforms. Prerequisite: STATS 116 or equivalent or consent of instructor.

3 units, Aut (Tang, H)

GENE 260. Supervised Study—Genetics graduate student lab research from first quarter to filing of candidacy. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

GENE 299. Directed Reading in Genetics—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

GENE 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSE

See respective department listings for course descriptions. See degree requirements above or the program's student services office for applicability of this course to a major or minor program.

MED 255. The Responsible Conduct of Research
1 unit, Aut, Win, Spr, Sum (Karkazis, K)

HEALTH RESEARCH AND POLICY

Emeriti: (Professors) Dan Bloch, John Farquhar, Victor R. Fuchs
Chair: Phil Lavori
Co-Chair: Robert Tibshirani
Professors: Bradley Efron, Trevor Hastie, Victor W. Henderson, Mark Hlatky, Iain M. Johnstone, Abby C. King, Philip W. Lavori, Richard A. Olshen, Julie Parsonnet, Robert Tibshirani, Alice S. Whittemore, Dee W. West, Wing Wong
Associate Professors: Laurence Baker, Lorene M. Nelson, David Rogosa
Assistant Professors: M. Kate Bundorf, Marc Coram, Mei-Chiung Shih
Assistant Professors (Clinical): Rita Popat, Kristin Sainani
Courtesy Professors: Stephen P. Fortmann, Alan M. Garber, Mary Goldstein, Daniel Kessler, Alex Macario, Douglas Owens, Paul Wise
Courtesy Associate Professors: Michael K. Gould, Paul Heidenreich, Yvonne Maldonado, Mark McClellan (on leave), David R. Rogosa, Marilyn Winkleby
Courtesy Assistant Professors: Jay Bhattacharya, Grant Miller
Senior Lecturer: Irene Corso
Lecturers: Raymond Balise, Ellen Chang, Christina Clarke-Dur, Scarlett Gomez, Laurel Habel, Lisa Herrington, Theresa Keegan, De Kun Li, David Lilienfeld, Cynthia O'Malley, Caroline Tanner, Stephen Van Den Eeden
Consulting Professors: Gary Friedman, Elizabeth Holly, Marion Lee, George Lundberg, Peggy Reynolds, Joseph Selby
Consulting Associate Professors: Paul Barnett, Sally Glaser, Pamela Horn-Ross, Esther John, Ciaran Phibbs
Consulting Assistant Professors: Ellen Chang, Christina Clarke-Dur, Theresa Keegan, Bang Nguyen, Ingrid Oakley-Girvan, Rudy Rull, Todd Wagner

Mail Code: 94305-5405
Phone: (650) 723-5456
Web Site: http://hrp.stanford.edu/

Courses given in Health Research and Policy have the subject code HRP. For a complete list of subject codes, see Appendix.

The Department of Health Research and Policy has three principal areas of scholarly interest:

1. Biostatistics deals with scientific methodology in the medical sciences, emphasizing the use of statistical techniques.
2. Epidemiology is the study of the distribution and determinants of illness and impairment in human populations. Epidemiology training provides analytic tools for clinical and translational research, including studies of disease etiology, prevention, and therapy.
3. Health Services Research is concerned with many aspects of health policy analysis in the public and private sectors.

GRADUATE PROGRAMS

The Program in Epidemiology and the Program in Health Services Research are housed in the Department of Health Research and Policy. These programs, which offer M.S. degrees in Epidemiology and in Health Services Research, are described separately in the relevant sections of this bulletin. Students with an interest in pursuing advanced degrees with an emphasis on biostatistics can do so through programs offered by the Department of Statistics. Division of Biostatistics faculty participate in these programs.

For additional information, address inquiries to the Educational Coordinator, Department of Health Research and Policy, Stanford University School of Medicine, HRP Redwood Building, Room T138C, Stanford, California 94305-5405.

COURSES

Course and lab instruction in the Department of Health Research and Policy conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www. stanford.edu/dept/DoR/rph/8-2.html.

HRP89Q. Introduction to Crosscultural Issues in Medicine—Stanford Introductory Seminar. Preference to sophomores. Crosscultural issues that impact health care delivery such as ethnicity, immigration, language barriers, and service expectations. Focus is on culturally unique and non-English speaking populations and developing interpersonal and communication skills with diverse ethnic groups. GER:EC-AmerCul
3 units, Win (Corso, I)

HRP 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

HRP 207,208. Issues and Methods of Health Services and Policy Research—Primarily for students in the Health Services and Policy Research scholarly track. Health care systems and institutions, health insurance, regulation, cost effectiveness analysis, and medical decision making.
2 units, **207:** *Aut (Baker, L; McDonald, K; Haberland, C),*
208: *offered occasionally*

HRP 209. FDA's Regulation of Health Care—(Same as LAW 458.) Open to law or medical students; graduate students by consent of instructor. The FDA's regulatory authority over drugs, biologics, medical devices, and dietary supplements. The nature of the pharmaceutical, biotech, medical device, and nutritional supplement industries.
3-4 units, Win (Greely, H)

HRP 210. Health Law and Policy I—(Same as LAW 313.) Open to law or medical students and to qualified undergraduates by consent of instructor. Introduction to the American health care system and its legal and policy problems. Topics: the special characteristics of medical care compared to other goods and services, the difficulties of assuring quality care, the complex patchwork of the financing system, and the ethical problems the system raises.
3-4 units, Aut (Greely, H)

HRP 211. Law and the Biosciences—(Same as LAW 368.) For medical students; graduate students by consent of instructor. Legal, social, and ethical issues arising from advances in the biosciences. Focus is on human genetics; also advances in assisted reproduction and neuroscience. Topics include forensic use of DNA, genetic testing, genetic discrimination, eugenics, cloning, pre-implantation genetic diagnosis, neuroscientific methods of lie detection, and genetic or neuroscience enhancement.
3 units, Win (Greely, H)

HRP 212. Crosscultural Medicine—Interviewing and behavioral skills needed to facilitate culturally relevant health care across all population groups. Explicit and implicit cultural influences operating in formal and informal medical contexts.
3 units, Spr (Corso, I)

HRP 213. Research Protocol Development for Clinical and Translational Research—Primarily for medical students in the Clinical Research Scholarly concentration; open to graduate students except in Epidemiology. Development of research questions and plans for statistical analysis. Study design, sample size and power calculations, and statistical analysis of study data. Analytic methods to carry out statistical power and sample size calculations. Prerequisites: 225, and 258 or 259, or consent of instructor.
2-3 units, not given this year

HRP 214. Scientific Writing—Step-by-step through the process of writing and publishing a scientific manuscript. How to write effectively, concisely, and clearly. Preparation of an actual scientific manuscript. Students are encouraged to bring a manuscript on which they are currently working to develop and polish throughout the course.
2-3 units, Win (Sainani, K)

HRP 215. Scientific Writing for Basic and Translational Scientists—Teaches students in the basic sciences how to write clearly, concisely, and effectively. Focuses on the process of writing and publishing a scientific manuscript. Not intended for epidemiology graduate students.
2-3 units, not given this year

HRP 216. Analytical and Practical Issues in the Conduct of Clinical and Epidemiologic Research—Topics include: advanced aspects of study design and data analyses; development of health measurement instruments; methods of summarizing literature and quantifying effect sizes; and multivariable nature of health events in human populations. 3 units requires a term paper. Prerequisites: 225, and 258 or 259, or consent of instructor.
2-3 units, Spr (Popat, R)

HRP 223. Epidemiologic Analysis: Data Management and Statistical Programming—The skills required for management and analysis of biomedical data. Topics include importing and exporting data from multiple database systems, visualizing and cleaning data, data management for multicenter projects, and data security. Introduction to applied statistical programming relevant to epidemiologic and clinical research. No previous programming experience required.
2-3 units, Aut (Balise, R)

HRP 225. Design and Conduct of Clinical and Epidemiologic Studies—Intermediate-level. The skills to design, carry out, and interpret epidemiologic studies, particularly of chronic diseases. Topics: epidemiologic concepts, sources of data, cohort studies, case-control studies, cross-sectional studies, sampling, estimating sample size, questionnaire design, and the effects of measurement error. Prerequisite: 159/259 or equivalent, or consent of instructor.
3-4 units, Aut (Popat, R)

HRP 226. Advanced Epidemiologic and Clinical Research Methods—The principles of measurement, measures of effect, confounding, effect modification, and strategies for minimizing bias in epidemiologic studies. Prerequisite: 225 or consent of instructor.
3-4 units, Win (Nelson, L)

HRP 229. Chronic Disease Epidemiology—Descriptive epidemiology and sources of incidence and mortality data; biological bases of neurological, musculoskeletal, cardiovascular, and other chronic diseases except cancer; methodological issues relevant to chronic epidemiologic research; causal inference; major environmental risk factors; genetic susceptibility; and examples of current research and critiques of literature. Prerequisite: 225 or consent of instructor.
2-3 units, alternate years, not given this year

HRP 230. Cancer Epidemiology—Descriptive epidemiology and sources of incidence/mortality data; the biological basis of carcinogenesis and its implications for epidemiologic research; methodological issues relevant to cancer research; causal inference; major environmental risk factors; genetic susceptibility; cancer control; examples of current research; and critique of the literature. 3 units requires paper or project. Prerequisite: 225, or consent of instructor.
2-3 units, Win (West, D)

HRP 231. Epidemiology of Infectious Diseases—Principles of the transmission of the infectious agents (viruses, bacteria, rickettsiae, mycoplasma, fungi, and protozoan and helminth parasites). The role of vectors, reservoirs, and environmental factors. Pathogen and host characteristics that determine the spectrum of infection and disease. Endemicity, outbreaks, and epidemics of selected infectious diseases. Principles of control and surveillance.
3 units, alternate years, not given this year

HRP 234. Foundations of Pharmacoepidemiology—Historical development of the field, the drug development process and pharmacoepidemiology's role in it, pharmacovigilance/drug safety systems, epidemiology in outcomes research, the role of pharmacoepidemiology in risk management, and classic examples of pharmacoepidemiologic investigations.
2-3 units, alternate years, not given this year

HRP 236. Epidemiology Research Seminar—Weekly forum for ongoing epidemiologic research by faculty, staff, guests, and students, emphasizing research issues relevant to disease causation, prevention, and treatment. May be repeated for credit.
1 unit, Aut, Win, Spr (Friedman, G; Henderson, V; Whittemore, A)

HRP 239. Understanding Statistical Models and their Social Science Applications—(Same as EDUC 260X, STATS 209.) Information that statistical modeling can provide in experimental and non-experimental settings emphasizing misconceptions in social science applications such as causal modeling. Text is *Statistical Models: Theory and Practice*, by David Freedman. See http://www-stat.stanford.edu/~rag/stat209. Prerequisite: intermediate-level statistical methods including multiple regression, logistic regression, and log-linear models.
3 units, Win (Rogosa, D)

HRP 251. Design and Conduct of Clinical Trials—The rationale for phases 1-3 clinical trials, the recruitment of subjects, techniques for randomization, data collection and endpoints, interim monitoring, and reporting of results. Emphasis is on the theoretical underpinnings of clinical research and the practical aspects of conducting clinical trials.
3 units, Spr (Henderson, V; Lavori, P)

HRP 252. Outcomes Analysis—(Same as BIOMEDIN 251.) Methods of conducting empirical studies which use large existing medical, survey, and other databases to ask clinical and policy questions. Econometric and statistical models used to conduct medical outcomes research. How research is conducted on medical and health economics questions when a randomized trial is impossible. Problem sets emphasize hands-on data analysis and application of methods, including re-analyses of well-known studies. Prerequisites: one or more courses in probability, and statistics or biostatistics.
3 units, Spr (Bhattacharya, J)

HRP 256. Economics of Health and Medical Care—(Same as BIOMEDIN 156/256, ECON 126.) Graduate students with research interests should take ECON 248. Institutional, theoretical, and empirical analysis of the problems of health and medical care. Topics: institutions in the health sector; measurement and valuation of health; nonmedical determinants of health; medical technology and technology assessment; demand for medical care and medical insurance; physicians, hospitals, and managed care; international comparisons. Prerequisite: ECON 50 and 102A or equivalent statistics, or consent of instructor. Recommended: ECON 51.
5 units, Aut (Bhattacharya, J)

HRP 258. Introduction to Probability and Statistics for Clinical Research—Open to medical and graduate students; required of medical students in the Clinical Research Scholarly Concentration. Tools to evaluate medical literature. Topics include random variables, expectation, variance, probability distributions, the central limit theorem, sampling theory, hypothesis testing, confidence intervals, correlation, regression, analysis of variance, and survival analysis.
3 units, Spr (Sainani, K)

HRP 259. Introduction to Probability and Statistics for Epidemiology—Topics: random variables, expectation, variance, probability distributions, the central limit theorem, sampling theory, hypothesis testing, confidence intervals. Correlation, regression, analysis of variance, and nonparametric tests. Introduction to least squares and maximum likelihood estimation. Emphasis is on medical applications.

4-5 units, Aut (Balise, R)

HRP 260A,B,C. Workshop in Biostatistics—(Same as STATS 260A,B,C) Applications of statistical techniques to current problems in medical science. Enrollment for more than 2 units of credit involves extra reading or consulting and requires consent of instructor.

1-2 units, **A:** *Aut,* **B:** *Win,* **C:** *Spr (Olshen, R)*

HRP 261. Intermediate Biostatistics: Analysis of Discrete Data—(Same as BIOMEDIN 233, STATS 261.) The 2x2 table. Chi-square test. Fisher's exact test. Odds ratios. Sampling plans; case control and cohort studies. Series of 2x2 tables. Mantel Hantzel. Other tests. k x m tables. Matched data logistic models. Conditional logistic analysis, application to case-control data. Log-linear models. Generalized estimating equations for longitudinal data. Cell phones and car crashes: the crossover design. Special topics: generalized additive models, classification trees, bootstrap inference.

3 units, Win (Sainani, K)

HRP 262. Intermediate Biostatistics: Regression, Prediction, Survival Analysis—(Same as STATS 262.) Methods for analyzing longitudinal data. Topics include Kaplan-Meier methods, Cox regression, hazard ratios, time-dependent variables, longitudinal data structures, profile plots, missing data, modeling change, MANOVA, repeated-measures ANOVA, GEE, and mixed models. Emphasis is on practical applications. Prerequisites: basic ANOVA and linear regression.

3 units, Spr (Sainani, K)

HRP 280,281,282. Spanish for Medical Students—(Same as SPANLANG 121M,122M,123M.) Goal is a practical and rapid command of spoken Spanish. Topics: the human body, hospital procedures, diagnostics, food, and essential phrases for on-the-spot reference when dealing with Spanish-speaking patients. Series can be taken independently, depending on the level of prior knowledge.

3 units, **280:** *Aut,* **281:** *Win (Corso, I),* **282:** *Spr (Corso, I)*

HRP 283. Health Services Research Core Seminar—Presentation of research in progress and tutorials in the field of health services research.

1 unit, Aut (Bundorf, M; Baker, L), Win (McDonald, K),
Spr (Baker, L; Hlatky, M), Sum (McDonald, K)

HRP 290. Advanced Spanish Conversation—Oral language skills covering pediatric, gynecological, and other specialty exams; patient health education and counseling; and diseases such as diabetes, asthma, and TB. Prerequisite: Spanish proficiency or consent of instructor.

3 units, Aut, Win, Spr (Corso, I)

HRP 299. Directed Reading in Health Research and Policy—Epidemiology, health services research, preventive medicine, medical genetics, public health, economics of medical care, occupational or environmental medicine, international health, or related fields. May be repeated for credit. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

HRP 351. Innovation and Management in Health Care—(Same as GSBGEN 351.) The workings of the major institutions such as hospitals, health insurance companies, HMOs, Medicare and Medicaid, federal regulators, and the medical establishment. National health expenditures and alternative models for healthcare financing and delivery. Trends in treatment innovations provided by biopharmaceuticals, medical devices, and surgical procedures; delivery innovations facilitated by information systems and new processes. Policy and business challenges raised by these innovations and the health care ecosystems they promote.

4 units, Win (Zenios, S; Chess, R)

HRP 391. Political Economy of Health Care in the United States—(Same as MGTECON 331, PUBLPOL 231.) The economic tools and institutional and legal background to understand how markets for health care products and services work. Moral hazard and adverse selection. Institutional organization of the health care sector. Hospital and physician services markets, integrated delivery systems, managed care, pharmaceutical and medical device industries. Public policy issues in health care, medical ethics, regulation of managed care, patients' bill of rights, regulation of pharmaceuticals, Medicare reform, universal health insurance, and coverage of the uninsured. International perspectives, how other countries' health care systems evolved, and what the U.S. can learn from their experiences.

4 units, Spr (Kessler, D; Bundorf, K)

HRP 392. Analysis of Costs, Risks, and Benefits of Health Care—(Same as BIOMEDIN 432, MGTECON 332) For graduate students. The principal evaluative techniques for health care, including utility assessment, cost-effectiveness analysis, cost-benefit analysis, and decision analysis. Emphasis is on the practical application of these techniques. Group project presented at end of quarter. Guest lectures by experts from the medical school, pharmaceutical industry, health care plans, and government.

4 units, Aut (Garber, A; Owens, D)

HRP 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

HEALTH SERVICES RESEARCH PROGRAM

Director: Mark Hlatky (Professor, Health Research and Policy, and Medicine)

Executive Committee: Laurence Baker (Associate Professor, Health Research and Policy), M. Kate Bundorf (Assistant Professor, Health Research and Policy), Alan Garber (Professor, Medicine), Mary Goldstein (Professor, Medicine), Mark Hlatky (Professor, Health Research and Policy, and Medicine), Douglas Owens (Professor, Medicine)

Participating Faculty and Staff by Department:

Anesthesia: Alex Macario (Professor)

Economics: Mark McClellan (Associate Professor, on leave)

Business: Alain Enthoven (Professor, emeritus), Daniel Kessler (Professor)

Health Research and Policy: Laurence Baker (Associate Professor), Paul Barnett (Consulting Associate Professor), M. Kate Bundorf (Assistant Professor), Victor Fuchs (Professor, emeritus), Trevor Hastie (Professor), Mark Hlatky (Professor), Philip Lavori (Professor), Richard Olshen (Professor), Ciaran Phibbs (Consulting Associate Professor), Joseph Selby (Consulting Professor), Robert Tibshirani (Professor)

Law: Henry Greely (Professor)

Management Science and Engineering: Margaret Brandeau (Professor)

Medicine: Jay Bhattacharya (Assistant Professor), Alan Garber (Professor), Mary Goldstein (Professor), Michael Gould (Associate Professor), Paul Heidenreich (Associate Professor), Mark Hlatky (Professor), Mark McClellan (Associate Professor, on leave), Grant Miller (Assistant Professor) Douglas Owens (Professor)

Pediatrics: Paul Wise (Professor)

Psychiatry: Rudolph Moos (Professor)

Sociology: Richard Scott (Professor, emeritus)

Program Offices: HRP Redwood Building, Room T138C
Mail Code: 94305-5405
Phone: (650) 723-5456
Email: hsr-program@med.stanford.edu
Web Site: http://med.stanford.edu/hsr/

GRADUATE PROGRAM

MASTER OF SCIENCE

The Master's Degree Program in Health Services Research seeks to train students in the quantitative analysis of issues in health and medical care. The program emphasizes an individually designed program of course work and completion of a master's project under the mentorship of a faculty member. The typical student in the program is either a physician who has completed residency training and is preparing for a research career, or a student with a strong background in policy analysis who wishes to focus on problems in health or medical care. Faculty interests include outcomes research, health economics, health care organization, health care access, quality of care, decision analysis, clinical guidelines, and assessment of patient preferences and quality of life.

To receive the degree, students are expected to demonstrate knowledge of issues in health services research and the quantitative skills necessary for research in this area. Students must take at least 45 units of course work (9 of the units may be double-counted to meet other degree requirements) and write a University thesis. The course work requirements are:

1. At least 8 units from the following group of Health Research and Policy (HRP) core courses: 256, Economics of Health and Medical Care; 391, Political Economy of Health Care in the United States; 392, Analysis of Costs, Risks, and Benefits in Health Care.
2. At least 6 units of graduate-level statistics courses. The sequence of HRP 261 and 262 is strongly recommended.
3. At least 3 units of HRP 283, Health Services Research Core Seminar.
4. At least 15 units of HRP research credit from 299, Directed Reading, or 399, Research.
5. An additional set of approved elective courses to complete the program total of at least 45 units.

For additional information, address inquiries to the Educational Coordinator, Department of Health Research and Policy, Stanford University School of Medicine, HRP Redwood Building, Room T138C, Stanford, California 94305-5405.

COURSES

The course listings of individual departments participating in the Health Services Research Program should be consulted for complete descriptions.

IMMUNOLOGY PROGRAM

Chair, Executive Committee for the Immunology Program: Lawrence Steinman (Professor, Neurology and Neurological Sciences)

Director for Immunology Program: K. Christopher Garcia (Associate Professor, Microbiology and Immunology)

Director for Clinical Immunology Program: C. Garrison Fathman (Medicine/Immunology and Rheumatology)

Participating Departments and Faculty:

Biological Sciences: Anthony W. De Tomaso (Assistant Professor), Patricia P. Jones (Professor)

Chemistry: Harden M. McConnell (Professor, emeritus)*

Genetics: Leonard A. Herzenberg (Professor, emeritus), Lenore A. Herzenberg (Professor, Research), Man-wah Tan (Assistant Professor)

Medicine/Bone Marrow Transplantation Program: Robert Negrin (Professor), David Miklos (Assistant Professor), Judith Shizuru (Associate Professor)

Medicine/Endocrinology: Ajay Chawla (Assistant Professor)

Medicine/Hematology: Calvin Kuo (Assistant Professor), Peter Lee (Associate Professor)

Medicine/Immunology and Rheumatology: C. Garrison Fathman (Professor), William Robinson (Assistant Professor), Samuel Strober (Professor), Paul J. Utz (Associate Professor)

Medicine/Oncology: Gilbert Chu (Professor, and Biochemistry), Dean Felsher (Associate Professor, and Pathology), Ronald Levy (Professor), Shoshana Levy (Professor, Research)

Microbiology and Immunology: Chang-Zheng Chen (Assistant Professor), Yueh-Hsiu Chien (Professor), Mark M. Davis (Professor), Hugh McDevitt (Professor), Garry P. Nolan (Professor), David Schneider (Assistant Professor)

Molecular and Cellular Physiology: K. Christopher Garcia (Associate Professor, and Structural Biology), Richard S. Lewis (Professor)

Neurology and Neurological Sciences: Lawrence Steinman (Professor, and Pediatrics), Tony Wyss-Coray (Associate Professor)

Pathology: Eugene C. Butcher (Professor), Michael Cleary (Professor), Gerald R. Crabtree (Professor, and Developmental Biology), Edgar G. Engleman (Professor, and Medicine/Immunology and Rheumatology), Magali Fontaine (Assistant Professor), Joseph S. Lipsick (Professor), Sara Michie (Associate Professor), Raymond A. Sobel (Professor), Irving L. Weissman (Professor, and Developmental Biology)

Pediatrics: Ann Arvin (Professor, and Microbiology and Immunology), Christopher Contag (Associate Professor, Research, and Microbiology and Immunology, and Radiology), David B. Lewis (Professor), Elizabeth Mellins (Associate Professor)

Psychiatry and Behavioral Sciences: Firdaus Dhabhar (Associate Professor)

Structural Biology: Peter Parham (Professor, and Microbiology and Immunology)

Surgery: Sheri Krams (Associate Professor, Research), Olivia Martinez (Professor, Research)

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* Recalled to active duty

Mail Code: 94305-5121
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Web Site: http://immunol.stanford.edu/

Courses given in Immunology have the subject code IMMUNOL. For a complete list of subject codes, see Appendix.

GRADUATE PROGRAMS

MASTER OF SCIENCE

Students in the Ph.D. program in Immunology may apply for an M.S. degree in Immunology, assuming completion of appropriate requirements. Students must complete:

1. Three full-tuition quarters of residency as a graduate student at Stanford.
2. At least 45 units of academic work, all of which must be in courses at or above the 100 level, 36 units of which must be at or above the 200 level.
3. 2-3 quarters of graduate research (IMMUNOL 399), consisting of rotations in the labs of 3 faculty members.
4. Course work in Immunology as follows: basic immunology (BIOSCI 230, IMMUNOL 205 or equivalent), advanced Immunology such as IMMUNOL 201, 200, and 203. In addition, the student may take one elective course. Some possible electives are: MPHA 210, Signal Transduction Pathways and Networks, SBIO 241, Biological Macromolecules, Cancer Biology, CBIO 241, or DBIO 210, Developmental Biology. Other required core courses are: GENE 203, Advanced Genetics, IMMUNOL 215, Principles of Biological Technologies, MCP 221, Cell Biology of Physiological Processes.
5. Graduate-level biochemistry and molecular biology (BIOC 187, 200, 201, or equivalents).
6. Course work in IMMUNOL 311, Seminar in Immunology, and IMMUNOL 311A, Seminar Discussion in Immunology.
7. Participation in the Immunology journal club (IMMUNOL 305), and attendance at the weekly Immunology seminar and at the annual Stanford Immunology Scientific Conference.
8. The qualifying examination process in Immunology before admission to Ph.D. candidacy has two parts: an oral exam on many fields in immunology, part I, in the last week in June, first year; the thesis proposal, part II, before December 17th, second year. In addition, an oral presentation is required on the research of one rotation, mid-July, first year.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The Immunology Program offers instruction and research opportunities leading to a Ph.D. in Immunology. The goal of the program is to develop investigators who have a solid foundation in immunology and related sciences to carry out innovative research. The program features a flexible choice of courses and seminars combined with extensive research training in the laboratories of participating Immunology faculty.

Students applying to the program typically have an undergraduate major in biological sciences, but majors in other areas are acceptable if the applicants have had sufficient course work in biology and chemistry. Formal application should be made by December 4. Applications are evaluated by the Immunology predoctoral committee based upon: GRE scores; grades; evi dence of research experience; letters of recommendation, including letters from research sponsor(s); and commitment to a career in biomedical research. Subject tests are not required. Interested Stanford medical students are welcome to apply to the program and should submit a formal application by December 4.

Students admitted to the program are offered financial support covering tuition, a living stipend, insurance coverage, and an allowance for books/travel. Applicants are urged to apply for independent fellowships such as from the National Science Foundation. Fellowship applications are due in November of the year prior to matriculation in the graduate program, but Immunology graduate students may continue to apply for outside fellowships after matriculation. Because of the small number of department-funded slots, students who have been awarded an outside fellowship have an improved chance of acceptance into the program. On matriculation, each student is assisted by a first-year advising committee in selecting courses and lab rotations in the first year and in choosing a lab for the dissertation research. Once a dissertation adviser has been selected, a dissertation committee including at least two Immunology faculty, and including the dissertation adviser, is constituted to guide the student during the dissertation research. The student must meet with the dissertation committee at least once a year.

Candidates for Ph.D. degrees at Stanford must satisfactorily complete a three-year program of study that includes 72 units of graduate course work and research. At least 3 units must be taken with each of four different Stanford faculty members.

The requirements for the Ph.D. degree in Immunology include:

1. Training in biology and cognate disciplines equivalent to that provided by the undergraduate Biology major at Stanford.
2. Completion of the following courses (or their equivalents from undergraduate work):
   a) Basic Immunology (BIOSCI 230)
   b) Advanced Immunology (IMMUNOL 201, 202, 203)
   c) Biochemistry and Molecular Biology (BIOC 187, 200, or 201)
   d) Advanced Genetics (GENE 203)
   e) Cell Biology of Physiological Processes (MCP 221)
   f) Biostatistics (BIOSCI 141)
   g) Principles of Biological Technologies (IMMUNOL 215)
   h) One elective course; suggested courses include: MPHA 210, Signal Transduction Pathways and Networks; SBIO 241, Biological Macromolecules; CBIO 241, Cancer Biology; DBIO 210, Developmental Biology.
   i) Responsible Conduct in Science (MED 255)
   j) Immunology Journal Club (IMMUNOL 305)
3. First-year students are required to take both the IMMUNOL 311, Seminar in Immunology, and the companion course, IMMUNOL 311A, Seminar Discussion in Immunology, and participate in IMMUNOL 305, Immunology Journal Club. Students in their second year and above must participate in the IMMUNOL 311, Seminar in Immunology and may opt to take the companion course, IMMUNOL 311A. Students who have not yet achieved TGR status must register for 1 unit for IMMUNOL 311. Students attend the weekly Immunology Seminar Series (4-5 p.m., Tuesdays). Students read the papers of and have dinner with visiting seminar speakers two or three times each quarter, and meet to discuss the material.
4. Elective courses as agreed upon by the student, adviser, and advisory committee. Electives may be chosen from graduate courses and seminars in any of the biomedical science departments and programs.
5. Completion in the first year of three one quarter rotations. Two weeks after taking the oral examination (part 1 of the qualifying examination) at the end of June, students, including MSTP and M.D./Ph.D. students, present their lab rotation research projects to the predoctoral committee. Medical students who have declared Immunology as their scholarly concentration major, and who are accepted into the Ph.D. program, must do at least three rotations.
6. Teaching assistantship in two Immunology courses (IMMUNOL 290, Teaching in Immunology). A teaching assistantship requirement may be fulfilled by proposing a graduate student-initiated course IMMUNOL 315, Topics in Immunology. Before fulfilling their teaching assistantships, Immunology graduate students are required to undertake a teaching assistantship workshop offered at the beginning of every quarter by the Center for Teaching and Learning. MSTP students may submit one of their medical school TAships as partial fulfillment of the TA requirement for the Ph.D. in immunology.
7. For admission to candidacy, completion of two requirements by the end of the Autumn Quarter of the second year: a rotation presentation on one of three lab rotations, and a comprehensive oral examination in immunology and related biomedical sciences must be completed satisfactorily by the middle of Summer Quarter of the first year. Finally, students must prepare and defend a research proposal on their dissertation research by December 17, the end of Autumn Quarter of their second year. Administration and evaluation of these requirements is the responsibility of the student's dissertation committee.
8. Participation (through regular attendance and oral presentation) in the student-run immunology journal clubs for at least the first 2 years (IMMUNOL 305). First- through fourth-year students are also expected to attend the graduate students' journal club, the Tuesday evening immunology seminars, and the annual Stanford Immunology Scientific Conference at Asilomar. Students are required to give one poster and one scientific presentation at these annual Stanford Immunology scientific conferences.
9. Passing the University oral examination on the dissertation research, which is to be taken only after the student has substantially completed the research. The examination is preceded by a public seminar in which the candidate presents his/her research.
10. Completion of a Ph.D. dissertation, resulting from independent investigation and constituting a contribution to knowledge in the area of immunology.

COURSES

Course and lab instruction in the Immunology Program conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

IMMUNOL 201. Advanced Immunology I—(Same as MI 211.) For graduate and medical students and advanced undergraduates. Molecules and cells of the innate and adaptive immune systems; genetics, structure, and function of immune molecules; lymphocyte differentiation and activation; regulation of immune responses; autoimmunity and other problems in immune system dysfunction. Prerequisites: undergraduate course in Immunology and familiarity with experimental approaches in biochemistry, molecular biology, and cell biology.

3 units, Win (Chien, Y)

IMMUNOL 202. Advanced Immunology II—(Same as MI 212.) Readings of immunological literature. Classic problems and emerging areas based on primary literature. Student and faculty presentations. Prerequisite: IMMUNOL 201.

3 units, Spr (Garcia, K)

IMMUNOL 203. Advanced Immunology III—Key experiments and papers in immunology. Student presentations and faculty participation; faculty describe their experimental process and scientific papers. Prerequisite: IMMUNOL 201/MI 211 or IMMUNOL 202/MI 212.

3 units, Sum (Staff)

IMMUNOL 205. Immunology in Health and Disease—Concepts and application of adaptive and innate immunology and the role of the immune system in human diseases. Case presentations of diseases including autoimmune diseases, infectious disease, transplantation, genetic and acquired immunodeficiencies, hypersensitivity reactions, and allergic diseases. Problem sets based on lectures and current clinical literature. Laboratory in acute and chronic inflammation.
2-4 units, Win (Lewis, D)

IMMUNOL 215. Principles of Biological Technologies—(Same as MI 215.) Required of first-year graduate students in Microbiology and Immunology, and the Immunology program. The principles underlying commonly utilized technical procedures in biological research. Lectures and primary literature critiques on gel electrophoresis, protein purification and stabilization, immunofluorescence microscopy, FACS. Prerequisites: biochemistry, organic chemistry, and physics.
3 units, Spr (Kirkegaard, K)

IMMUNOL 230. Introduction to Medicine—For graduate students in biological sciences, bioengineering, and biomedical informatics. Information and approaches used by physicians to understand human disease. Focus is on diabetes; attention to other diseases. Guest medical school and outside faculty. Field trip to anatomy lab, clinics, and the clinical laboratory. Quarter-long, team projects addressing current medical issues.
2-4 units, Spr (Mellins, E; Aye, T)

IMMUNOL 230A. Independent Study in Medical Sciences—For doctoral students. Completion of team projects begun in 230.
1-4 units, Aut, Win, Spr, Sum (Mellins, E; Aye, T)

IMMUNOL 290. Teaching in Immunology—Practical experience in teaching by serving as a teaching assistant in an immunology course. Unit values are allotted individually to reflect the level of teaching responsibility assigned to the student. May be repeated for credit.
1-15 units, Aut, Win, Spr, Sum (Staff)

IMMUNOL 299. Directed Reading in Immunology—Prerequisite: consent of instructor.
1-15 units, Aut, Win, Spr, Sum (Staff)

IMMUNOL 305. Immunology Journal Club—Required of first- to fourth-year graduate students. Graduate students present and discuss recent papers in the literature. May be repeated for credit.
1 unit, Aut, Win, Spr (Steinman, L)

IMMUNOL 311. Seminar in Immunology—Enrollment limited to Ph.D., M.D./Ph.D., and medical students whose scholarly concentrations are in Immunology. Current research topics.
1 unit, Aut, Win, Spr (Steinman, L; Fathman, C)

IMMUNOL 311A. Discussions in Immunology—Students discuss papers of speakers in 311, and meet with the speakers. Corequisite: 311.
1 unit, Aut, Win, Spr (Steinman, L; Fathman, C)

IMMUNOL 315. Special Topics in Immunology—Graduate student-initiated seminar in journal club style. Previous topics include evolutionary immunology and the principles of vaccine development, cytokines, tumor immunology, and neuroimmunology. May be repeated for credit.
1-4 units, Aut, Win, Spr, Sum (Staff)

IMMUNOL 399. Graduate Research—For Ph.D., M.D./Ph.D. students, and medical students whose scholarly concentrations are in Immunology.
1-15 units, Aut, Win, Spr, Sum (Staff)

MICROBIOLOGY AND IMMUNOLOGY

Emeriti: (Professors) Edward S. Mocarski, Sidney Raffel, Leon T. Rosenberg
Chair: Karla Kirkegaard
Associate Chair: Hugh O. McDevitt
Professors: Ann Arvin, Helen Blau, John C. Boothroyd, Yueh-Hsiu Chien, Mark M. Davis, Stanley Falkow, Stephen J. Galli, Harry B. Greenberg, Karla Kirkegaard, A. C. Matin, Hugh O. McDevitt, Peter Parham, Phillip Pizzo, Charles Prober, Peter Sarnow, Gary K. Schoolnik, Lucy S. Tompkins
Associate Professors: Christopher Contag, Garry Nolan, David Relman, Julie Theriot
Assistant Professors: Matthew Bogyo, Chang-Zheng Chen, Denise Monack, David Schneider, Upinder Singh
Associate Professor (Teaching): Robert D. Siegel

Department Offices: D300 Fairchild Building, 299 Campus Drive
Mail Code: 94305-5124
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Email: micro_immuno@lists.stanford.edu
Web Site: http://cmgm.stanford.edu/micro/

Courses given in Microbiology and Immunology have the subject code MI. For a complete list of subject codes, see Appendix.

The Department of Microbiology and Immunology offers a program of training leading to the Ph.D. degree, as well as research training, courses, and seminars for medical students and postdoctoral fellows. Research interests focus on two broad areas: host/parasite interactions; and the function of the immune system. Laboratories investigate mechanisms of pathogenesis and the physiology of viruses, bacteria, and protozoan parasites, as well as the lymphocyte function in antigen recognition, immune response, and autoimmunity.

GRADUATE PROGRAMS

MASTER OF SCIENCE

A regular M.S. program is not offered, although this degree is awarded under special circumstances. Candidates for master's degrees are expected to have completed the preliminary requirements for the B.S. degree, or the equivalent. In addition, the candidate is expected to complete 45 quarter units of work related to microbiology; at least 25 of these units should concern research devoted to a thesis. The thesis must be approved by at least two members of the department faculty.

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

Application, Admission, and Financial Aid—Prospective Ph.D. candidates should have completed a bachelor's degree in a discipline of biology or chemistry, including course work in biochemistry, chemistry, genetics, immunology, microbiology, and molecular biology. The deadline for receipt of applications with all supporting materials is December 4.

Applicants must file a report of scores on the general subject tests of the Graduate Record Examination (GRE). It is strongly recommended that the GRE be taken before October so that scores are available when applications are evaluated.

In the absence of independent fellowship support, entering predoctoral students are fully supported with a stipend and tuition award. Highly qualified applicants may be honored by a nomination for a Stanford Graduate Fellowship. Successful applicants have been competitive for predoctoral fellowships such as those from the National Science Foundation.

Program for Graduate Study—The Ph.D. degree requires course work and independent research demonstrating an individual's creative, scholastic, and intellectual abilities. On entering the department, students meet an advisory faculty member; together they design a timetable for completion of the degree requirements. Typically, this consists of first identifying gaps in the student's undergraduate education and determining courses that should be taken. Then, a tentative plan is made for two to four lab rotations (one rotation per quarter). During the first year of graduate study in the department, each student also takes six or seven upper-level (200-series) courses. Three of these courses are requirements of the department: MI 215, Principles of Biological Techniques; MI 209, Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites, Part I; and MI 210, Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites, Part II. Three courses are part of the core curriculum that is required of many graduate students in Stanford Biosciences: BIOSCI 203 /DBIO 203 /GENE 203, Advanced Genetics; BIOSCI 230, Molecular and Cellular Immunology; and MCP 221/BIOSCI 214, Cell Biology of Physiological Processes.

In Autumn Quarter of the second year, a research proposal based on the student's own thesis topic is defended to the thesis committee. In Spring Quarter of the second year, each student defends orally a formal research proposal on a topic outside the intended thesis project. This qualifying examination proposal is due to the graduate program steering committee by May 1. Based on successful performance on this proposal, the student is admitted to candidacy. Teaching experience and training are also part of the graduate curriculum. Graduate students are required to act as teaching assistants for two courses. In addition, first- and second-year graduate students are required to participate in a bi-weekly journal club.

COURSES

MI 25N. Modern Plagues—Stanford Introductory Seminar. Preference to freshmen. Molecular and medical aspects of new and old microorganisms that infect humans. Goal is to place modern human plagues in scientific and historical perspective. Factors that lead to emergence and control. Write-2

3 units, Spr (Boothroyd, J)

MI 104/204. Innate Immunology—(Undergraduates register for 104.) Innate immune mechanisms as the only defenses used by the majority of multicellular organisms. Topics include Toll signaling, NK cells, complement, antimicrobial peptides, phagocytes, neuroimmunity, community responses to infection, and the role of native flora in immunity. How microbes induce and defeat innate immune reactions, including examples from vertebrates, invertebrates, and plants.

3 units, Spr (Schneider, D)

MI 115B. The Vaccine Revolution—(Same as HUMBIO 155B.) Advanced seminar. Human aspects of viral disease, focusing on recent discoveries in vaccine development and emerging infections. Journal club format: students select articles from primary scientific literature, write formal summaries, and synthesize them into a literature review. Emphasis is on analysis, experimental design, and interpretation of data. Oral presentations. Enrollment limited to 10. Prerequisite: 115A.

6 units, alternate years, not given this year

MI 155H. Humans and Viruses I—(Same as HUMBIO 155H.) Intensive introduction to Human Virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis on host pathogen interactions and policy issues. Topics: polio and vaccination, smallpox and eradication, yellow fever and history, influenza and genomic diversity, rubella and childhood infections, adenovirus and viral morphology, ebola and emerging infection, lassa fever and immune response.

6 units, Aut (Siegel, R)

MI 155V. Humans and Viruses II—Intensive introduction to Human Virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis on host pathogen interactions and policy issues. Topics: measles and viral epidemiology, rotavirus and world health, rabies and infections of the brain, HPV and cancer -causing viruses, herpes simplex and viral latency, CMV and viral teratogenesis, retrovirology and endogenous viral sequences, HIV and viral treatement, viral hepatitis and chronic infections, prions and diseases of life style. Prerequisite: 155H.

6 units, Win (Siegel, R)

MI 185. Topics in Microbiology—Topics include diversity, molecular regulation, growth, bioenergetics, and unique metabolic processes. Student papers for presentation on current topics such as antibiotic resistance and molecular approaches to bioremediation. Prerequisites: CHEM 31X, Biological Sciences core.

3 units, Win (Matin, A)

MI 198. Directed Reading in Microbiology and Immunology—Fields of study are decided in consultation with sponsoring professor. Prerequisite: consent of instructor.

1-15 units, Aut, Win, Spr, Sum (Staff)

MI 199. Undergraduate Research—Investigations sponsored by individual faculty members. Possible fields: microbial molecular biology and physiology, microbial pathogenicity, immunology, virology, and molecular parasitology. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

MI 209. Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites: Part I—For graduate students and advanced undergraduates; required of first-year graduate students in Microbiology and Immunology. Emphasis is on mechanisms to establish infection in the host and responses of the host to infection. Current literature. Prerequisite: background in biochemistry and molecular biology.

4 units, Win (Sarnow, P)

MI 210. Advanced Pathogenesis of Bacteria, Viruses, and Eukaryotic Parasites: Part II—For graduate and medical students, and advanced undergraduates; required of first-year graduate students in Microbiology and Immunology. The molecular mechanisms by which microorganisms invade animal and human hosts, express their genomes, interact with macromolecular pathways in the infected host, and induce disease. Current literature.

4 units, Spr (Chen, C)

MI 211. Advanced Immunology I—(Same as IMMUNOL 201.) For graduate and medical students and advanced undergraduates. Molecules and cells of the innate and adaptive immune systems; genetics, structure, and function of immune molecules; lymphocyte differentiation and activation; regulation of immune responses; autoimmunity and other problems in immune system dysfunction. Prerequisites: undergraduate course in Immunology and familiarity with experimental approaches in biochemistry, molecular biology, and cell biology.

3 units, Win (Chien, Y)

MI 212. Advanced Immunology II—(Same as IMMUNOL 202.) Readings of immunological literature. Classic problems and emerging areas based on primary literature. Student and faculty presentations. Prerequisite: IMMUNOL 201.

3 units, Spr (Garcia, K)

MI 214. Biodefense and Biosecurity—Science and policy behind American and international biosecurity and biodefense. Is the international community prepared to defend against a naturally-occurring disease or a bioterror attack? Topics include the scope of the problem, agent pathogenesis, threat of biological weapons, responding to a biological attack, microbial forensics, international health, the threat of naturally emerging infectious disease, and policy against these threats. Guest lecturers.

2 units, offered occasionally

MI 215. Principles of Biological Technologies—(Same as IMMUNOL 215.) Required of first-year graduate students in Microbiology and Immunology, and the Immunology program. The principles underlying commonly utilized technical procedures in biological research. Lectures and primary literature critiques on gel electrophoresis, protein purification and stabilization, immunofluorescence microscopy, FACS. Prerequisites: biochemistry, organic chemistry, and physics.

3 units, Spr (Kirkegaard, K)

MI 232. Topics in Regenerative Medicine—(Same as DBIO 232.) Forum. Students and researchers discuss current developments in regenerative medicine at Stanford to spark collaboration. Topics include novel applications in biological and chemical engineering, stem cell biology, biotechnology, and human disease. May be repeated for credit.
2 units, Aut, Win, Spr (Blau, H; Fuller, M)

MI 233. The Biology of Small Modulatory RNAs—(Same as GENE 233, PATH 233.) Open to graduate and medical students. How recent discoveries of miRNA, RNA interference, and short interfering RNAs reveal potentially widespread gene regulatory mechanisms mediated by small modulatory RNAs during animal and plant development. Required paper proposing novel research.
2 units, Aut (Fire, A; Chen, C), alternate years, not given next year

MI 250. Frontiers in Microbiology and Immunology—Required of first- and second-year students in Microbiology and Immunology. How to evaluate biological research. Held in conjunction with the Microbiology and Immunology Friday noon seminar series. Before the seminar, students and faculty discuss one or more papers from the speaker's primary research literature on a related topic. After the seminar, students meet informally with the speaker to discuss their research.
1 unit, Aut, Win, Spr (Schneider, D)

MI 299. Directed Reading in Microbiology and Immunology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

MI 399. Graduate Research—Students who have completed the necessary foundation courses undertake investigations in general bacteriology, bacterial physiology and ecology, bacterial genetics, microbial pathogenicity, immunology, parasitology, or virology sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

MOLECULAR AND CELLULAR PHYSIOLOGY

Chair: Richard S. Lewis
Professors: Axel T. Brunger, Brian K. Kobilka, Richard S. Lewis, W. James Nelson, Stephen J. Smith, Richard W. Tsien, William Weis
Associate Professors: Christopher Garcia, V. Daniel Madison
Assistant Professors: Miriam Goodman, Merritt Maduke
Courtesy Associate Professor: Stefan Heller, John Huguenard, Anson W. Lowe, Tony Ricci
Courtesy Assistant Professor: Richard J. Reimer

Department Offices: Beckman Center, B100
Mail Code: 94305-5345
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Email: schantae@stanford.edu
Web Site: http://mcp.stanford.edu

Courses given in Molecular and Cellular Physiology have the subject code MCP. For a complete list of subject codes, see Appendix.

The Department of Molecular and Cellular Physiology is located in the Beckman Center for Molecular and Genetic Medicine.

A central goal of physiology in the post-genomic era is to understand how thousands of encoded proteins serve to bring about the highly coordinated behavior of cells and tissues. Research in the department approaches this goal at many levels of organization, ranging from single molecules and individual cells to multicellular systems and the whole organism. The faculty share common interests in the molecular mechanisms of cell signaling and behavior, with a special focus on structure/function analysis of ion channels and G-protein coupled receptors, and their roles at the cellular, organ, and whole-organism levels; the molecular basis of sensory transduction, synaptic transmission, plasticity and memory; the role of ion channels and calcium in controlling gene expression in neural and immune cells; and the regulation of vesicle trafficking and targeting, cell polarity, and cell-cell interactions in the nervous system and in epithelia. Research programs employ a wide range of approaches, including molecular and cell biology, biochemistry, genetics, biophysics, x-ray crystallography and solution NMR, electrophysiology, and *in vitro* and *in vivo* imaging with confocal and multi-photon microscopy.

GRADUATE PROGRAMS

The department offers required and elective courses for students in the School of Medicine and is also open to other qualified students with the consent of the instructor. Training of medical, graduate, and postdoctoral students is available. The program offers a course of study leading to the Ph.D. degree. No B.S. is offered, and an M.S. is offered only in the unusual circumstance where a student completes the course work, rotation, and the written section of the qualifying exam, but is unable to complete the requirements for the Ph.D.

DOCTOR OF PHILOSOPHY

Students with undergraduate or master's degrees who have completed a year each of college chemistry (including lectures in organic and physical chemistry), physics, calculus, and biology are considered for admission to graduate study. Applicants submit a report of scores from the Graduate Record Examination (verbal, quantitative, analytical, and an advanced subject test in one of the sciences) as part of the application.

Students who do not speak English as their native language must submit scores from TOEFL unless waived by Graduate Admissions, the Registrar's Office.

Study toward the Ph.D. is expected to occupy five years, including summers. A minimum of six quarter-long courses is required. These include four graduate-level courses (200-300 series) and a choice of two out of these three courses: MCP 221, MCP 255, and MCP 256. Students are also required to take the Molecular and Cellular Physiology seminar/Research In Progress series. Each student presents a talk on research in progress to the department at least every other year, starting their second year. Acceptable grades for all course work must be a minimum of 'B-', and at least two grades equal to 'A-' or above are necessary (but not sufficient) for continuation in the program.

Qualifying Examination—At the end of the second year in residence as a graduate student, each Ph.D. candidate presents a written thesis proposal to be defended at an oral comprehensive examination. The examinations may be taken only after all course work has been completed by the required standard. Students undertake individual research studies as early as possible after consultation with their preceptor. Upon passing this exam, the student is advanced to candidacy for the Ph.D.

Dissertation and University Oral Examination—The results of independent, original work by the students are presented in a dissertation. The oral examination is largely a defense of the dissertation.

Advisers and Advisory Committees—A graduate advisory committee, currently Professors Lewis and Madison, advises students during the period before the formation of their qualifying committees.

Financial Aid—Students may be funded by their advisers' research grants, by training grants, by department funds, or by extramural funds. Students are encouraged to obtain funding from outside sources such as NIH and NSF.

COURSES

Course and lab instruction in the Department of Molecular and Cellular Physiology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

MCP 100Q. The Hippocampus as a Window to the Mind—Stanford Introductory Seminar. Preference to sophomores. Electrical physiology of the brain using the hippocampus as a model system. The seminar builds from basic anatomical and electrical principles of brain structure and function, through the electrical properties of individual neurons and simple neuronal circuits, to the nature of behaviors that emerge from these more basic properties. Also discusses other brain regions where the hippocampal model provides insight into specific neuronal functions. Culminates in a discussion of neuronal disorders such as epilepsy, drug addiction, and obsessive-compulsive disorder that can be better understood on a basis of knowledge of the hippocampal model.

3 units, Spr (Madison, V)

MCP 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

MCP 200. Cardiovascular Physiology—Offered jointly with the Department of Medicine. Lectures, small group instruction, clinical presentations, and lab demonstrations of normal and disordered human cardiovascular physiology. Prerequisite: understanding of general biochemistry.

5 units, Spr (Kobilka, B)

MCP 213. Special Topics in Molecular and Cellular Physiology—Introductory and advanced physiological topics agreed on by an instructor and students. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

MCP 216. Genetic Analysis of Behavior—(Same as NBIO 216.) Advanced seminar. Findings and implications of behavioral genetics as applied to invertebrate and vertebrate model systems. Topics include biological clocks, and sensation and central pattern generators. Relevant genetic techniques and historical perspective. Student presentation.

4 units, Win (Goodman, M; Clanindin, T)

MCP 222. Imaging: Biological Light Microscopy—(Same as BIOSCI 152, NBIO 222.) Survey of instruments which use light and other radiation for analysis of cells in biological and medical research. Topics: basic light microscopy through confocal fluorescence and video/digital image processing. Lectures on physical principles; involves partial assembly and extensive use of lab instruments. Lab. Prerequisites: some college physics, Biological Sciences core.

3 units, Spr (Smith, S; Dolmetsch, R)

MCP 232. Advanced Imaging Lab in Biophysics—(Same as BIOSCI 132/232, BIOPHYS 232.) Laboratory and lectures. Advanced microscopy and imaging, emphasizing hands-on experience with state-of-the-art techniques. Students construct and operate working apparatus. Topics include microscope optics, Koehler illumination, contrast-generating mechanisms (bright/dark field, fluorescence, phase contrast, differential interference contrast), and resolution limits. Laboratory topics vary by year, but include single-molecule fluorescence, fluorescence resonance energy transfer, confocal microscopy, two-photon microscopy, and optical trapping. Limited enrollment. Recommended: basic physics, Biological Sciences core or equivalent, and consent of instructor.

4 units, Spr (Block, S; Schnitzer, M; Smith, S; Stearns, T)

MCP 256. How Cells Work: Energetics, Compartments, and Coupling in Cell Biology—Open to graduate and medical students, and advanced undergraduates. Dynamic aspects of cell behavior and function, including cellular energetics, homeostasis, heterogeneity of membranes, structure and function of organelles, solute and water transport, signaling and motility. Emphasis is on the principles of how coupling of molecular processes gives rise to essential functions at the cellular level. Mathematical models of cell function. Student presentations.

4 units, Spr (Goodman, M; Maduke, M)

MCP 258. Information and Signaling Mechanisms in Neurons and Circuits—(Same as NBIO 258.) How synapses, cells, and neural circuits process information relevant to a behaving organism. How phenomena of information processing emerge at several levels of complexity in the nervous system, including sensory transduction in molecular cascades, information transmission through axons and synapses, plasticity and feedback in recurrent circuits, and encoding of sensory stimuli in neural circuits.

5 units, Aut (Tsien, R; Baccus, S)

MCP 299. Directed Reading in Molecular and Cellular Physiology—Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

MCP 399. Graduate Research—Investigations sponsored by individual faculty members. Research fields include endocrinology, neuroendocrinology, and topics in molecular and cellular physiology. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

NEUROBIOLOGY

Emeritus: Denis Baylor, Eric Shooter, Lubert Stryer
Chair: William T. Newsome
Professors: Ben Barres, Eric I. Knudsen, Uel J. McMahan, William T. Newsome
Assistant Professors: Stephen Baccus, Thomas Clandinin, Ricardo Dolmetsch, Tirin Moore, Jennifer Raymond

Department Offices: Fairchild Building, Second Floor
Mail Code: 94305-5125
Web Site: http://www.stanford.edu/dept/nbio/

Courses given in Neurobiology have the subject code NBIO. For a complete list of subject codes, see Appendix.

GRADUATE PROGRAM

Graduate students in the Department of Neurobiology obtain the Ph.D. degree through the interdepartmental Neurosciences Ph.D. program. Accepted students receive funding for tuition and a living stipend. Applicants should familiarize themselves with the research interests of the faculty and, if possible, indicate their preference on the application form which is submitted directly to the Neurosciences Program.

Medical students also are encouraged to enroll in the Ph.D. program. The requirements of the Ph.D. program are fitted to the interests and time schedules of the student. Postdoctoral training is available to graduates holding Ph.D. or M.D. degrees, and further information is obtained directly from the faculty member concerned.

Research interests of the department include information processing in vertebrate retina; structure, function, and development of auditory and visual systems; development and regeneration in the central and peripheral nervous system; neural mechanisms mediating higher nervous system functions, including perception, learning, attention and decision making.

COURSES

Course and lab instruction in the Department of Neurobiology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

The department offers a one quarter course (NBIO 206) on the structure and function of the nervous system, which is open to medical and graduate students and advanced undergraduates. Advanced courses are open to students who have completed the basic course.

NBIO 101/201. Social and Ethical Issues in the Neurosciences—(Graduate students register for 201.) Influences on public debate and policy of scientific advances in the study of the brain and behavior: theories of brain function; philosophical and scientific approaches; advances in the neurosciences, possible uses in medical therapy, and interventions involving genetic screening, genetic selection, enhancement of neurological functioning, and manipulation of behavior; questions related to medical therapy, social policy, and broader considerations of human nature such as consciousness, free will, personal identity, and moral responsibility. May be taken for 2 units without a research paper. Prerequisite: Neuroscience, Biological Sciences, or Symbolic Systems major; or Human Biology core; or consent of instructor.

2-4 units, Spr (Hurlbut, W; Newsome, W)

NBIO 198. Directed Reading in Neurobiology—Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

NBIO 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

NBIO 206. The Nervous System—Introduction to the structure and function of the nervous system, including neuroanatomy, neurophysiology, and systems neurobiology. Topics include the properties of neurons and the mechanisms and organization underlying higher functions. Framework for general work in neurology, neuropathology, clinical medicine, and for more advanced work in neurobiology. Lecture and lab components must be taken together.
7-8 units, Win (Clandinin, T)

NBIO 216. Genetic Analysis of Behavior—(Same as MCP 216.) Advanced seminar. Findings and implications of behavioral genetics as applied to invertebrate and vertebrate model systems. Topics include biological clocks, and sensation and central pattern generators. Relevant genetic techniques and historical perspective. Student presentation.
4 units, Win (Goodman, M; Clandinin, T)

NBIO 218. Neural Basis of Behavior—Advanced seminar. The principles of information processing in the vertebrate central nervous system, and the relationship of functional properties of neural systems with perception and behavior. Emphasis is on the visual and auditory systems. Original papers; student presentations. Prerequisite: 206 or consent of instructor.
4 units, Spr (Raymond, J; Knudsen, E), alternate years, not given next year

NBIO 220. Central Mechanisms in Vision-based Cognition—Contemporary visual neuroscience, emphasizing the neural mechanisms underlying primate vision and visually guided behavior. Seven foundational topics in visual neuroscience; current papers concerning each topic. Student presentations. Computer-based demonstration exercises.
2-4 units, alternate years, not given this year (Newsome, W; Moore, T)

NBIO 221. Frontiers in Translational Medicine—Small group course for first-year MSTP and M.D./Ph.D. students only. Pathways for combining science and medicine during graduate and postdoctoral training and in one's career. Practical aspects of translational medicine. Guest lecturers are physician-scientists who have advanced the frontiers of translational medicine, including Drs. Gilbert Chu, Jamie Topper, Irv Weissman, Ching Wang, Linda Giudice, Geoff Duyk, William Mobley, Judy Shizuru, and David Cox. Prerequisite: consent of instructor.
1 unit, Spr (Barres, B)

NBIO 222. Imaging: Biological Light Microscopy—(Same as BIOSCI 152, MCP 222.) Survey of instruments which use light and other radiation for analysis of cells in biological and medical research. Topics: basic light microscopy through confocal fluorescence and video/digital image processing. Lectures on physical principles; involves partial assembly and extensive use of lab instruments. Lab. Prerequisites: some college physics, Biological Sciences core.
3 units, Spr (Smith, S; Dolmetsch, R)

NBIO 227. Understanding Techniques in Neuroscience—Techniques commonly used in neuroscience, including molecular/genetic, electrophysiological, and whole brain imaging. Presentations by senior graduate students and examples from the literature. Optional laboratory demonstrations.
2 units, Aut (Carter, M; Villeda, S; Shieh, J)

NBIO 254. Molecular and Cellular Neurobiology—(Same as BIOSCI 154/254.) For advanced undergraduates and graduate students. Cellular and molecular mechanisms in the organization and functions of the nervous system. Topics: wiring of the neuronal circuit, synapse structure and synaptic transmission, signal transduction in the nervous system, sensory systems, molecular basis of behavior including learning and memory, molecular pathogenesis of neurological diseases. Prerequisite for undergraduates: Biological Sciences core or equivalent, or consent of instructors.
4-5 units, alternate years, not given this year

NBIO 258. Information and Signaling Mechanisms in Neurons and Circuits—(Same as MCP 258.) How synapses, cells, and neural circuits process information relevant to a behaving organism. How phenomena of information processing emerge at several levels of complexity in the nervous system, including sensory transduction in molecular cascades, information transmission through axons and synapses, plasticity and feedback in recurrent circuits, and encoding of sensory stimuli in neural circuits.
5 units, Aut (Baccus,S; Tsien R)

NBIO 299. Directed Reading in Neurobiology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

NBIO 300. Professional Development and Integrity in Neuroscience—Required of Neurosciences Ph.D. students every quarter. Develops professional skills in critical assessment and oral presentation of findings from current neuroscience literature in the visual presentation of quantitative data and writing research grants. The role of animals in lab research, fraud in science, the responsibility of authors and reviewers, science in a multicultural environment, and the relationship between student and mentor. Student and faculty presentations and discussions.
1-2 units, Aut, Win, Spr (Dolmetsch, R)

NBIO 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSES

See respective department listings for course descriptions. See degree requirements above or the program's student services office for applicability of these courses to a major or minor program.

PSYCH 204A. Computational Neuroimaging
1-3 units, Spr (Wandell, B)

PSYCH 250. High-level Vision
1-3 units, Spr (Grill-Spector, K), alternate years, not given next year

NEUROSCIENCES PROGRAM

Director: John R. Huguenard (Professor, Neurology and Neurological Sciences)

Committee: Corinna Darian-Smith, Craig Garner, Miriam Goodman, Shaul Hestrin, John R. Huguenard, Jennifer Raymond, Kang Shen, Krishna Shenoy, Anthony Wagner

Participating Faculty:

Anesthesia: Rona Giffard (Professor), M. Bruce MacIver (Associate Professor, Research), Sean Mackey (Assistant Professor), David Yeomans (Associate Professor)

Applied Physics: Mark Schnitzer (Assistant Professor)

Bioengineering: Kwabena Boahen (Associate Professor), Karl Deisseroth (Assistant Professor)

Biological Sciences: Bruce Baker (Professor), Russell D. Fernald (Professor), William F. Gilly (Professor), H. Craig Heller (Professor), Ron Kopito (Professor), Liqun Luo (Professor), Susan McConnell (Professor), Robert M. Sapolsky (Professor), Mark Schnitzer (Assistant Professor), Kang Shen (Assistant Professor), Stuart Thompson (Professor)

Chemical and Systems Biology: Tobias Meyer (Professor), Daria Mochly-Rosen (Professor)

Comparative Medicine: Paul S. Buckmaster (Associate Professor), Corinna Darian-Smith (Assistant Professor), Shaul Hestrin (Associate Professor)

Developmental Biology: Ben Barres (Professor), Matthew P. Scott (Professor)

Electrical Engineering: Krishna Shenoy (Assistant Professor)

Genetics: Anne Brunet (Assistant Professor), David R. Cox (Professor)

Microbiology and Immunology: Helen Blau (Professor)

Molecular and Cellular Physiology: Miriam B. Goodman (Assistant Professor), Brian Kobilka (Professor), Richard S. Lewis (Professor), V. Daniel Madison (Associate Professor), Merritt C. Maduke (Assistant Professor), Stephen Smith (Professor), Richard Tsien (Professor)

Neurobiology: Stephen Baccus (Assistant Professor), Ben Barres (Professor), Tom Clandinin (Assistant Professor), Ricardo Dolmetsch (Assistant Professor), Eric I. Knudsen (Professor), U. J. McMahan (Professor), Tirin Moore (Assistant Professor), William T. Newsome (Professor), Jennifer Raymond (Assistant Professor)

Neurology and Neurological Sciences: Ben Barres (Professor), Paul Buckmaster (Associate Professor), Robert S. Fisher (Professor), Ting-Ting Huang (Assistant Professor, Research), John A. Huguenard (Associate Professor), Frank Longo (Professor), William C. Mobley (Professor), David A. Prince (Professor), Thomas A. Rando (Associate Professor), Lawrence Recht (Professor), Richard Reimer (Assistant Professor), Terence Sanger (Assistant Professor), Robert M. Sapolsky (Professor), Lawrence Steinman (Professor), Tony Wyss-Coray (Associate Professor, Research), Yanmin Yang (Assistant Professor)

Neurosurgery: Pak H. Chan (Professor), Theo Palmer (Assistant Professor), Gary K. Steinberg (Professor)

Otolaryngology: Stefan Heller (Associate Professor), Anthony Ricci (Associate Professor)

Pathology: Isabella Graef (Assistant Professor), Bingwei Lu (Assistant Professor), Raymond Sobel (Professor)

Pediatrics: Judy Illes (Assistant Professor), Anna Penn (Assistant Professor), Lawrence Steinman (Professor)

Psychiatry and Behavioral Sciences: Karl Deisseroth (Assistant Professor), Luis de Lecea (Associate Professor), Craig Garner (Professor), Terrence A. Ketter (Associate Professor), Robert C. Malenka (Professor), Vinod Menon (Associate Professor, Research), Emmanuel Mignot (Professor), Allan L. Reiss (Professor), Edith Sullivan (Professor, Research)

Psychology: Lera Boroditsky (Assistant Professor), Ian Gotlib (Professor), Kalanit Grill-Spector (Assistant Professor), James J. Gross (Associate Professor), Brian Knutson (Assistant Professor), James McClelland (Professor), Anthony Wagner (Assistant Professor), Brian Wandell (Professor), Jeffrey J. Wine (Professor)

Radiology: Gary H. Glover (Professor)

Structural Biology: U. J. McMahan (Professor)

Program Offices: Alway Building, M-103D
Mail Code: 94305-5121
Phone: (650) 723-9855
Web Site: http://neuroscience.stanford.edu/

Courses given in the Neurosciences Program have the subject code NEPR. For a complete list of subject codes, see Appendix.

GRADUATE PROGRAM

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The interdepartmental Neurosciences Program offers instruction and research opportunities leading to a Ph.D. in Neurosciences. The requirements for a Ph.D. degree follow those of the University and in addition are tailored to fit the background and interests of the student. Accepted students receive an award covering tuition, a basic health plan, and a living stipend. Qualified applicants should, where possible, apply for the predoctoral fellowships in open competition, especially those from the National Science Foundation. December 16 is the deadline for receipt in the Neurosciences Program office of applications with all supporting material.

Applicants should familiarize themselves with the research interests of the faculty and indicate their preferences clearly on the application form.

Since students enter with differing backgrounds, and the labs in which they may elect to work cover several different disciplines, the specific program for each student is developed individually with an advisory committee. All students are required to complete the basic introduction to neurobiology (NBIO 206 or equivalent). Students must also take five advanced courses, four of which must be distributed among four of the following core areas: systems and behavioral neuroscience, molecular and cellular neuroscience, developmental neuroscience, clinical neuroscience, and computational neuroscience. The fifth advanced course is chosen by the student in an area related to the student's research interest, and may be selected from outside the Neurosciences core with prior approval from the program director and the student's adviser.

Students usually rotate through several labs during their first year, although they may choose to begin thesis research on entry. After the first rotation, students may rotate both within and outside the Neurosciences Program. Required course work should be completed by the end of the second year. Passing of a comprehensive oral preliminary examination given by the student's advisory committee is required for admission to Ph.D. candidacy. This examination is usually taken by the end of the second year. The student is required to present a Ph.D. dissertation, which is the result of independent investigation contributing to knowledge in an area of neuroscience, and to defend his or her dissertation in a University oral examination, which includes a public seminar.

Medical students may participate in this program provided they meet the prerequisites and satisfy all the requirements of the graduate program as listed above. The timing of the program may be adjusted to fit their special circumstances.

COURSES

Course and lab instruction in the Neurosciences Program conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

NEPR 299. Directed Reading in Neurosciences—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

NEPR 399. Graduate Research—Investigations sponsored by individual faculty members.
1-18 units, Aut, Win, Spr, Sum (Staff)

OBSTETRICS AND GYNECOLOGY

Chair: Jonathan S. Berek

Courses given in Gynecology have the subject code OBGYN. For a complete list of subject codes, see Appendix.

The Department of Obstetrics and Gynecology does not offer degrees; however, qualified medical, graduate, or undergraduate students with an interest in basic research in reproductive biology may apply to arrange individual projects under the supervision of the faculty. The focus for the Division of Reproductive Biology is the study of the molecular and cellular biology of male and female reproductive organs.

COURSES

OBGYN 78Q. Darwin's Evolution and Genomic Revolution—Stanford Introductory Seminar. Preference to sophomores. Topics include evolution based on fossil and genetic evidence, mechanisms of natural selection, the impact of genomic revolution on the study of gene evolution, new gene discovery, human-accelerated selection, Darwinian medicine, and the social implications of evolution.

3 units, Win (Hsueh, A)

OBGYN 199. Undergraduate Research in Reproductive Biology—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

OBGYN 202. Assisted Reproductive Technologies—(Same as DBIO 202.) Primary literature in basic and clinical science, and demonstrations of assisted reproductive technologies (ART). Techniques include in vitro fertilization covering micromanipulation procedures such as intracytoplasmic sperm injection and the culture of blastocysts, using mouse gametes, and pre-embryos. Class only may be taken for 1 unit. 2 units includes papers and attendance at clinical demonstrations. 3 units includes a term paper. Prerequisite: DBIO 201 recommended, or consent of instructors.

1-3 units, Win (Porzig, E; Behr, B)

OBGYN 399. Graduate Research - Reproductive Biology—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

1-18 units, Aut, Win, Spr, Sum (Staff)

PATHOLOGY

Emeriti: (Professor) Ronald Dorfman; Richard L. Kempson; *(Professor, Clinical)* P. Joanne Cornbleet, Lawrence F. Eng, Luis Fajardo, Heinz Furthmayr, F. Carl Grumet

Chair: Stephen J. Galli

Professors: Daniel Arber, Ellen Jo Baron, Gerald J. Berry, Eugene C. Butcher, Michael L. Cleary, Gerald R. Crabtree, Edgar G. Engleman, Andrew Fire, Steven Foung, Stephen J. Galli, Lawrence Tim Goodnough, Michael R. Hendrickson, Sabine Kohler, Jon C. Kosek, Joseph S. Lipsick, Robert V. Rouse, Richard K. Sibley, Raymond Sobel, Howard H. Sussman, Dolly Tyan, Matt van de Rijn, Hannes Vogel, Teresa S. F. Wang, Roger A. Warnke, Irving L. Weissman, James Zehnder

Associate Professors: Jeffrey D. Axelrod, Athena M. Cherry, Tina Cowan, James D. Faix, Dean Felsher, Susan A. Galel, Sharon M. Geaghan, Peter K. Jackson, Teri A. Longacre, Sara A. Michie, Yasodha Natkunam, Bruce Patterson, Donald P. Regula, Arend Sidow

Assistant Professors: Matthew Bogyo, Raffick Bowen, Andrew Connolly, Soheil Dadras, Magali Fontaine, Tracy George, John P. Higgins, Kristin Jensen, Neeraja Kambham, Christina Kong, Bingwei Lu, Jonathan R. Pollack, Iris Schrijver, Erich Schwartz, Uma Sundram, Robert West

Courtesy Professors: Bertil Glader, Lucy Tompkins

Courtesy Associate Professors: Donna Bouley, Robert Shafer

Clinician Educators: Susan Atwater, David Bingham, Barbara Egbert, Dita Gratzinger, Terri Haddix, Melanie Manning, Reetesh Pai, Shalini Pereira, Run Shi, Brent Tan, Maurene Viele

Instructors: Niaz Banaei, Daniel Kraft, Michaela Liedtke

Adjunct Clinical Faculty: Robert Archibald, Jerome S. Burke, Glenn Cockerham, Stephen Shi-Hua Chen, Seth Haber, Maie K. Herrick, Paul W. Herrmann, Simon Hirschl, Charles Lombard, John E. McNeal, Judy Melinek, Joseph O'Hara, Mahendra Ranchod, Thomas W. Rogers, Joshua Sickel

Department Offices: Medical Center, Lane Building, L-235
Mail Code: 94305-5324
Phone: (650) 723-5255
Web Site: http://pathology.stanford.edu

Courses given in Pathology have the subject code PATH. For a complete list of subject codes, see Appendix.

PROGRAMS OF STUDY

The Department of Pathology offers advanced courses in aspects of pathology. The department does not offer advanced degrees in pathology, but qualified graduate students who are admitted to department-based or interdepartmental graduate programs may elect to pursue their thesis requirements in the department's research laboratories. The discipline of pathology has served as a bridge between the preclinical and clinical sciences and is concerned with the application of advances in the basic biological sciences, both to the diagnosis of human disease and the elucidation of the mechanisms of normal molecular, cellular, and organ structure and function that manifest themselves in clinical disease. Accordingly, the department's research interests extend from fundamental molecular biology to clinical-pathological correlations, with an emphasis on experimental oncology.

Investigation in the department includes basic studies in areas using molecular biological, biochemical, and genetic cell biological techniques: DNA replication in yeast and cultured eukaryotic cells, cell cycle control in animal cells and yeast, identification and pathogenetic role of chromosomal aberrations in human malignancies and mechanisms of activation of oncogenes in human and animal cells, lymphocyte and neutrophil-interactions with endothelial cells, cell type specification and signal transduction pathways leading to specific gene expression or modulation of cytoskeletal behavior; cytoskeletal architecture, cell-matrix interaction, developmental biology of hematopoietic stem cells and thymus, regulation of the immune system, mechanisms of immune and other responses in the central nervous system, and neuro-degenerative diseases. Various studies focus on the development of novel diagnostic and immunotherapeutic treatment modalities and techniques for solid tumors, lymphomas, HIV, and genetic diseases. Research training in all of these areas is available for qualified medical and graduate students by individual arrangement with the appropriate faculty member. A summary of the research interests of the department faculty is available at http://pathology.stanford.edu.

COURSES

Course and lab instruction in the Department of Pathology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

PATH 101. Cancer Biology—(Same as CBIO 101.) Experimental approaches to understanding the origins, diagnosis, and treatment of cancer. Focus on key experiments and discoveries with emphasis on genetics, molecular biology, and cell biology. Topics include carcinogens, tumor virology, oncogenes, tumor suppressor genes, cell cycle regulation, angiogenesis, invasion and metastasis, cancer genomics, cancer epidemiology, and cancer therapies. Discussion sections based on primary research articles that describe key experiments in the field. Prerequisite: Biological Sciences or Human Biology core or equivalent, or consent of instructor.

4 units, Spr (Lipsick, J)

PATH 103Q. Lymphocyte Migration—Stanford Introductory Seminar. Preference to sophomores. How lymphocytes leave the blood stream and enter tissues to participate in immune surveillance and the development of inflammation. Known as lymphocyte migration, this process involves a complex series of adhesion, activation and diapedesis events. The cellular mechanisms involved in lymphocyte migration, including lymphocyte adhesion molecules that interact with their counter-receptors on endothelial cells, and molecules, including cytokines and chemokines, that attract or activate lymphocytes. The roles of these molecules in the development of human diseases such as asthma, type 1 diabetes, and multiple sclerosis.
1 unit, Aut (Michie, S)

PATH 105Q. Final Analysis: The Autopsy as a Tool of Medical Inquiry—Stanford Introductory Seminar. Preference to sophomores. Based on review of patient medical histories and examination of formalin-fixed and unfixed tissues from autopsy. Student-directed problem-solving; students develop learning objectives for each case, and present findings. The effect of disease on normal structure and function, ethics of patient care, allocation of medical resources, efficiency of therapy, and medical error. Prerequisite: hepatitis-B vaccination; free vaccinations during the winter for accepted students.
3 units, Spr (Regula, D)

PATH 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

PATH 206. Epigenetics—(Same as GENE 206.) For graduate students; undergraduates by consent of instructor. Mechanisms by which phenotypes not determined by the DNA sequence are stably inherited in successive cell divisions. From the discovery of position-effect variegation in Drosophila in the 20s to present-day studies of covalent modifications of histones and DNA methylation. Topics include: position effect, gene silencing, heterochromatin, centromere identity, genomic imprinting, histone code, variant histones, and the role of epigenetics in cancer. Prerequisite: background in genetics and molecular biology.
2 units, Win (Lipsick, J)

PATH 210. Stem Cells in Development and Disease—Molecular and cellular mechanisms underlying the basic self-renewal and differentiation properties of stem cells in multiple tissues and organisms. How abnormal stem cell behavior may contribute to diseases such as cancer. How to manipulate stem cell behavior in vitro or in vivo for therapeutic purposes. Classical papers and recent literatures in the field of stem cell biology. Open to graduate, medical, and advanced undergraduate students. Prerequisite: consent of instructor.
1-2 units, Spr (Lu, B)

PATH 218. Computational Analysis of Biological Images—Physical and computational tools for acquisition, processing, interpretation, and archiving of biological images. Emphasis is on digital microscopy.
2 units, alternate years, not given this year

PATH 233. The Biology of Small Modulatory RNAs—(Same as GENE 233, MI 233.) Open to graduate and medical students. How recent discoveries of miRNA, RNA interference, and short interfering RNAs reveal potentially widespread gene regulatory mechanisms mediated by small modulatory RNAs during animal and plant development. Required paper proposing novel research.
2 units, Aut (Fire, A; Chen, C), alternate years, not given next year

PATH 296. Stem Cell Biology and Regenerative Medicine—(Same as DBIO 296.) For graduate and medical students. Embryonic and adult stem cells, including origin, regulation, self-renewal, differentiation, fate, and relationship to cancer; biological mechanisms and methods to translate findings to therapeutic applications. Medical students must enroll for 5 units; graduate students may choose to take only the basic science part for 3 units. Prerequisites: DBIO 201 and 210, or consent of instructor.
3-5 units, Win (Weissman, I; Fuller, M; Nusse, R)

PATH 299. Directed Reading in Pathology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

PATH 399. Graduate Research—Investigations sponsored by individual faculty members. Opportunities at the molecular, cellular, and clinicopathologic levels. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

COGNATE COURSE

See department listings for course description. See degree requirements above or the program's student services office for applicability of this course to a major or minor program.

MI 211. Advanced Immunology I—(Same as IMMUNOL 201.)
3 units, Win (Chien, Y)

RADIATION ONCOLOGY

Emeriti: Malcolm A. Bagshaw, Peter Fessenden, Don R. Goffinet, George M. Hahn, Kendric Smith
Chair: Richard T. Hoppe
Professors: J. Martin Brown, Sarah S. Donaldson, Amato J. Giaccia, Steven L. Hancock, Richard T. Hoppe, Quynh-Thu Le, Daniel S. Kapp, Steven A. Liebel
Associate Professors: Iris C. Gibbs, Paul Keall, Christopher R. King, Susan J. Knox, Gary Luxton, Lei Xing
Assistant Professors: Laura Attardi, Daniel Chang, Nicholas Denko, Edward Graves, Albert C. Koong
Consulting Professor: Robert M. Sutherland

Courses given in Radiation Oncology have the subject code RADO. For a complete list of subject codes, see Appendix.

Radiation Oncology focuses on the use of radiation for cancer therapy and research. The department does not offer degrees; however, its faculty teach courses open to medical students, graduate students, and undergraduates. The department also accepts students in other curricula as advisees for study and research. Graduate students in Biophysics and Cancer Biology may perform their thesis research in the department. Undergraduates may arrange individual research projects under supervision of faculty.

At the present time, the major areas of basic research investigation in the department include: DNA repair in mammalian cells after ionizing irradiation; studies of the mechanism of tumor hypoxia in animal tumors; development of new anti-cancer drugs to exploit tumor hypoxia; cytogenetic and molecular methods of predicting the sensitivity of individual tumors to cancer therapy; radiolabeled monoclonal antibodies for cancer detection and treatment; studies of oxygen levels in human tumors using polarographic electrodes; clinical trials of a new hypoxic cytotoxic agent (tirapazamine); studies of the late effects of cancer therapy; and techniques of conformal and intensity modulated radiation therapy.

COURSES

Course and lab instruction in the Department of Radiation Oncology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

The following are open to undergraduates and graduate students.

RADO 101. Readings in Radiation Biology
1-18 units, Aut, Win, Spr, Sum (Staff)

RADO 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

RADO 299. Directed Reading in Radiation Oncology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

RADO 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

RADIOLOGY

Emeriti: (Professors) Herbert L. Abrams, Gerald Friedland, David A. Goodwin, Henry H. Jones, Albert Macovski, William H. Northway, Lewis Wexler, Leslie M. Zatz
Chair: Gary M. Glazer
Professors: Scott W. Atlas, Richard A. Barth, Christopher F. Beaulieu, Sanjiv Sam Gambhir, Gary M. Glazer, Gary H. Glover, Michael L. Goris, Robert J. Herfkens, R. Brooke Jeffrey, Barton Lane, Ann Leung, Michael Marks, I. Ross McDougall, Robert E. Mindelzun, Michael Moseley, Sandy Napel, Matilde Nino-Murcia, Norbert J. Pelc, Geoffrey Rubin, George Segall, F. Graham Sommer
Associate Professors: Patrick D. Barnes, Francis Blankenberg, Bruce Daniel, Terry Desser, Huy M. Do, Nancy Fischbein, Dominik Fleischmann, Garry E. Gold, Lawrence Hofmann, Debra M. Ikeda, Beverley Newman, Eric W. Olcott, Daniel M. Spielman, Daniel Y. Sze
Associate Professors (Research): Kim Butts-Pauly, Craig Levin, Sylvia Plevritis
Assistant Professors: Sandip Biswal, Frandics P. Chan, Nishita Kothary, William Kuo, Andrew Quon, Kathryn J. Stevens, Joseph Wu, Greg Zaharchuk
Assistant Professors (Research): Roland Bammer, Xiaoyuan Chen, Rebecca Fahrig, Samira Guccione, Brian Hargreaves, David Paik
Web Site: http://www-radiology.stanford.edu/

Courses given in Radiology have the subject code RAD. For a complete list of subject codes, see Appendix.

The Department of Radiology does not offer degrees; however, its faculty teach courses open to medical students, graduate students, and undergraduates. The department also accepts students in other curricula as advisees for study and research. Undergraduates may also arrange individual research projects under the supervision of the department's faculty. This discipline focuses on the use of radiation, ultrasound, and magnetic resonance as diagnostic, therapeutic, and research tools. The fundamental and applied research within the department reflects this broad spectrum as it relates to anatomy, pathology, physiology, and interventional procedures. Original research and development of new clinical applications in medical imaging is supported within the Radiological Sciences Laboratory.

COURSES

The following courses are open to undergraduates and graduate students.

RAD 101. Readings in Radiology Research—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

RAD 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

RAD 208. Experimental Nuclear Medicine—Computer applications in medicine, particularly in the use of radioisotopes as tracers. Recommended: some knowledge of physiology and calculus.
2 units, Win, Sum (Goris, M)

RAD 220. Introduction to Imaging and Image-Based Human Anatomy—(Same as BIOE 220.) The physics of medical imaging and human anatomy through medical images. Emphasis is on normal anatomy, contrast mechanisms, and the relative strengths of each imaging modality. Labs reinforce imaging techniques and anatomy. Recommended: basic biology, physics, and math.
3 units, Win (Gold, G; Butts-Pauly, K)

RAD 222A. Multimodality Molecular Imaging in Living Subjects I-(Same as BIOE 222A.) Instruments for imaging molecular and cellular events using novel assays. Instrumentation physics, chemistry of molecular imaging probes, and applications to preclinical models and clinical disease management.
4 units, Aut (Gambhir, S; Rao, J)

RAD 222B. Multimodality Molecular Imaging in Living Subjects II—(Same as BIOE 222B.) In vivo imaging techniques and applications to preclinical models and clinical disease management. Focus on cancer research, neurobiology, cardiovascular and musculoskeletal diseases.
4 units, Win (Gambhir, S; Rao, J)

RAD 226. In Vivo Magnetic Resonance Spectroscopy and Imaging—Collections of identical independent nuclear spins are described by the classical vector model of magnetic resonance imaging (MRI); however, interactions among spins, as occur in many in vivo processes, require a more complete description. Physics and engineering principles of these in vivo magnetic resonance phenomena with emphasis on current research questions and clinical applications. Topics: quantum mechanical description of magnetic resonance, density matrix theory, product operator formalism, relaxation theory and contrast mechanisms, spectroscopic imaging, spectral editing, and multinuclear studies. Prerequisites: EE 369B or familiarity with magnetic resonance, working knowledge of linear algebra.
3 units, Win (Spielman, D)

RAD 227. Functional MRI Methods—(Same as BIOPHYS 227.) Basics of functional magnetic resonance neuroimaging, including data acquisition, analysis, and experimental design. Journal club sections. Cognitive neuroscience and clinical applications. Prerequisites: basic physics, mathematics. Recommended: neuroscience.
3 units, alternate years, not given this year

RAD 228. Magnetic Resonance Imaging Programming Seminar—Primarily for students working on research projects involving MRI pulse sequence programming. Introductory and student-initiated topics in seminars and hands-on labs. Image contrast mechanisms achieved by pulse sequences that control radiofrequency and gradient magnetic fields in real time, while acquiring data in an organized manner for image reconstruction. Prerequisites: EE 369B and consent of instructor.
2 units, Aut (Staff), Spr (Hargreaves, B)

RAD 299. Directed Reading in Radiology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

RAD 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

STRUCTURAL BIOLOGY

Chair: Joseph D. Puglisi
Associate Chair: Michael Levitt
Professors: Roger D. Kornberg, Michael Levitt, David B. McKay, Peter Parham, Joseph D. Puglisi, William I. Weis
Associate Professor: K. Christopher Garcia
Associate Professor (Research): Yahli Lorch
Professor (Teaching): Patricia Cross
Courtesy Professor: Axel Brunger, Uel J. McMahan
Courtesy Associate Professor: Vijay Pande
Courtesy Assistant Professor: Zev Bryant

Department Offices: Fairchild Building, D100
Mail Code: 94305- 5126
Phone: (650) 723-7576
Email: structuralbio@med.stanford.edu
Web Site: http://www.med.stanford.edu/school/structuralbio

Courses given in Structural Biology have the subject code SBIO. For a complete list of subject codes, see Appendix.

The department offers course work and opportunities for research in structural biology. Courses fall into two categories: (1) a series of one quarter courses that treat topics of current interest in structural biology and biophysics at an advanced level; and (2) INDE 216, Cells to Tissues, a course for medical students that includes lectures on structure-function relationships of mammalian cells and tissues and a lab on medical histology.

The emphasis of research in the department is on understanding fundamental cellular processes in terms of the structure and function of biological macromolecules and their assemblies. Techniques used include standard methods of biochemistry, cell culture, single-molecule fluorescence spectroscopy, genetic engineering, and three dimensional structure determination by x-ray diffraction, nuclear magnetic resonance spectroscopy and electron microscopy, coupled with the development of computational methods.

GRADUATE PROGRAMS

DOCTOR OF PHILOSOPHY

University requirements for the Ph.D. are described in the "Graduate Degrees" section of this bulletin.

The graduate program in Structural Biology leads to the Ph.D. degree. The department also participates in the Medical Scientists Training Program (MSTP) in which individuals are candidates for both Ph.D. and M.D. degrees.

The graduate program is intended to prepare students for careers as independent investigators in cell and molecular biology. The principal requirement of a Ph.D. degree is the completion of research constituting an original and significant contribution to the advancement of knowledge. The requirements and recommendations for the Ph.D. degree include:

1. Training in physics or chemistry equivalent to that of an undergraduate physics or chemistry major at Stanford.
2. Completion of the following background courses or their equivalents at other institutions:
   a) CHEM 131, 171, 173, and 175
   b) BIOC 200, 201
3. Completion of the following courses or their equivalents:
   a) SBIO 241 and 242
   b) At least four additional graduate-level courses in physical or biological science
   c) MED 255
4. Opportunities for teaching are available during the first nine quarters at the discretion of the advising committee.
5. The student must prepare a dissertation proposal defining the research to be undertaken including methods of procedure. This proposal should be submitted by Winter Quarter of the third year, and it must be approved by a committee of at least three members including the principal research adviser and at least one member from the Department of Structural Biology. The candidate must defend the dissertation proposal in an oral examination. The dissertation reading committee normally evolves from the dissertation proposal review committee.
6. The student must present a Ph.D. dissertation as the result of independent investigation and expressing a contribution to knowledge in the field of structural biology.
7. The student must pass the University oral examination, taken only after the student has substantially completed the research. The examination is preceded by a public seminar in which the research is presented by the candidate.

Applicants to the program should have a bachelor's degree and should have completed at least a year of course work in biology, mathematics, organic chemistry, physical chemistry, and physics. Application forms must be received by the department before December 15 for notification by April 15. Application to the National Science Foundation for fellowship support is also encouraged. Remission of fees and a personal stipend are available to graduate students in the department. Prospective applicants should contact the Department of Structural Biology for further information.

Current topics of research in the department lie in the areas of gene expression; theoretical, crystallographic, and genetic analysis of protein structure; and cell-cell interaction. See http://www.med.stanford.edu/school/structuralbio/ for further information.

COURSES

Course and lab instruction in the Department of Structural Biology conforms to the "Policy on the Use of Vertebrate Animals in Teaching Activities," the text of which is available at http://www.stanford.edu/dept/DoR/rph/8-2.html.

SBIO 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

SBIO 228. Computational Structural Biology—(Same as BIOPHYS 228.) Interatomic forces and interactions such as electrostatics and hydrophobicity, and protein structure in terms of amino acid properties, local chain conformation, secondary structure, domains, and families of folds. How protein motion can be simulated. Bioinformatics introduced in terms of methods that compare proteins via their amino acid sequences and their three-dimensional structures. Structure prediction via simple comparative modeling. How to detect and model remote homologues. Predicting the structure of a protein from knowledge of its amino acid sequence. Via Internet.
3 units, Aut, Spr (Levitt, M)

SBIO 229. The Eukaryote Chromosome—The principles of chromosome structure and function including the structure, dynamics, and topological forms of DNA; units and hierarchies of DNA coiling in chromosomes; centromeres, telomeres, and basis of chromosome maintenance and sorting in mitosis; mechanism of gene activation with particular regard to enhancer, promoter, and terminator sequences; basis of sequence-specific protein-DNA interaction; and organization and assembly of the cell nucleus. Prerequisite: knowledge of basic biochemistry and cell biology.
3 units, not given this year

SBIO 241. Biological Macromolecules—(Same as BIOC 241, BIOPHYS 241.) The physical and chemical basis of macromolecular function. Forces that stabilize biopolymers with three-dimensional structures and their functional implications. Thermodynamics, molecular forces, and kinetics of enzymatic and diffusional processes, and relationship to their practical application in experimental design and interpretation. Biological function and the level of individual molecular interactions and at the level of complex processes. Case studies. Prerequisites: introductory biochemistry and physical chemistry or consent of instructor.
3-5 units, Aut (Herschlag, D; Puglisi, J; Garcia, K; Ferrell, J; Block, S; Pande, V; Weis, W; Harbury, P)

SBIO 242. Methods in Molecular Biophysics—(Same as BIOPHYS 242.) The potential utility of physical approaches to research, and how to evaluate literature that incorporates these methods. Experimental methods in molecular biophysics from theoretical and practical standpoints. Emphasis is on X-ray diffraction and nuclear magnetic resonance spectroscopy. Additional topics include fluorescence spectroscopy, circular dichroism, calorimetry, and separation methods. Prerequisite: physical chemistry or consent of instructor.
3 units, alternate years, not given this year

SBIO 274. Topics in Nucleic Acid Structure and Function—Principles of nucleic acid structure and function. Methods for investigating nucleic acid structure. Limited to graduate students and postdoctoral fellows in structural biology. Prerequisite: consent of instructor.
2 units, Spr (Puglisi, J)

SBIO 299. Directed Reading in Structural Biology—Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

SBIO 399. Graduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

SURGERY

Chair: Thomas M. Krummel

Division Heads: Craig Albanese (Pediatric General Surgery), James Chang (Plastic and Reconstructive Surgery), Ronald Dalman (Vascular Surgery), Carlos Esquivel (Transplant Surgery), Ralph Greco (General Surgery), Michael Longaker (Research), Robert Norris (Emergency Medicine)

Department Office: 701B Welch Road, Suite 225
Mail Code: 94305-5784
Phone: (650) 498-4292
Website: http://surgery.stanford.edu

Courses given in Surgery have the subject code SURG. For a complete list of subject codes, see Appendix.

COURSES

The following courses are open to undergraduates. For graduate and Medical School course offerings, see http://medcatalog.stanford.edu/.

SURG 67Q. Medical Experience in Foreign Lands—Stanford Introductory Seminar. Preference to sophomores. Topics may include the history and international development of Interplast, a nonprofit organization providing free reconstructive surgery for needy children and adults in developing nations; health care at King Faisal Hospital, Saudi Arabia; medical conditions in S. India; eye care in Africa; teaching experiences in Dar es Salaam; and rural health care in Latin America. The role such activities play in U.S. international relationships.
3 units, Win (Wang, N; Laub, D)

SURG 68Q. Current Concepts in Transplantation—Stanford Introductory Seminar. Preference to sophomores. Biological aspects of cell and organ transplantation, including issues that arise in the media. Diseases for which transplantation is a treatment, the state of the art in human transplantation, transplantation of animal tissue into humans (xenotransplantation), development of new tissue and organs in the laboratory (tissue engineering and cloning), and development of drugs and biological strategies to promote long-term survival of the tissue or organ (tolerance). How to write a scientific abstract, critique scientific literature, and research and present topics in contemporary transplantation. Write-2
3 units, Spr (Martinez, O; Krams, S)

SURG 69Q. It's All in the Head: Understanding Diversity, Development, and Deformities of the Face—Stanford Introductory Seminar. Preference to sophomores. How the face conveys moods and emotions, and elicits reactions when disease or genetic disorders leave behind disfigurement. New work by evolutionary and molecular biologists concerning how variations in facial form are elicited; how tissues and molecules interact to form the face. How differences in facial anatomy affect an individual's self-perception and their acceptance in our beauty-conscious society. Write-2
3-4 units, Win (Helms, J)

SURG 101. Regional Study of Human Structure—Preference to seniors. Lectures in regional anatomy and dissection of the human cadaver; the anatomy of the trunk and limbs through the dissection process, excluding the head and neck.
5 units, Win (Gosling, J; Whitmore, I)

SURG 111A/211A. Emergency Medical Technician (EMT-1): Training and Application—(Graduate students register for 211A.) Basics of life support outside the hospital setting; readiness training for emergencies on- or off-campus. Topics include emergency patient assessments, and cardiac, respiratory, and neurological emergencies. Lectures, practicals, and applications. Upon completion of SURG 111A,B,C or 211A,B,C, students are eligible to sit for the National Registry EMT licensure exam.
3 units, Aut (Gilbert, G; Richards, C)

SURG 111B/211B. Emergency Medical Technician (EMT-1): Training and Application—(Graduate students register for 211B.) Continuation of 111A/211A. Approach to traumatic injuries. Topics include head, neck, and trunk injuries, bleeding and shock, burn emergencies, and environmental emergencies. Lectures, practicals, and applications. Upon completion of SURG 111A,B,C or 211A,B,C, students are eligible to sit for the National Registry EMT licensure exam. Prerequisite: 111A/211A.
3 units, Win (Gilbert, G; Richards, C)

SURG 111C/211C. Emergency Medical Technician (EMT-1): Training and Application—(Graduate students register for 211C.) Continuation of 111B/211B. Topics include pediatric, obstetric, and gynecologic emergencies, EMS operations, mass casualty incidents, and assault. Lectures, practicals, and applications. Upon completion of SURG 111A,B,C or 211A,B,C, students are eligible to sit for the National Registry EMT licensure exam. Prerequisite: 111B/211B.
3 units, Spr (Gilbert, G; Richards, C)

SURG 112/212. Advanced Topics in EMS and Training in Teaching BLS Skills—(Graduate students register for 212.) Topics include advanced airway and stroke management, abdominal emergencies, and prehospital pharmacology. Prerequisites: SURG 111 or 211 A-C (or equivalent), EMT -I and CPR certifications, and consent of instructor.
2-3 units, Aut, Win, Spr (Gilbert, G; D'Souza, P; Richards, C)

SURG 199. Undergraduate Research—Investigations sponsored by individual faculty members. Prerequisite: consent of instructor.
1-18 units, Aut, Win, Spr, Sum (Staff)

SURG 223. Wilderness Medicine—Wilderness-related illnesses and injuries; framework for dealing with emergencies in the backcountry. Hands-on workshops. Topics include high altitude medicine, diving medicine, hypothermia, snake and spider envenomations, search and rescue, and travel medicine. Open to all students.
2 units, Spr (Weiss, E)

SURG 267. International Health—Issues in public health with an international perspective. Topics include: colonialism and development, reproductive health, women's health issues, environmental health, maternal child health, primary health care and its evolution, health policy, infectious disease, human rights, and social justice. Guest speakers from UCSF and Berkeley School of Public Health.
1 unit, not given this year

ACADEMIC PROGRAMS AND CENTERS, AND INDEPENDENT RESEARCH LABORATORIES, CENTERS, AND INSTITUTES

Vice Provost and Dean of Research and Dean of the Independent Laboratories, Centers, and Institutes: Ann M. Arvin

Independent Research Laboratories, Centers, and Institutes perform multidisciplinary research that extends beyond the scope of any one of the University's organized schools.

The following laboratories, centers, and institutes report to the Vice Provost and Dean of Research:

Stanford Institute for Economic Policy Research
Geballe Laboratory for Advanced Materials
Edward L. Ginzton Laboratory
Global Climate and Energy Program
W. W. Hansen Experimental Physics Laboratory
Stanford Humanities Center
Freeman Spogli Institute for International Studies
Human-Sciences and Technologies Advance Research Institute
Kavli Institute for Particle Astrophysics and Cosmology
Photon Ultrafast Laser Science and Engineering
Precourt Institute for Energy Efficiency
Stanford Center on Longevity
Stanford Program for Bioengineering, Biomedicine, and Biosciences (BioX)
Stanford Institute for the Quantitative Study of Society
Woods Institute for the Environment
X-Ray Laboratory for Advance Materials

The Hoover Institution on War, Revolution and Peace and the Stanford Linear Accelerator Center (SLAC) report to the President and Provost. SLAC is independently operated under a contract with the Department of Energy.

Following is a description of the activities of these organizations and other academic programs and centers, including research activities, and where applicable, courses offered.

GEBALLE LABORATORY FOR ADVANCED MATERIALS

Director: Zhi-Xun Shen
Deputy Director: Paul McIntyre
Web Site: http://www-lam.stanford.edu

The Geballe Laboratory for Advanced Materials (GLAM) is an Independent Laboratory that reports to the Dean of Research. The Laboratory supports the research activities of more than 20 faculty members from the departments of Applied Physics, Chemical Engineering, Chemistry, Electrical Engineering, Materials Science and Engineering, Mechanical Engineering, and Physics. The multidisciplinary foundations of faculty, students, and research provide a dynamic academic environment for a broad spectrum of scientific research areas including high temperature superconducting materials and devices, mesoscopic devices, magnetic recording and storage media materials, electronic materials, opto-electronic materials, nanoscale materials and phenomena, nanoprobe devices, highly correlated electronic systems, computational materials science, condensed matter theory and physics, polymeric and biological materials, crystal growth, and thin film synthesis of complex oxides.

GLAM also has a newly remodeled Stanford Nanocharacterization Laboratory which provides advanced materials characterization and synthesis facilities for its members as well as for the Stanford materials research community at large. The instruments include a focused ion beam (FIB), scanning electron microscopy (SEM), scanning probe microscopy (SPM), transmission electron microscopy (TEM), x-ray diffraction analysis (XRD), x-ray photoelectron spectroscopy (XPS), and high resolution Auger electron spectroscopy (AES) for characterization and thin film deposition capabilities for synthesis of materials. These facilities are managed by professional staff who also conduct research and development of new tools and techniques in areas related to advanced materials synthesis and characterization. GLAM is also home to the Center for Probing the Nanoscale, a nanoscale science and engineering center sponsored by the National Science Foundation, and to the Stanford Center for Magnetic Nanotechnology. GLAM also maintains a strong link to the X-ray Laboratory for Advanced Materials at the Stanford Synchrotron Radiation Laboratory.

The Geballe Laboratory for Advanced Materials is housed in the Moore Materials Research Building and McCullough Building complex.

STANFORD INSTITUTE FOR ECONOMIC POLICY RESEARCH

Director: John B. Shoven
Deputy Director: Gregory Rosston
Institute Office: 579 Serra Mall
Phone: (650) 725-1874
Web Site: http://siepr.stanford.edu

The primary mission of the Stanford Institute for Economic Policy Research (SIEPR) is to encourage and support research on economic policy issues in areas such as economic growth, technology policies, environmental and telecommunication regulation, tax reform, international trade, and monetary policy. SIEPR pursues four interrelated goals in support of this mission: (1) facilitating graduate student and faculty research on economic policy issues; (2) building a community of scholars conducting policy research; (3) disseminating research findings broadly; and (4) linking academics at Stanford with decision makers in business and government.

SIEPR is a University-wide research institute, involving economists from the schools of Business, Engineering, Law, Humanities and Sciences, as well as the Hoover Institution and the Institute for International Studies. Affiliated faculty and students maintain appointments in their home departments while working on SIEPR projects. In addition, scholars visiting from other institutions may apply for affiliation with SIEPR.

Much of the research at SIEPR takes place in its three research centers and six programs. The Stanford Center for International Development (SCID; Roger G. Noll, Director) fosters research on the economic problems of developing economies and economies in transition, as well as analyzing the political aspects of economic policy reform and historical episodes of reform. For more information about this center call (650) 725-8730. The Center on Employment and Economic Growth (CEEG; Tim Bresnahan, Director) is focusing on the relationship between long-term economic growth, the economic success of individuals and families in their jobs and careers, and the role played by higher education and how it can supply workers and technology in the work force. The program on regulation is part of this center. The Center for Public and Private Finance (CPPF; John B. Shoven and Michael J. Boskin, co-Directors) encompasses work on macroeconomics and monetary policy, tax and budget policy, and finance.

Separate research programs within SIEPR and their directors are the California Policy Program (Thomas MaCurdy); the Energy, Natural Resources, and the Environment Program (James L. Sweeney); the Knowledge Networks and Institutions for Innovation Program (Paul A. David); the Program on the Japanese Economy (Masahiko Aoki); and the Program on Market Design (Susan Athey and Paul Milgrom).

PRECOURT INSTITUTE FOR ENERGY EFFICIENCY

Director: James L. Sweeney
Web Site: piee.stanford.edu

The Precourt Institute for Energy Efficiency (PIEE), founded in October 2006, conducts research and analysis through interdisciplinary teams of faculty, postdoctoral fellows, graduate students, and undergraduates students. The institute's mission is to improve opportunities for and implementation of energy efficient technologies, systems, and practices, with an emphasis on economically attractive deployment. Research includes technology development, economic analysis, policy analysis, and behavioral research.

PIEE adopts a broad systems approach, examining links among technology, policy, and market diffusion in areas such as: energy-efficiency problems in economic sectors such as buildings, transportation, and electric power; supply- and demand-side barriers and solutions to energy-efficiency challenges; combining engineering, economic, and political expertise in devising solutions to energy-efficiency challenges; and the decision making environment in corporations, public organizations, and households.

GEBALLE LABORATORY FOR ADVANCED MATERIALS

Director: Zhi-Xun Shen
Deputy Director: Paul McIntyre
Web Site: http://www-lam.stanford.edu

The Geballe Laboratory for Advanced Materials (GLAM) is an Independent Laboratory that reports to the Dean of Research. The Laboratory supports the research activities of more than 20 faculty members from the departments of Applied Physics, Chemical Engineering, Chemistry, Electrical Engineering, Materials Science and Engineering, Mechanical Engineering, and Physics. The multidisciplinary foundations of faculty, students, and research provide a dynamic academic environment for a broad spectrum of scientific research areas including high temperature superconducting materials and devices, mesoscopic devices, magnetic recording and storage media materials, electronic materials, opto-electronic materials, nanoscale materials and phenomena, nanoprobe devices, highly correlated electronic systems, computational materials science, condensed matter theory and physics, polymeric and biological materials, crystal growth, and thin film synthesis of complex oxides.

GLAM also has a newly remodeled Stanford Nanocharacterization Laboratory which provides advanced materials characterization and synthesis facilities for its members as well as for the Stanford materials research community at large. The instruments include a focused ion beam (FIB), scanning electron microscopy (SEM), scanning probe microscopy (SPM), transmission electron microscopy (TEM), x-ray diffraction analysis (XRD), x-ray photoelectron spectroscopy (XPS), and high resolution Auger electron spectroscopy (AES) for characterization and thin film deposition capabilities for synthesis of materials. These facilities are managed by professional staff who also conduct research and development of new tools and techniques in areas related to advanced materials synthesis and characterization. GLAM is also home to the Center for Probing the Nanoscale, a nanoscale science and engineering center sponsored by the National Science Foundation, and to the Stanford Center for Magnetic Nanotechnology. GLAM also maintains a strong link to the X-ray Laboratory for Advanced Materials at the Stanford Synchrotron Radiation Laboratory.

The Geballe Laboratory for Advanced Materials is housed in the Moore Materials Research Building and McCullough Building complex.

EDWARD L. GINZTON LABORATORY

Director: Robert L. Byer
Deputy Director: Olav Solgaard
Web Site: http://www.stanford.edu/group/ginzton/

The Ginzton Laboratory houses the research activities of a number of faculty members from the departments of Applied Physics, Electrical Engineering, and Mechanical Engineering. The multidisciplinary foundations of faculty, students, and research provide a dynamic academic environment for scientific research in the fields of photonic science and engineering, quantum science and engineering, and nanoscience and engineering, including fiber optics, laser physics and applications, mesoscopic devices, microelectromechanical and microacoustic devices and systems, optoelectronic devices and systems, photonics, nanophotonics and photonic crystals, scanning optical microscopy, quantum cryptography and computing, tunneling and force microscopy, and ultrafast and nonlinear optics.

W. W. HANSEN EXPERIMENTAL PHYSICS LABORATORY (HEPL)

Director: Blas Cabrera
Web Site: http://hepl.stanford.edu/

HEPL is an independent laboratory celebrating over 50 years of fundamental science and engineering research. HEPL faculty and students are engaged in research in accelerator physics, astrophysics, dark matter in the universe, free electron lasers, fundamental tests of relativity in space, gamma ray observations, gravitational wave detection, quantum condensed matter, and space based solar physics studies. Many of the programs involve satellite-based studies in fundamental physics and engineering.

HOOVER INSTITUTION ON WAR, REVOLUTION AND PEACE

Director: John Raisian
Web Site: http://www-hoover.stanford.edu/

The Hoover Institution, founded in 1919 by Stanford alumnus Herbert Hoover, is a public policy research center devoted to the advanced study of politics, economics, and political economy, both domestic and foreign, as well as international affairs. Hoover fellows are the foundation of the research program. This varied and distinguished community of scholars strives to conceive and disseminate ideas defining a free society within the framework of three programs:

American Institutions and Economic Performance—Focus is on interrelationships of U.S. political and legal institutions and economic activity, often referred to as political economy.

Democracy and Free Markets—Focus is on on political economy in countries around the world.

International Rivalries and Global Cooperation—Focus is on interrelationships among countries, by examining issues of foreign policy, security, and trade.

By collecting knowledge, generating ideas, and disseminating both, the Institution seeks to secure and safeguard peace, improve the human condition, and limit government intrusion into the lives of individuals, all of which are consistent with three prominent values: peace, personal freedom, and the safeguards of the American system.

HUMAN SCIENCES AND TECHNOLOGIES ADVANCED RESEARCH INSTITUTE (H-STAR)

Executive Committee: Keith Devlin, Junco Norton, Roy Pea, Byron Reeves, Tom Wasow

Web Site: http://hstar.stanford.edu

H-STAR (Human Sciences and Technologies Advanced Research) is a new Stanford interdisciplinary research institute focusing on how people use technology, how to better design technology to make it more usable and more competitive in the marketplace, how technology affects people's lives, and the innovative use of technologies in research, education, art, business, commerce, entertainment, communication, national security, and other walks of life. Among the problems at the heart of the H-STAR research agendas are:

Reducing complexity of technology to enable its universal uses for work, learning and other vital sectors of life

Closing digital divides across class, race, gender, age, and nations, so that access to and fluencies in technologies provide equal opportunities to learn and work productively

Accelerating innovation in the creation and diffusion of products and services that better meet human needs

Solving security and trust problems of computing, communications, and information systems at home and work and in governmental affairs

Ensuring safety and health with human-centered technology innovations

Within H-STAR are two interdisciplinary centers, CSLI (the Center for the Study of Language and Information) and SCIL (the Stanford Center for Innovations in Learning), and an industry partners program, Media X.

CENTER FOR THE STUDY OF LANGUAGE AND INFORMATION

Director: Tom Wasow
Executive Director: Keith Devlin

Center Offices: Cordura Hall
Mail Code: 94305-4115
Web Site: http://www-csli.stanford.edu/

CSLI supports research at the intersection of the social and computing sciences. It is an interdisciplinary endeavor, bringing researchers together from academe and industry in the fields of artificial intelligence, computer science, engineering, linguistics, logic, education, philosophy, and psychology. CSLI's researchers are united by a common interest in communication and information processing that ties together people and interactive technology.

The technologies of interest at CSLI, at the cutting edge of the information revolution, include natural language processing, voice/user interfaces, ubiquitous computing, collaborative work environments, handheld devices, information appliances, automatic language translation, conversational interfaces, machine learning, intelligent agents, electronic customer relationship management, and distance learning applications.

A primary goal of CSLI is to have a substantial and long-term intellectual impact on the academic and business communities involved with interactive technology. The center's industry research partners and sponsors have access to ideas, faculty, students, and laboratories. Partners can share in the intellectual property of CSLI, and in the governance committees of the center that establish research directions and funding priorities. CSLI accelerates knowledge transfer to products and services by involving executives and researchers in Stanford classrooms. CSLI partners can meet Stanford students studying in over 20 degree programs.

Course work related to the research at CSLI can be found in the "Program in Symbolic Systems" section of this bulletin.

STANFORD CENTER FOR INNOVATIONS IN LEARNING

Director: Roy Pea

Center Offices: Wallenberg Hall (Building 160)
Web Site: http://scil.stanford.edu

The Stanford Center for Innovations in Learning (SCIL) conducts scholarly research to advance the science, technology, and practice of learning and teaching from early childhood through postsecondary education. The center brings together teachers, scholars, and students from around the world to study how to improve formal and informal learning across cultural boundaries.

SCIL is housed in Wallenberg Hall, a state-of-the-art testing ground for technology applications in the classroom. With the support of SCIL technical and advisory staff, more than 70 professors and instructors have taught courses in Wallenberg Hall.

SCIL programs are multidisciplinary and collaborative in nature and include the LIFE Center (Learning in Informal and Formal Environments), a research endeavor funded by the National Science Foundation whose researchers are working toward the development of an integrated multidisciplinary science of learning. Engaging more than 40 faculty members and researchers from the learning sciences, psychology, education, communications, computer science, and developmental, cognitive, and social neuroscience, LIFE is a collaboration with the University of Washington and SRI International.

In addition to its research work, SCIL provides year-round technical and advisory support to University instructors.

MEDIA X

Web Site: http://mediax.stanford.edu/

Media X builds bridges between faculty and student scholars at Stanford and thought leaders from influential companies to address questions of importance within academia and industry. Activities are driven by the inspiration that emerge at the intersections of industry need and academic research, of various disciplines addressing the same question, and of people and technology.

STANFORD HUMANITIES CENTER

Director: John Bender
Associate Director: Matthew Tiews

Web Site: http://shc.stanford.edu/

The Stanford Humanities Center promotes research and education in the humanities at Stanford and nationwide. In particular, it stresses work of an interdisciplinary nature, accomplished through the following programs: one-year residential fellowships for Stanford faculty, faculty members from other institutions, and Stanford graduate and undergraduate students; public presentations such as lectures, conferences, and publications; and a research workshop program that brings faculty and graduate students together regularly to advance ongoing research on topics of interdisciplinary interest.

Fellows are selected on the basis of an open competition. They pursue their own research and participate in a weekly seminar at the center throughout the year. Faculty fellows also contribute to the intellectual life of the Stanford community through activities such as giving departmental courses, participating in ongoing research workshops, or organizing conferences.

CENTER FOR THE INTERDISCIPLINARY STUDY OF SCIENCE AND TECHNOLOGY

Center Director: Michael Friedman
STS Undergraduate Director: Robert McGinn
HPST Graduate Director: Jessica Riskin
Executive Committee: Keith Baker, Paula Findlen, Michael Friedman, Robert McGinn, Eric Roberts

Phone: (650) 725-0119; 725-0714
Web Site: http://cisst.stanford.edu

The Center for the Interdisciplinary Study of Science and Technology (CISST) brings together faculty, undergraduate and graduate programs, and research initiatives concerned with understanding science and technology in an interdisciplinary context. It is concerned equally with the historical, philosophical, and cultural study of science, technology, and medicine, and with critical analysis of issues raised by scientific and technological innovations in contemporary society. CISST houses two major programs: HPST (History and Philosophy of Science and Technology) and STS (Science, Technology, and Society); see their respective sections in this bulletin for their programs. CISST also sponsors visiting scholars, postdoctoral researchers, workshops, and speakers, providing a bridge between the humanities and social sciences on the one hand, and the sciences and engineering on the other.

At the undergraduate level, CISST houses STS, an undergraduate major that grants both B.A. and B.S. degrees. The STS major is designed to foster understanding of issues raised by the natures, consequences, and social shaping of technology and science in the contemporary world. To this end, the STS curriculum combines interdisciplinary, humanistic, and social scientific studies of science and technology in society with attainment of either technical literacy or fundamental understanding in some area of engineering or science. CISST also offers an honors program in STS that is open not only to STS majors but also to students in other majors who wish to pursue a senior honors project that addresses a research question arising from the relations among science, technology and society. Prospective majors or honors students should consult the STS section in this bulletin.

At the graduate level, CISST houses an interdisciplinary graduate program, the Program in History and Philosophy of Science and Technology (HPST), jointly administered by the History and Philosophy departments; it involves faculty and students in these and other departments in the humanities. Prospective students interested in applying to the graduate program should consult the "History and Philosophy of Science and Technology" section of this bulletin, and the admissions requirements of the department in which they wish to apply for a M.A. or a Ph.D.

FREEMAN SPOGLI INSTITUTE FOR INTERNATIONAL STUDIES

Director: Coit D. Blacker
Deputy Director: Michael A. McFaul

Institute office: Encina Hall, 616 Serra Street
Phone: (650) 723-4581
Web Site: http://fsi.stanford.edu

The Freeman Spogli Institute for International Studies (FSI) is Stanford University's primary forum for interdisciplinary research on contemporary international issues and challenges. Working in partnership with the seven schools at Stanford and the Hoover Institution, FSI undertakes collaborative research and teaching which transcend disciplinary, school, and national boundaries. Priority areas of research include: efforts to prevent nuclear proliferation and ensure effective responses to acts of biological or chemical terrorism; linkages among democracy, development, and the rule of law; trade-offs among energy, food security, and environmental degradation; global healthcare delivery and outcomes; political, economic, and social change in the Asia-Pacific region; and national, regional, and multilateral security concerns in the region.

Opportunities for undergraduate research include the CISAC Interschool Honors Program in International Security and the CDDRL Undergraduate Honors Program. The institute manages 10 undergraduate and graduate fellowship programs.

Constituent centers within FSI include: the Center on Democracy, Development, and the Rule of Law; the Center for Health Policy/Center for Primary Care and Outcomes Research; the Center for International Security and Cooperation; and the Walter H. Shorenstein Asia-Pacific Research Center.

FSI administers the following programs: the Forum on Contemporary Europe; the Program on Food Security and the Environment; the Initiative on Distance Learning; the Inter-University Center for Japanese Language Studies; the Program on Energy and Sustainable Development; the Program on Global Justice; the Stanford Center on International Conflict and Negotiation; and the Stanford Program on International and Cross-cultural Education.

For more information about particular FSI centers and programs, contact the center or program directly (area code 650):

Center on Democracy, Development, and the Rule of Law (CDDRL)—724-7197, http://cddrl.stanford.edu/, Michael McFaul, *Director*

Center for Health Policy/Center for Primary Care and Outcomes Research (CHP/PCOR)—723-1020, http://chppcor.stanford.edu/, Alan M. Garber, *Director*

Center for International Security and Cooperation (CISAC)—723-9625, http://cisac.stanford.edu/, Scott D. Sagan, Siegfried S. Hecker, *Co-Directors*

Walter H. Shorenstein Asia-Pacific Research Center (Shorenstein APARC)—723-9741, http://aparc.stanford.edu, Gi-Wook Shin, *Director*

Program on Food Security and the Environment—725-6851; http://fse.stanford.edu, Rosamond Naylor, *Director*

Forum on Contemporary Europe (FCE)—723-4716, http://fce.stanford.edu/, Amir Eshel, *Director*

Initiative on Distance Learning (IDL)—725-3036, http://idl.stanford.edu, Katherine Kuhns, *Director*

Inter-University Center for Japanese Language Studies (IUC)—725-1490, http://www.stanford.edu/dept/IUC/, Steven Carter, Director

Program on Energy and Sustainable Development (PESD)—724-1714, http://pesd.stanford.edu, David G. Victor, *Director*

Program on Global Justice (PGJ)—723-0256, http://globaljustice.stanford.edu, Joshua Cohen, *Director*

Stanford Center on International Conflict and Negotiation (SCICN)—723-2574, http://www.law.stanford.edu/program/centers/scicn/, David Holloway, Allen Weiner, *Co-Directors*

Stanford Program on International and Cross-cultural Education (SPICE)—723-1116, http://spice.stanford.edu/, Gary Mukai, *Director*

UNDERGRADUATE PROGRAMS

INTERSCHOOL HONORS PROGRAM IN INTERNATIONAL SECURITY

Co-Directors: Scott D. Sagan and Paul Stockton

The Center for International Security and Cooperation (CISAC) coordinates a University-wide interschool honors program in international security studies. Students selected for the honors program fulfill individual department course requirements, attend a year-long seminar on international security research, intern at a security-related organization, and produce an honors thesis with policy implications. In order to qualify for the program, students must demonstrate sufficient depth and breadth of international security course work. Ideally, applicants to the program should have taken POLISCI 114S, International Security in a Changing World; MS&E 193, Technology and National Security; and at least one related course such as ECON 150/PUBLPOL 104, Economic Policy Analysis; STS 110/MS&E 197/PUBLPOL 103B, Ethics and Public Policy; SOC 160, Formal Organizations; PUBLPOL 102/SOC 166, Organizations and Public Policy; POLISCI 110B, Strategy, War, and Politics; and POLISCI 114T, Major Issues in International Conflict Management.

Information about and applications to this program may be obtained from the Center for International Security and Cooperation, E223 Encina Hall East, telephone (650) 723-9626, or http://cisac.stanford.edu.

COURSES

IIS 199. Interschool Honors Program in International Security Studies—Students from different schools meet in a year-long seminar to discuss, analyze, and conduct research on international security. Combines research methods, policy evaluation, oral presentation, and preparation of an honors thesis by each student. May be repeated for credit.

10-15 units, Aut, Win, Spr (Stedman)

CDDRL UNDERGRADUATE HONORS PROGRAM

The Center on Democracy, Development, and the Rule of Law (CDDRL) Honors Program provides students majoring in International Relations the opportunity to conduct an independent research project focused on issues of democracy, development, and the rule of law under CDDRL faculty guidance. Students interested in the program consult with their prospective honors advisers in their junior year and must submit their honors thesis proposal in the Spring Quarter of that year. Honors students present a formal defense of their theses in mid-May of the senior year. Prerequisites for the program are a 3.5 grade-point average, a strong overall academic record, and demonstrated skills in writing and conducting independent research.

For more information, contact the Center on Democracy, Development, and the Rule of Law, Encina Hall C100, phone (650) 724-7197; or see http://cddrl.stanford.edu.

COURSES

Required coursework includes INTNLREL 199, an honors research seminar that focuses on democracy, development, and the rule of law in developing countries as well as INTNLREL/POLISCI 114D, CDDRL's flagship undergraduate lecture course taught every Autumn Quarter. Honors students meet bi-weekly with faculty and their peers to present project theses and receive feedback. Students must attend honors college in September before Autumn Quarter classes begin and the weekly CDDRL seminar.

STANFORD INSTITUTE FOR THE QUANTITATIVE STUDY OF SOCIETY

Director: Norman H. Nie

Center Offices: 417 Galvez Mall, Encina Hall West, first floor
Mail Code: 94305-6048
Phone: (650) 723-7242
Web Site: http://www.stanford.edu/group/siqss

Founded in 1998, the Stanford Institute for the Quantitative Study of Society (SIQSS) is a multidisciplinary research institute affiliated with Stanford University's Office of Research and Graduate Policy. The Institute is devoted to producing and sponsoring high-quality empirical social science research about the nature of society and social change.

The central mission of SIQSS is to provide social knowledge for the larger society and to develop the empirical social sciences as a primary tool for understanding social reality. SIQSS seeks to fulfill this mission by undertaking large-scale, socially relevant, theoretically important, and methodologically sound social research. Examples of projects under way include unintended consequences of information and technology in society; education and its social outcomes; conducting the 2000 census under adversity; and an online scholarly journal, *IT & Society* at http://www.stanford.edu/group/siqss/itandsociety/.

Scholars participating in SIQSS research programs and activities are drawn from diverse disciplines throughout Stanford University and from other academic institutions. SIQSS currently supports quantitative research through the following: long-term institute-initiated research programs, Stanford faculty research grants and student research assistantships, Stanford faculty fellows, interdisciplinary seminars, and the American Empirical Series.

MICHELLE R. CLAYMAN INSTITUTE FOR GENDER RESEARCH

Director: Londa Schiebinger
Associate Director: Michelle Cale
Research Director: Andrea Henderson
Program Manager: Jane Gruba-Chevalier
Artist in Residence: Valerie Miner
Art Curator: Karen M. Rapp
Research Fellows: Cynthia M. Friend, Sabine C. Girod, Myra M. Hart, Nancy Hopkins, Michelle Murphy, Kavita Phillip, Sue Rosser, Sheri D. Sheppard

Institute Office: Serra House, 589 Capistrano Way
Mail Code: 94305-8640
Phone: (650) 723-1994
Web Site: http://gender.stanford.edu

Formerly the Institute for Research on Women and Gender, the Clayman Institute contributes to the development of a more equal society for women and men through the creation of innovative research studies and the dissemination of key findings to decision makers in universities, business, communities, and government.

The institute focuses on women and gender issues in science, technology, engineering, and mathematics. It brings together faculty and students in interdisciplinary seminars, and organizes guest lectures and conferences open to the general public. It has three in-house research projects, due to be completed in 2008: on dual career academic couples; on women entrepreneurs; and on why mid-level women leave technology jobs in Silicon Valley. The institute also offers a number of prizes and awards to graduate students and faculty, including seven graduate dissertation fellowships, and hosts up to eight residential research fellows who contribute to the instituteís research studies and broader research agenda.

STANFORD CENTER ON LONGEVITY

Director: Laura Carstensen
Deputy Director: Thomas Rando
Web Site: http://longevity2.stanford.edu/

The aim of the Center is to use increased life expectancy to bring about profound advances in the quality of life from early childhood to old age.

The center sponsors an interdisciplinary mobility project to integrate new technologies and to institute streamlined methods of assisting Stanford faculty with the development of innovative ideas. Major disciplines represented in this project are biology, medicine, engineering, psychology, economics, urban planning, and the d.school.

SOCIAL SCIENCE HISTORY INSTITUTE

Co-Directors: David Brady, Stephen Haber
Institute Office: Building 200, Room 10
Mail Code: 94305-2024
Phone: (650) 723-1466
Email: toney@stanford.edu
Web Site: http://sshi.stanford.edu

The goal of Social Science History Institute (SSHI) is to re-engineer the manner in which students in social science departments learn about historical institutions and data, and the manner in which students in history and related disciplines are trained in social science methods. Historians and social scientists share many of the same substantive interests (for example, the development of economies, political systems, and social structures), but they approach them with different and complementary methods and bodies of evidence. There is, however, a great deal of potential for historians and social scientists to draw on the strengths of each other's methods to improve their own work and to foster increased interaction among the various disciplines that employ history as a laboratory to operationalize social science theories. The Social Science History Institute seeks to realize this potential by transplanting state-of-the-art research methods from classics, economics, history, political science, and sociology across the boundaries of each discipline. Toward this end, SSHI offers conferences and research support for faculty and graduate students.

STANFORD LINEAR ACCELERATOR CENTER

Director: Jonathan Dorfan
Web Site: http://www.slac.stanford.edu/

The Stanford Linear Accelerator Center (SLAC) has two academic departments. The Particle and Particle Astrophysics Department includes several areas of research: theoretical and experimental elementary particle physics, particle astrophysics, cosmology, accelerator and beam physics, and detector instrumentation. The Photon Science Department includes all areas of science done at the Stanford Synchrotron Radiation Laboratory (SSRL), the Photon Ultrafast Laser Science and Engineering Center (PULSE), and Linac Coherent Light Source, currently under construction to become a state-of-the-art X-ray laser research facility.

SLAC is located on 425 acres of Stanford property west of the main campus and is operated under a contract with the United States Department of Energy. SLAC is operated by Stanford as a national facility allowing qualified scientists from Stanford and other universities and research centers worldwide to participate in the research programs. Graduate students at Stanford may carry out Ph.D. research with members of the SLAC faculty; graduate students from other universities also participate in the research programs of visiting groups.

Research assistantships are available for qualified Stanford students by arrangement with individual faculty members. There are also opportunities for summer employment in the research groups at the center. Students interested in research in the areas of high energy physics, particle astrophysics, and accelerator physics should first contact Professor Rafe H. Schindler at the SLAC Graduate Studies Office. Students interested in research opportunities in photon science and SPEAR 3 should contact a member of the SSRL faculty, or other members of the Stanford faculty who use SSRL in their research programs; see http://www.ssrl.slac.stanford.edu/faculty/.

KAVLI INSTITUTE FOR PARTICLE ASTROPHYSICS AND COSMOLOGY (KIPAC)

Director: Roger Blandford
Web Site: http://www-group.slac.stanford.edu/kipac

KIPAC is an independent laboratory funded in part by Stanford University and the Department of Energy. KIPAC was founded to explore new fronts and challenges in particle astrophysics and cosmology, including the study of the very large and the study of the very small as a source of fundamental questions.

PHOTON ULTRAFAST LASER SCIENCE AND ENGINEERING (PULSE)

Director: Phil Bucksbaum
Web Site: http://photonscience.slac.stanford.edu/pulse/index.php

PULSE (Photon Ultrafast Laser Science and Engineering) is based on the construction of the world's first x-ray free electron laser. The construction of this new x-ray source, called the Linac Coherent Light Source (LCLS), is funded by the Department of Energy, and its operation is planned to begin toward the end of calendar 2008. LCLS will provide x-ray beams of unprecedented brightness, delivered in femtosecond pulses with full transverse coherence.

PULSE builds on, and leverages existing strengths in, atomic physics, chemistry, biology, and condensed matter physics. The center plans to focus on ultrafast structural and electronic dynamics in materials science, the generation of attosecond laser pulses, single molecule imaging, and the origin of efficient light harvesting and solar energy conversion in molecular systems during the first three years of operation.

STANFORD SYNCHROTRON RADIATION LABORATORY (SSRL)

Director: Joachim Stöhr

Web Site: http://www-ssrl.slac.stanford.edu

SSRL, a division of the Stanford Linear Accelerator Center, is a National User Facility which provides synchrotron radiation, a name given to x-rays or light produced by electrons circulating in a storage ring at nearly the speed of light. These extremely bright x-rays can be used to investigate forms of matter ranging from objects of atomic and molecular size to man-made materials with unusual properties. The obtained information and knowledge is of great value to society, with impact in areas such as the environment, future technologies, health, and national security. Many of SSRL's 22 faculty hold joint appointments with campus departments.

SSRL has research programs in materials science, chemistry, structural biology, and ultrafast science, as well as accelerator physics and development of advanced sources of synchrotron radiation, especially ultra short pulse, x-ray free electron lasers. The lab is interdisciplinary with graduate students pursuing degrees from Stanford campus departments that include Applied Physics, Chemical Engineering, Chemistry, Earth Sciences, Electrical Engineering, Materials Science and Engineering, Physics, and Structural Biology.

Students interested in working at the facility should contact a member of the SSRL faculty, one of the assistant directors, or other members of the Stanford faculty who use SSRL in their research programs; see http://www-ssrl.slac.stanford.edu/faculty/.

X-RAY LABORATORY FOR ADVANCED MATERIALS (XLAM)

Director: Z-X Shen

Web Site: http://photonscience.slac.stanford.edu/xlam/index.php

XLAM, a research unit within the Photon Science Directorate at SLAC, addresses key challenges associated with the Department of Energy's mission in the areas of condensed matter physics and materials science, providing scientific leadership in using and developing photon science devices and detectors and other SLAC facilities. XLAM also provides theoretical leadership and support for photon/materials-based experiments at SLAC. The emphasis of this core group is in scattering, spectroscopy, and imaging using the Stanford Synchrotron Radiation Laboratory (SSRL) and the Linac Coherent Light Source (LCLS).

The SLAC-based core capabilities include x-ray scattering, x-ray absorption and emission spectroscopy, angle-resolved photoemission, time-resolved scattering and spectroscopy, and spectro-microscopy. The emphasis has been the unique photon source at SLAC and its related spectroscopy and scattering expertise; there are plans for a strong computational component of this core to support the interpretation of experimental data. The SLAC photon based experimental techniques have been applied to strongly correlated materials, magnetic materials, low-dimensional materials, molecular solids, materials made of nano-clusters, surfaces and interfaces, and catalysis. XLAM programs plan to extend this effort to include matters under extreme conditions, such as high magnetic field and high pressure.

XLAM serves as a link between SLAC and the intellectual resources in other Stanford schools such as the Geballe Laboratory for Advanced Materials (GLAM). XLAM serves to couple SLAC and the Stanford campus by engaging the larger Stanford community to participate in DOE's basic energy science research enterprise. XLAM programs co-located with GLAM in the McCullough Building include materials synthesis, local probe microscopy, condensed matter theory, and organic/inorganic interfaces.

WOODS INSTITUTE FOR THE ENVIRONMENT

Directors: Jeffrey R. Koseff, Barton H. Thompson, Jr.

Institute Office: Encina Modular C, 429 Arguello Way
Mail Code: 94305-6030
Phone: (650) 725-5778
Web Site: http://environment.stanford.edu/

The Ward W. and Priscilla B. Woods Institute for the Environment serves as a catalyst and hub for interdisciplinary research, teaching, and problem solving. It draws on the experience and expertise of faculty, students, and staff from all seven Stanford schools, and other institutes, centers, and independent labs. The institute's mission is to promote environmental sustainability, and to help societies learn to meet their resource demands without undermining the ability of the planet to provide for future generations. The Woods Institute is at the core of the campus-wide Initiative on the Environment and Sustainability which leverages Stanford's historic strengths in research, teaching, outreach, and technology transfer, and carries out its mission by seeking solutions to major challenges through innovative research, educating and training environmental leaders, and moving ideas into action by collaborating directly with decision makers. The institute also encourages innovation by funding collaborative faculty research and student projects. The Woods Institute currently concentrates its work in four focus areas: energy and global climate systems; freshwater; land use and conservation; and oceans and estuaries.

UNDERGRADUATE PROGRAMS

GOLDMAN INTERSCHOOL HONORS PROGRAM IN ENVIRONMENTAL SCIENCE, TECHNOLOGY, AND POLICY

The Woods Institute for the Environment coordinates a University-wide interschool honors program in environmental science, technology, and policy. Undergraduates planning to participate in the honors program are required to pursue studies in environmental sciences, technology, and policy, with a concentration in a single discipline. After completion of the prerequisite units, students join small group honors seminars to work with faculty members in the environmental field on an honors thesis that incorporates both scientific principles and policy aspects of environmental issues.

Courses in environmental studies appear under the course listings of the schools of Earth Sciences, Engineering, and Humanities and Sciences. Information about and applications to this program may be obtained by phoning (650) 723-5697.

COURSES

WOODS 195. Interschool Honors Program in Environmental Science, Technology, and Policy—Students from the schools of Humanities and Sciences, Engineering, and Earth Sciences analyze important problems in a year-long small group seminar. Combines research methods, oral presentations, preparation of an honors thesis by each student, and where relevant, field study. May be repeated for credit.

1-9 units, Aut, Win, Spr (Naylor, R; Falcon, W; Vitousek, P Freyberg, D)

LIBRARIES AND COMPUTING RESOURCES

STANFORD UNIVERSITY LIBRARIES AND ACADEMIC INFORMATION RESOURCES

University Librarian and Director of Academic Information Resources: Michael A. Keller

Web Site: http://library.stanford.edu/

Stanford University Libraries and Academic Information Resources (SULAIR) includes more than 30 libraries and programs supporting research, teaching, and learning at Stanford University. SULAIR acquires and delivers library collections in all formats, establishes policies and standards to guide the use of academic information resources, develops training and support programs for academic uses of computers, and maintains a broad array of electronic information resources, including the online library catalog and several hundred article and indexing databases and electronic journal subscriptions.

In each library unit, knowledgeable professional staff provide assistance in locating and using print and online information resources. Subject specialists and reference librarians are available for individual consultation, group classes, demonstrations, and special workshops by request.

Libraries throughout campus provide group and individual study spaces, public computers, personal laptop connections, photocopy machines, and digital scanners for use by Stanford faculty, staff, and students.

For information about library hours, see http://libraryhours.stanford.edu/.

In support of the University's academic mission, Academic Computing provides technology expertise, resources and services directly to students and faculty, and to other organizations that in turn support aspects of the mission. Academic Computing provides information on the use of technology in teaching and learning environments; operates and manages classrooms, public and multimedia computer clusters in Meyer Library and a computer cluster in Tresidder; provides faculty-specific computing resources through the Academic Technology Specialist program and Academic Technology Lab; provides technology support to Stanford University Library services; operates and manages residential computing clusters and services; and supports the Stanford course management system.

Information about the library collections, facilities, services, and policies is available at http://library.stanford.edu/.

Further information about library services and resources is available from the Information Center staff in Cecil H. Green Library at http://infocenter.stanford.edu/, and from reference staff in all University libraries.

CENTRAL CAMPUS LIBRARIES

The Cecil H. Green Library (East and Bing Wings) maintains research collections in the humanities, social sciences, area studies, and interdisciplinary areas. These collections number more than 2.2 million volumes. Major services in Green Library include: the Information Center, the Humanities and Area Studies Reading Room, the Jonsson Social Sciences Reading Room, the Bender Room, foreign language and area collections, loan desk and privileges, current periodicals, newspapers, media and microtexts, interlibrary services, course reserves, the Department of Special Collections, and the University Archives.

The J. Henry Meyer Memorial Library houses the East Asia Library as well as the Academic Computing group of SULAIR and provides instructional support services. In addition, Meyer Library houses the University's Digital Language Lab, computer clusters, technology enhanced classrooms, an Academic Technology Lab, an Assistive Learning Technology Center, and the central offices of Residential Computing and Academic Computing.

BRANCH LIBRARIES

Humanities and Social Sciences Branch Libraries include the Art and Architecture Library, Cubberley Education Library, East Asia Library, Music Library, and Archive of Recorded Sound.

Science Branch Libraries include the Branner Earth Sciences Library, Engineering Library, Falconer Biology Library, Mathematical and Computer Sciences Library, Harold A. Miller Library at the Hopkins Marine Station, Physics Library, and Swain Library of Chemistry and Chemical Engineering.

COORDINATE LIBRARIES

J. Hugh Jackson Library, Graduate School of Business
Director: Kathy Long

Lane Medical Library
Director: Debra Ketchell

Crown Law Library
Director: Paul Lomio

Stanford Linear Accelerator Center Library
Director of Technical Information Services: Patricia Kreitz

HOOVER INSTITUTION ON WAR, REVOLUTION AND PEACE

Director: John Raisian
Web Site: http://www-hoover.stanford.edu/hila/

Since its founding by Herbert Hoover in 1919 as a special collection dealing with the causes and consequences of World War I, the Hoover Institution has become an international center for documentation, research, and publication on political, economic, social, and educational change in the 20th and 21st centuries.

The Hoover Library and Archives include one of the largest private archives in the world and contain outstanding area collections on Africa, East Asia, Eastern Europe, Russia and the former Soviet Union, Latin America, the Middle East, North America, and Western Europe.

Holdings include government documents, files of newspapers and serials, manuscripts, memoirs, diaries, and personal papers of men and women who have played significant roles in the events of these centuries, the publications of societies and of resistance and underground movements, the publications and records of national and international bodies, both official and unofficial, and books and pamphlets, many of them rare and irreplaceable. The materials are open to all Stanford students, faculty, and staff, to scholars from outside the University, and to the public at large.

INFORMATION TECHNOLOGY SERVICES (IT SERVICES)

Web Site: http://it-services.stanford.edu

IT Services manages the University's central information technology infrastructure and provides hundreds of services and applications for use in academic and business activities. Support is provided in four layers:

- Participation and client-focused leadership in institutional IT planning, including strategies for data center expansion, centrally managed storage and backup, and business continuity and disaster recovery.
- Applications and services for departments and end-users including email, calendaring, wireless connectivity, web authentication, and Windows and Linux server hosting. These services are supported by a help desk, contract-support consultants, online self-help, and training.
- Applications and services that support other campus service providers, including the help desk, change management, and network registration systems.
- A communications and collaboration infrastructure robust enough to support advanced network, voice, and web-based services.

To learn about the variety of information technology resources available at Stanford, see http://computing.stanford.edu. For assistance with technology services at Stanford, contact the Stanford IT Help Desk at (650) 725-HELP (5-4357) or submit a request through http://helpsu.stanford.edu.

THE CONTINUING STUDIES PROGRAM

Dean and Associate Provost: Charles Junkerman
Program Offices: 482 Galvez Mall
Mail Code: 94305-6079
Phone: (650) 725-2650; Fax: (650) 725-4248
Email: continuingstudies@stanford.edu
Web Site: http://continuingstudies.stanford.edu

The Continuing Studies Program provides adults from Stanford and surrounding communities the opportunity to take classes on a part-time basis for intellectual enrichment, both personal and professional. Courses and events are offered in all four academic quarters, with over 350 courses planned for the 2007-08 academic year.

The faculty are primarily drawn from the ranks of the University's professoriate. The program presents a wide variety of courses, with a central concentration in the liberal arts, including literature, history, art and architecture, and music.

Tuition discounts are available to University employees, Stanford students and faculty, Stanford Alumni Association members, educators, and those over age 65.

For a course catalogue, contact the Continuing Studies Program by mail, phone, or email as above.

The Continuing Studies Program also administers the Master of Liberal Arts Program and Summer Session.

MASTER OF LIBERAL ARTS PROGRAM

Associate Dean and Director: Linda Paulson
Participating Faculty: David Abernethy (Political Science), Clifford Barnett (Anthropology), Russell Berman (Comparative Literature and German), Marc Bertrand (French, emeritus), Eavan Boland (English), John Bravman (Material Sciences and Engineering), Bliss Carnochan (English), Clayborn Carson (History), Wanda Corn, (Art and Art History), George Dekker (English), Carol Delaney (Anthropology, emeritus), Gerry Dorfman (Hoover Institute and Political Science), Arnold Eisen (Religious Studies), Michele Elam (English), Martin Evans (English), Anne Fernald (Psychology), Paula Findlen (History), John Freccero (French and Italian), Larry Friedlander (English), Kenneth Fields (English), Hester Gelber (Religious Studies), Albert Gelpi (English), Barbara Gelpi (English), Monika Greenleaf (Slavic Languages), Robert Gregg (Religious Studies), Tom Grey (Music), Hans Ulrich Gumbrecht (French and Italian), Van Harvey (Religious Studies), Stephen Hinton (Music), Charles Junkerman (Continuing Studies Program), Nancy Kollmann (History), Marsh McCall (Classics), Robert McGinn (Management Science and Engineering, and Science, Technology, and Society), Mark Mancall (History), Joseph Manning (Classics), Diane Middlebrook (English, emeritus), Thomas Moser (English), David Palumbo-Liu (Comparative Literature), Linda Paulson (English), Denis Phillips (Education, and, by courtesy, Philosophy), Jack Rakove (History), Ronald Rebholz (English), Rush Rehm (Drama), John Rick (Anthropological Sciences), John Rickford (Linguistics), Paul Robinson (History), Ramón Saldívar (English), Paul Seaver (History), Thomas Sheehan (Religious Studies), Robert Siegel (Microbiology and Immunology), Stephen Stedman (Freeman Spogli Institute for International Studies, and, by courtesy, Political Science), Thomas Wasow (Linguistics), Lee Yearley (Religious Studies), Ernlé Young (Center for Biomedical Ethics), Steven Zipperstein (History)

Program Offices: 482 Galvez Mall
Mail Code: 94305-6079
Phone: (650) 725-0061
Email: mlaprogram@stanford.edu
Web Site: http://mla.stanford.edu

Program Description—The Master of Liberal Arts (MLA) program aims to provide a flexible, interdisciplinary program for returning adult students who seek a broad education in the liberal arts. The underlying premise of the MLA program is that knowledge gained through an interdisciplinary course of study leads to intellectual independence and satisfaction not always found in discipline-based programs of study. The goals of the MLA program are to develop advanced critical thinking, to foster intellectual range and flexibility, and to cultivate an individual's ability to find the connections among different areas of human thought: art, history, literature, music, philosophy, political science, science, and theology.

The program is designed with part-time students in mind: seminars meet in the evening, and students complete the degree in 4-5 years. All master's seminars are taught by members of the Stanford faculty. Seminar size is limited to 20 students.

Degree Requirements—Candidates for the MLA degree must complete a minimum of 50 units of course work with at least a grade point average of 3.3 (B+). These units must include a three quarter foundation course (equal to 12 units total), one 4-unit core introductory seminar for second-year students, at least seven 4-unit MLA seminars, and a 6-unit master's thesis. Students must also fulfill distribution requirements in each of the following areas: humanities; social science or social policy; and science, engineering, or medicine.

Foundation Course—During the Autumn, Winter, and Spring following admission to the program, there is a three quarter foundation course required of all students. The purpose of this course is to lay the groundwork for the interdisciplinary, intercultural studies the student will shortly undertake. The foundation course will introduce students to the broad framework of history, literature, philosophy, political science, and art.

Core Seminar—During the first quarter of the second year, new students take the core introductory seminar, The Plague: An Introduction to Interdisciplinary Graduate Study. This seminar aims to prepare students for interdisciplinary graduate work at Stanford. Students concentrate on writing a critical graduate paper, conducting library research, presenting the results of their research, and productively participating in a collaborative seminar.

MLA Seminars—Students are required to take at least seven MLA seminars of four units each. Each year, at least nine seminars are offered in the MLA program. Each MLA course requires a substantial seminar paper. Students are encouraged to use these papers as a way to investigate new fields of interest, as well as a way to develop different perspectives on issues in which they have an ongoing interest.

Master's Thesis—The MLA program culminates in the master's thesis. Students approaching the end of the program write a thesis, approximately 75-100 pages in length, that evolves out of work they have pursued during their MLA studies. The thesis is undertaken with the prior approval of the MLA program, and under the supervision of a Stanford faculty member. During the process of writing the thesis, students are members of a work-in-progress group, which meets regularly to provide peer critiques, motivation, and advice. Each student presents the penultimate draft of the thesis to a colloquium of MLA faculty and students, in preparation for revising and submitting the final draft to the adviser and to the MLA program.

Enrollment Requirements—MLA students must enroll for each academic year from the time of original matriculation until conferral of the degree. To remain active, students must either: (a) complete a minimum of two courses (eight units) in one academic year, defined as from the beginning of Autumn Quarter through the end of the following Summer Quarter; or (b) be actively working on their theses and regularly attend a minimum of three-quarters of the work-in-progress meetings from the time the student enrolls in work-in-progress through graduation.

Timeline for completion—All requirements for the Master of Liberal Arts degree must be completed within five years after the student's first term of enrollment in the program. If extraordinary circumstances prevent completion within five years, a student may submit a written petition for a maximum one-year extension to the Associate Dean and Director. This petition is reviewed by a committee which makes a recommendation to the Director; the final decision is at the discretion of the Director. To be considered, the petition must be submitted on or before May 1 of the student's fifth year in the program.

Registration—Master of Liberal Arts students register for courses online through the Continuing Studies web site.

COURSES

101A. Foundations I—Required for first-year MLA students.
4 units, Aut (Steidle)

101B. Foundations II—Required for first-year MLA students.
4 units, Win (Steidle)

101C. Foundations III—Required for first-year MLA students.
4 units, Spr (Berman)

102. The Plague: An Introduction to Interdisciplinary Graduate Study
4 units, Aut (Paulson)

214. Romanticism and Modernism in 19th-Century Paris
4 units, Aut (Bertrand)

235. Clash of Civilizations? Islam and the West Today
4 units, Aut (Berman)

236. Imagining Rome
4 units, Win (Gelpi, Gelpi)

237. Belief and Doubt in the British Enlightenment
4 units, Win (Bertrand)

238. Nazi Culture and California Exile
4 units, Win (Berman)

239. Slave Narratives
4 units, Win (Elam)

240. Family Fictions
4 units, Spr (Palumbo-Liu)

241. Shakespeare and Music
4 units, Spr (Chang)

242. Eccentric Concord: New England Laboratory of American Liberalism
4 units, Spr (Junkerman)

243. Negotiating for the UN
4 units, Spr (Stedman)

244. Love and Death in the Middle Ages
4 units, Sum (Gelber)

245. Shakespeare through Performance IX
4 units, Sum (Friedlander)

SUMMER SESSION

Associate Dean: Patricia Brandt
Director of Admission and Student Services: Teresa Nishikawa
Program Offices: 482 Galvez Mall
Mail Code: 94305-6079
Phone: (650) 723-3109; Fax: (650) 725-6080
Email: summersession@stanford.edu
Web Site: http://summer.stanford.edu

Students attending Stanford Summer Session are enrolled in either a regular degree program, the Summer Visitor Program, or the Summer College program for High School Students.

The regular degree program is for students who are candidates for a Stanford degree and who are continuing their academic work in Summer Quarter. Degree-seeking Stanford students should indicate on Axess during Spring Quarter that they intend to register for Summer Quarter. Separate application is not required.

The Summer Visitor Program is for students who are not presently candidates for a Stanford degree. It is open to students who are currently enrolled in or have graduated from another college or university. Qualified high school students who have completed at least their sophomore year may apply to the Summer College program.

Students in Summer Session, in general, enjoy the privileges of students in the regular degree programs except that work completed cannot be applied toward a Stanford degree or credential until the student has been admitted to regular standing. Admission as a summer visitor does not imply later admission to matriculated status. However, should the visitor matriculate at a later date through normal admission procedures, the summer work may be applied toward the requirements for a Stanford degree or credential at the discretion of the University or academic department.

For more information, contact Summer Session by email, mail, phone, or fax using the listings above. Information is updated annually in January and may also be found online at http://summer.stanford.edu.

STUDENT AFFAIRS

Vice Provost for Student Affairs: Greg Boardman
Web Site: http://www.stanford.edu/dept/vpsa/

Student Affairs supports the academic mission of the University by fostering a climate conducive to living and learning in a diverse community. The division encompasses programs and services for undergraduates and graduate students which include the Office of Residential Education, the University Registrar, the Vaden Health Center, the Career Development Center, the Office of Accessible Education, the Graduate Life Office, Judicial Affairs, Bechtel International Center, Asian American Activities Center, Black Community Services Center, El Centro Chicano, LGBT Community Resources Center, Native American Cultural Center, Women's Community Center, and the Office of Student Activities. The Vice Provost for Student Affairs reports directly to the Provost and is responsible for providing leadership, policy direction, administrative support for budget, personnel, facilities, and development, as well as oversight of the efficiency and effectiveness of each of the division's units. The Vice Provost interacts with the President, the Provost, the University Cabinet, faculty, schools, department representatives, students, and parents. The Vice Provost also serves as an ex officio member of the Senate of the Academic Council.

OFFICE OF ACCESSIBLE EDUCATION (OAE)

Offices: 563 Salvatierra Walk
Phone: (650) 723-1066; TDD (650) 723-1067
Web Site: http://www.stanford.edu/group/OAE/

The Office of Accessible Education provides services and resources to students with disabilities through its four primary centers.

STUDENT DISABILITY RESOURCE CENTER (SDRC)

The SDRC coordinates academic and other accommodations for undergraduates and graduate students who have disabilities including mobility impairments, chronic illness, sensory disabilities, learning disabilities, and psychological disabilities. The center's goal is to enable students with disabilities to participate fully in the educational experience at Stanford while meeting the academic standards maintained by the university.

In accordance with the provisions of the Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973, the SDRC offers an array of accommodations and auxiliary aids and services to students with documented disabilities. Direct support services include, but are not limited to, notetaking, Brailling, oral or sign language interpretation, stenocaptioning, books on tape or electronic text, examination accommodations, and special housing arrangements. During the academic year, the SDRC runs a golf cart service called DisGo Cart for use by students who have temporary and permanent mobility impairments or who use a wheelchair. To arrange for an on-campus ride call 725-2484 (5-CHUG).

ASSISTIVE LEARNING TECHNOLOGY CENTER (ALTEC)

ALTeC is the technology arm of the OAE. It provides resources to make information technology and education more accessible for those with disabilities, such as accessible PC and Mac computer workstations, speech recognition and screen reading software, alternative input devices, and numerous non-computer accommodations.

SCHWAB LEARNING CENTER

The Schwab Learning Center offers enhanced services for students with learning differences (LD) and attention deficit hyperactivity disorder (ADHD) including screening assessments for learning differences, individual learning strategy sessions, and tutoring in academic disciplines.

CENTER FOR UNIVERSAL DESIGN IN EDUCATION

Application of the principles of universal design for instruction (UDI) represents a new approach to teaching that promotes proactive design and use of inclusive instructional practices that benefit all students. The center seeks to advance the development of instructional methods, tools, and strategies that are flexible, customizable, and accessible to students from different backgrounds, learning styles, abilities, and disabilities in a variety of learning contexts.

CAREER DEVELOPMENT CENTER

Center Office: 563 Salvatierra Walk
Web Site: http://cardinalcareers.stanford.edu

Counseling Services—Monday, Tuesday, Wednesday, and Friday, 9 a.m. to 12 noon, 1 p.m. to 5 p.m., Thursday, 9 a.m. to 12 noon, 1 p.m. to 6 p.m.; (650) 725-1789.

Employment Services—Monday through Friday, 8:15 a.m. to 4:30 p.m.; (650) 723-9014.

Reference File Services—Monday through Friday, 9 a.m. to 12 noon, 1 p.m. to 3 p.m.; (650) 723-1548.

The Career Development Center (CDC) offers services such as counseling, workshops, presentations, on-campus recruiting, job/internship databases, reference file services, library resources, and alumni networking, to help students make informed decisions and to plan for life after Stanford.

Services are open to undergraduates and graduate students, and all students are encouraged to visit in person or via the web. Programs and services are free to students; limited services are available to alumni and student spouses and domestic partners.

The following suggestions may assist students in getting the most out of the CDC:

- Visit early in a Stanford career.
- Gather general career information through the career resource library, jobs and internship database, handouts, and alumni network.
- Inquire about individual counseling for all stages of career planning and development.
- Participate in workshops and other programs to clarify career goals.
- Use the Cardinal Recruiting Program as a convenient way to interview with employers; or use the Reference File Service to ease the management of applications for graduate school or employment.

COMMUNITY CENTERS

There are six ethnic and community centers that support students who seek services associated with a particular group or community. Each center has its own site and professional staff who advise and counsel students. In addition, the centers sponsor programs throughout the year that foster intellectual, personal, and cultural growth. Detailed information is available on the following web sites:

- Asian American Activities Center: http://www.stanford.edu/group/a3c/
- Black Community Services Center: http://www.stanford.edu/dept/BCSC/
- El Centro Chicano: http://www.stanford.edu/dept/elcentro/
- LGBT Community Resources Center: http://lgbt.stanford.edu/
- Native American Cultural Center: http://www.stanford.edu/dept/nacc/
- Women's Community Center: http://womenscntr.stanford.edu/

DEAN OF STUDENTS

Dean of Students: Maureen H. Powers
Office: Tresidder Memorial Union
Phone: (650) 723-2733
Web Site: http://www.stanford.edu/dept/dos/

The Office of the Dean of Students seeks to ensure that the University is sensitive and responsive to the needs of students. The office is responsible for administrative offices and community centers including: the Asian American Activities Center; Black Community Services Center; El Centro Chicano; Office of Judicial Affairs; Lesbian, Gay, Bisexual, and Transgender Community Resource Center; Native American Cultural Center/American Indian Program Office; Office of Multicultural Education; Old Union; Tresidder Memorial Union; the Office of Student Activities, including Greek Affairs; Organization Conduct Board; and the Women's Community Center. The office also provides consultation and coordination with approximately 600 student organizations, student media, activities, publications, and the Associated Students of Stanford University. Students are welcome to visit the Dean of Students to discuss ideas, personal issues, or general concerns about student life.

GRADUATE LIFE OFFICE

Graduate Life Office: Escondido Village Office, 859 Escondido Road
Graduate Community Center: 750 Escondido Road
Web Site: http://glo.stanford.edu

The Graduate Life Office (GLO) works with students on and off campus and with student groups, including Community Associates (student residence staff), the Graduate Student Programming Board, and the Graduate Student Council, to create an inclusive environment through programs in the residences and campus-wide. The recently constructed Graduate Community Center (GCC) serves as a centrally-located focal point for meetings and activities in the graduate community.

The GLO staff also works with individual students who need information and support or who may be experiencing personal difficulties. Staff members are knowledgeable about and have access to support and resources available throughout the University.

GRADUATE STUDENT RESIDENCE PROGRAM

The University's philosophy of graduate student housing is based on the premise that supporting high quality graduate scholarship and research is central to the mission of the University. By providing affordable housing in proximity to academic resources, the University creates an environment conducive to research and intellectual dialogue among students, their peers, and faculty members.

HAAS CENTER FOR PUBLIC SERVICE

The Haas Center for Public Service connects academic study with community and public service to strengthen communities and develop effective public leaders. The Center aspires to develop aware, engaged, and thoughtful citizens who contribute to the realization of a more just and humane world.

To accomplish these objectives, the center collaborates with associated units at Stanford to implement programs in the following areas of work. Through the center's fellowship programs, undergraduates perform summer internships in nonprofit organizations, foundations and government agencies locally, nationally, and internationally. The postgraduate public service program helps students, particularly graduating seniors, identify opportunities that will launch their public service careers in nonprofit and government agencies, and in the private sector in service-related positions. Postgraduate fellowships allow graduating seniors to work with a mentor in a nonprofit or public agency for a year. With support from the center, Stanford faculty members have created service-learning courses that involve Stanford students in providing direct service and community-based research efforts in collaboration with local schools and other partner agencies. The center's Public Service Scholars Program supports seniors writing honors theses that combine academic research with service to communities. Faculty from Stanford's School of Education collaborate with center staff to provide curriculum guidance and training for tutors and mentors at nearby schools. Another program trains Stanford students to bring results of scientific research to neighboring schools. The federally supported Community Service Work-Study program, administered in conjunction with the University's Financial Aid Office, allows students to satisfy work-study obligations year-round by working in community organizations and public agencies. The Public Service Leadership Fellows Program provides an opportunity for students who want to be intentional about their leadership development. Center staff also provides leadership development through training, advising, and resources to Stanford in Government, Alternative Spring Break, and other student groups engaged in service.

The Haas Center houses one associated program: the Center on Philanthropy and Civil Society, a program of the Institute for Research in the Social Sciences (IRiSS).

Students interested in public service fellowships, service-learning courses, community-based research, public and community service internships for youth and education, or service organization leadership development should visit the Haas Center, see http://haas.stanford.edu, or call (650) 723-0992.

BECHTEL INTERNATIONAL CENTER

Web Site: http://www.stanford.edu/dept/icenter/

The Bechtel International Center (I-Center) is a meeting place for students and senior research scholars at Stanford from throughout the world and for internationally oriented U.S. students, faculty, and short-term visitors on the campus. Through a variety of social, cultural, and educational programs, I-Center facilities are utilized to acquaint students and scholars with the life of the University and the community, and to bring them together in activities of mutual interest.

The Center believes that international educational exchange nurtures a lifelong global perspective, and plays a key role in supporting Stanford's standing as a truly international university in the following ways:

- Provides information about and assistance with obtaining and maintaining legal status in the U.S. to foreign students, scholars, and Stanford departments.
- Advises U.S. students who are pursuing scholarships for study and research abroad.
- Enables foreign students, scholars, and their family members at Stanford to receive maximum academic, cultural, and personal benefit from their stays in the U.S.
- Contributes to international activities at Stanford by helping to create a welcoming and supportive environment that is responsive to the needs of the international community.
- Facilitates professional meetings between visiting international delegations and their Stanford counterparts.
- Provides opportunities for Stanford students, faculty, staff, and members of the local community to broaden their horizons by interacting with people from different cultures through programs to increase international awareness and understanding.

JUDICIAL AFFAIRS AND STUDENT CONDUCT

In March 1996, President Gerhard Casper convened the Committee of 15 and requested a review of the student judicial system at the University under the then-existing Legislative and Judicial Charter of 1968. During the following year, the Committee of 15 conducted an extensive review of the existing charter and process and drafted a new charter to take its place. The Student Judicial Charter of 1997 was approved by the Associated Students of Stanford University, the Senate of the Academic Council, and the President of the University during Spring Quarter 1996-97 and Autumn Quarter 1997-98, replacing the earlier charter and becoming effective in January 1998. Cases of alleged violations of the University's Honor Code, Fundamental Standard, and other student conduct policies now proceed through an established student judicial process based upon the Student Judicial Charter of 1997, which can be found in its entirety at the University's Office of Judicial Affairs web site at http://judicialaffairs.stanford.edu. The web site also contains the policies, rules, and interpretations, as well as the University's Student Conduct Penalty Code, applicable to those students found responsible for violating the Honor Code, the Fundamental Standard, or other University policy or rule.

When a violation of the Fundamental Standard, Honor Code, or other University policy or rule governing student conduct is alleged, or whenever a member of the University community believes such a violation has occurred, he or she should contact the Office of Judicial Affairs, at Tresidder Memorial Union, 2nd floor, phone (650) 725-2485, fax (650) 736-0247, or email judicial.affairs@stanford.edu.

The primary codes of conduct for students are the Fundamental Standard and Honor Code.

THE FUNDAMENTAL STANDARD

Students at Stanford are expected to know, understand, and abide by the Fundamental Standard, which is the University's basic statement on behavioral expectations articulated in 1896 by Stanford's first President, David Starr Jordan, as follows:

"Students are expected to show both within and without the University such respect for order, morality, personal honor, and the rights of others as is demanded of good citizens. Failure to do this will be sufficient cause for removal from the University."

Actions that have been found to be in violation of the Fundamental Standard include:

Physical Assault
Property Damage
Forgery
Theft
Sexual harassment or other sexual misconduct
Misrepresentation in seeking financial aid, University housing, University meals, or other University benefits
Driving on campus while under the influence of alcohol
Misuse of computer equipment or email
Sending threatening or obscene messages

There is no standard penalty which applies to violations of the Fundamental Standard. Penalties range from a formal warning to expulsion. Each case is fact specific; considerations include the nature and seriousness of the offense, the motivation underlying the offense, and precedent in similar cases.

THE HONOR CODE

The Honor Code is the University's statement on academic integrity. It is essentially the application of the Fundamental Standard to academic matters. Provisions of the Honor Code date from 1921, when the honor system was established by the Academic Council of the University Faculty at the request of the student body and with the approval of the President. The Honor Code reads:

"A. The Honor Code is an undertaking of the students, individually and collectively:
  1) that they will not give or receive aid in examinations; that they will not give or receive unpermitted aid in class work, in the preparation of reports, or in any other work that is to be used by the instructor as the basis of grading;
  2) that they will do their share and take an active part in seeing to it that others as well as themselves uphold the spirit and letter of the Honor Code.

"B. The faculty on its part manifests its confidence in the honor of its students by refraining from proctoring examinations and from taking unusual and unreasonable precautions to prevent the forms of dishonesty mentioned above. The faculty will also avoid, as far as practicable, academic procedures that create temptations to violate the Honor Code.

"C. While the faculty alone has the right and obligation to set academic requirements, the students and faculty will work together to establish optimal conditions for honorable academic work."

Examples of conduct that have been found to be in violation of the Honor Code include:

Copying from another's examination paper or allowing another to copy from one's own paper
Unpermitted collaboration
Plagiarism
Revising and resubmitting a quiz or exam for regrading without the instructor's knowledge and consent
Representing as one's own work the work of another
Giving or receiving aid on an academic assignment under circumstances in which a reasonable person should have known that such aid was not permitted

For more information, see the Interpretations and Applications of the Honor Code at http://www.stanford.edu/dept/vpsa/judicialaffairs/guiding/honorcode.int.htm. The standard penalty for a first offense is a one quarter suspension from the University and 40 hours of community service. In addition, many faculty members issue a 'No Pass' for the course in which the violation occurred.

OFFICE OF RESIDENTIAL EDUCATION

Web Site: http://www.stanford.edu/dept/resed/

The Office of Residential Education is responsible for developing the policies, programs, and staffing which support the intellectual, educational, and community-building activities in student residences. The conviction behind the Stanford residence program is that formal teaching, informal learning, and personal support in residences play an important role in a Stanford education.

RESIDENTIAL EDUCATION PROGRAM

The Residential Education program provides Stanford undergraduates with a small community experience within a large research university. Residential Education programs extend the classroom into the residences and complement the academic curriculum with activities and experiences that contribute to students' preparation for a life of leadership, intellectual engagement, citizenship, and service. An extensive network of staff, including many that live in the residence halls, supports students during their undergraduate careers.

RESIDENCE DEANS

Residence Deans provide assistance to on- and off-campus students. They can advise students about personal matters, occasionally intervene directly in behavioral problems or mental health concerns, and assist with personal emergencies. Advice is also available on issues of academic probation or suspension, leaves of absence, special concerns of women or minorities, and administrative matters. Residence Deans work closely with the Dean of Students and other University offices. They are assigned to specific residences and to off-campus students. For further information, undergraduates should call Residential Education at (650) 725-2800, and graduate students should call the Graduate Life Office at (650) 723-1171.

OFFICE OF STUDENT ACTIVITIES

Web Site: http://www.stanford.edu/dept/OSA/

The Office of Student Activities supports student activities, over 600 student organizations, the ASSU, and sororities and fraternities through such as publications, workshops, one-on-one consultation, and major event planning support. The OSA also provides fundraising expertise for student groups and leadership opportunities for students.

VOLUNTARY STUDENT ORGANIZATIONS

At its March 1963 meeting, the Board of Trustees adopted the following policy:

"Students are encouraged to study, discuss, debate, and become knowledgeable about contemporary affairs. Expressing opinions or taking positions with respect to these matters is up to the individual students or to volunteer groups of students so constituted that they are authorized to speak for their members. This is not a function of student government at Stanford.

"All students are required to become members of the Associated Students of Stanford University, which represents them with respect to student affairs on the Stanford campus. The student government, under this policy, is not authorized to speak for students on other matters.

"Under such regulations as may be established from time to time by the President of the University, students may form voluntary organizations constituted to speak for their members with respect to matters outside the scope of student government, provided such organizations clearly identify themselves and, in any public statements, make it clear that they do not represent or speak for the University or the Associated Students.

"Any questions concerning the interpretation and application of this policy shall be resolved by the President of the University."

Voluntary student organizations are those organizations: (1) in which membership is not mandatory and is nondiscriminatory, (2) in which membership is both open and limited to current Stanford students registered in a degree-granting program, (3) in which students make all organizational decisions, and (4) whose purposes and procedures are consistent with the goals and standards of the University. In order to use University facilities, the Stanford name, or to receive ASSU funding, all voluntary student organizations must register with the University through the Office of Student Activities, Old Union, room 206.

As a condition of registration, each voluntary student organization must file and have approved each of the following:

1. A statement of purpose and organizational constitution.
2. A statement about membership eligibility.
3. Clear procedures for officer elections.
4. Identification of the authorized representatives of the group, who must be a currently registered student, and at least five active members in the organization who are currently registered students.

Each voluntary student organization must renew its registration with the University annually, early in Autumn Quarter, by submitting new registration materials.

If a voluntary student organization that is registered with the University seeks to use University facilities for meetings open to more than its own members and to specifically invited guests, such meetings shall be subject to the regulations of the Committee on Public Events. All organization events held in University facilities must receive event approval from the Office of Student Activities and Stanford Events.

A voluntary student religious organization may hold open meetings in University facilities only with the approval of the Office of the Dean of the Chapel.

A registered voluntary student organization may advocate publicly a position on a public issue, provided the organization clearly identifies itself, and provided such an organization in any public statement makes clear it does not represent or speak for the University or for the Associated Students.

No student group may use University space or facilities or receive other University support for purposes of supporting candidates for public office. Groups may use public places such as White Plaza for tables, speeches, and similar activities; may have intermittent use of on-campus meeting rooms; and may request to reserve auditoriums and similar space for public events including speeches by political candidates as long as all University guidelines are followed.

TRESIDDER MEMORIAL UNION

Tresidder Memorial Union (TMU) is a center of community activity on the Stanford campus. It houses a variety of food services; meeting rooms for special occasions; a ticket office, a campus information center; branch offices and ATMs for the Stanford Federal Credit Union, and Wells Fargo; ATMs for Bank of America; a fitness center; and a hair styling shop. Tresidder Express carries groceries, magazines, and sundries.

TMU is also the home of the Dean of Students Office, Judicial Affairs, and the office of the Vice Provost for Student Affairs.

VADEN HEALTH CENTER

Center Office: 866 Campus Drive
Web Site: http://vaden.stanford.edu

The Allene G. Vaden Health Center strictly protects the confidentiality of information obtained in medical care and counseling.

MEDICAL SERVICES

Medical Services (650-498-2336, ext. 1) is the first stop for diagnosis and treatment of illness, injury, and ongoing conditions, as well as preventive counseling and education. Services (without charge) include:

- Medical appointments in general medicine and sports medicine.
- Medical advice for routine concerns throughout the day. When Medical Services is closed, advice for urgent conditions is available from the on-call physician.
- Referral to specialists, primarily at Stanford Hospital and Clinics and Menlo Medical Clinic.
- Additional services (fees may apply): allergy injections, immunizations, travel services, physical exams for employment and scholarships, HIV testing, laboratory, X-rays, pediatric immunizations (academic year only), drug screening (academic year only).
- Pharmacy (650-498-2336, ext. 3) and physical therapy (650-723-3195) are available on site.

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS)

CAPS (650-723-3785) helps students who experience a wide variety of personal, academic, and relationship concerns. Services (without charge) include:

- Evaluation and brief counseling, including personal, couples and group therapy. Students requesting or requiring longer, ongoing therapy incur fees.
- Workshops and groups that focus on students' social, personal and academic effectiveness.
- Crisis counseling for urgent situations 24 hours a day.
- Consultation and outreach to faculty, staff, and student organizations.

YWCA SEXUAL ASSAULT CENTER AT STANFORD

The YWCA Sexual Assault Center at Stanford assists students, staff, faculty and other Stanford campus affiliates who are victims of sexual assault. Located on the first floor of Vaden Health Center, it is open by appointment or drop-in office hours, Monday through Thursday, 2:00-4:00 PM. The center also can be reached at its 24-hour campus telephone line (650) 725-9955.

HEALTH PROMOTION SERVICES

Health Promotion Services (650-723-0821) educates and supports students to help them make informed, healthy decisions about their lifestyle. Services include:

- Individual preventive counseling and resource referral concerning nutrition, weight management, eating and body image, alcohol, tobacco and other drug use, sexual assault and harassment, relationships, intimacy and gender issues, and sexual health.
- Health education speakers, programs, and events and workshops at student residences, community centers, student organizations, and for new students (such as Real World: Stanford).
- Academic courses and internships.
- Student groups and volunteer opportunities including Peer Health Educators, HIV Peer Anonymous Counseling and Testing (HIV*PACT), Sexual Health Peer Resource Center (SHPRC), and CPR/First Aid classes.

HEALTH INSURANCE

All registered students are required to have health insurance. Call (650) 723-2135 for more information. Cardinal Care, the University-sponsored plan for students, fulfills this requirement. Insured by The Chickering Group, an Aetna Company (medical), and ValueOptions (mental health), Cardinal Care features comprehensive, worldwide coverage, services by referral at Stanford University Medical Center and Menlo Medical Clinic, and lowest costs when one initiates care at Vaden Health Center. Stanford does not sponsor a health insurance plan for dependents; for available options, see http://vaden.stanford.edu/insurance/dependent.html. Options for voluntary dental insurance are also offered.

OTHER SERVICES AND PROGRAMS

BOOKSTORE

Web Site: http://www.stanfordbookstore.com

Organized in 1897, Stanford Bookstore, (650) 329-1217, located at 519 Lasuen Mall, provides a diverse selection of books, course materials, and supplies to the students, faculty, staff, and community in and surrounding Stanford. The bookstore carries over 130,000 titles, including a wide selection of books written by Stanford authors, making it one of the largest bookstores in the nation. The bookstore also carries a complete selection of Stanford logo apparel, gifts and souvenirs, periodicals, and a café that provides an enhanced shopping experience. The Computer Store, in the main branch, sells academically priced computer hardware and software. Other services include shipping of purchases, gift cards, book buyback, fax service, postage stamp sales, an ATM, and Enterprise Rent-A-Car hotline. There are five branches in addition to the Stanford Bookstore that also serve the community: the Stanford Professional Bookstore Palo Alto, (650) 614-0280, which carries medical and technical books, supplies, stationery, medical instruments, bestsellers, computers, gifts, and clothing; the Track House Sports Shop, (650) 327-8870, at the corner of Campus Drive and Galvez Street, is the headquarters for Stanford Athletic Gear; Tresidder Express convenience store in Tresidder Union; the Stanford Shop, (650) 614-0295, at the Stanford Shopping Center, provides Stanford apparel; and the Bookshop, (650) 725-2775, at the Cantor Center for the Arts, carries books on the arts, fine gifts, apparel, and jewelry.

STANFORD CONFERENCE SERVICES

Phone: (650) 723-3126
Email: conferenceinquiries@stanford.edu
Web Site: http://conference.stanford.edu

A conference is defined as any student or adult group that convenes for part of a day (including a luncheon), overnight, or for several days, outside the regular or summer academic sessions for registered students. Policies concerning conferences are the responsibility of the offices of the President and the Provost.

To make arrangements for holding a new summer conference during the mid-June through Labor Day time frame, contact Stanford Conference Services by phone or email as listed above. For conferences occurring immediately after Labor Day through early June, contact non-academic facilities scheduling in the Office of the University Registrar, (650) 723-6755 or reg-events@stanford.edu, or contact Stanford Events, (650) 723-2551 or stanfordevents@stanford.edu.

Sponsorship by a Stanford department head is required for first time conferences hosted by University departments or by conferences hosted by external organizations interested in meeting at Stanford. Conferences initiated by University departments or external organizations must demonstrate consistency with the University's academic mission. For summer conferences, the sponsoring department submits its proposal to the Director of Stanford Conference Services for review in terms of available facilities and for the approval of the President's Office. At least half of the participants in any summer conference at Stanford hosted by an external organization must be housed in Stanford's campus residences and participate in daily meal plans provided by Stanford Dining. On-campus residential housing and dining services are normally available from the Sunday following Commencement through Labor Day.

Stanford Conference Services provides meeting planning and conference registration services for University departments on a year-round basis.

Summer conference groups should contact Stanford Conference Services concerning arrangements for tables, chairs, audiovisual aids, signage, and other equipment. During the academic year, housing arrangements for University-sponsored visitors can be made through the Stanford Guest House, (650) 926-2800, or at http://guesthouse.stanford.edu.

OMBUDS

Stanford University Ombuds: David Rasch
Ombuds Office: Mariposa House, 585 Capistrano Way, Room 210
Phone: (650) 723-3682
Mail Code: 94305-8200
Email: rasch@stanford.edu
Web Site: http://www.stanford.edu/dept/ombuds/

School of Medicine Ombuds: Martha McKee
Email: martha.mckee@stanford.edu

The charge to the Ombuds office at Stanford is: "The Ombudsperson's task is to protect the interests and rights of members of the Stanford community from injustices or abuses of discretion, from gross inefficiency, from unnecessary delay and complication in the administration of University rules and regulations, and from inconsistency, unfairness, unresponsiveness, and prejudice in the individual's experience with University activities. The Ombudsperson's office exists to receive, examine, and channel the complaints and grievances of members of the Stanford community, and to secure expeditious and impartial redress."

Any troublesome matter in the University community may be discussed in confidence with the University Ombuds. Services of the office are available to students, staff, and faculty.

Although possessing no decision making authority, the Ombuds has wide powers of inquiry. The Ombuds refers matters to the proper person or office expeditiously and also provides conflict resolution services. For the role of the office of the Ombuds in cases of sexual harassment, see the "Non-Academic Regulations" section of this bulletin.

POLICE SERVICES

Department Office: Corner of Campus Drive and Serra Street
Phone: (650) 723-9633
Web Site: http://police.stanford.edu

The Stanford Department of Public Safety is a full service police department that operates 24 hours a day, 7 days a week. For police, fire, or ambulance response, dial 9-1-1, or 9-9-1-1 from a University phone. Emergency assistance can also be obtained by using one of the nearly 100 Blue Emergency Phone Towers strategically placed around campus.

The department is comprised of the following divisions:

The Field Services Division consists of sworn and non-sworn officers who patrol the campus and respond to calls for service. Sworn officers receive their police powers through the Santa Clara County Sheriff's Office. Sworn officers have the legal authority to stop vehicles, make arrests, and enforce all laws. Non-sworn officers assist the sworn officers with security patrols, evidence collection, crime prevention presentations, and other assigned tasks.

Community Service Division: Community Service Officers (CSOs) enforce the parking rules and regulations on campus, and provide traffic control at special events, construction zones, and accident scenes. CSOs also provide building security during emergency or critical incidents.

The Support Services Division provides logistical, technical, and accounting support to the department. Special events are handled through this division as well. Special Events Personnel (SEPs) provide security at campus events including athletic events, concerts, student-sponsored events, and dignitary visits. SEPs are available for hire by groups needing security at their University events. Contact the special events office at (650) 723-4924, or email event_security@stanford.edu, for more information.

The Administrative Support Division supports the department through training, recruiting, payroll, human resources, and other business functions.

For additional safety information or to view the yearly crime statistics, see the *Stanford Safety and Security Almanac*, available free from Public Safety, or see http://police.stanford.edu.

OFFICE FOR RELIGIOUS LIFE

Office: Memorial Church
Phone: (650) 723-1762
Web Site: http://religiouslife.stanford.edu

The mission of the Office for Religious Life is to guide and enhance spiritual, religious, and ethical life within the Stanford University community. Multifaith exploration and dialogue, central in Stanford's history from its founding, is a vital part of both its ethos and education.

The Deans for Religious Life oversee and provide support for Stanford Associated Religions (S.A.R.), approximately thirty religious organizations invited to offer their spiritual services to the campus. The deans are committed to welcoming students of all genders and sexual identities, all religious and non-religious traditions, and all cultural backgrounds. They strive to ensure that students, faculty, and staff have access to honest and supportive contexts in which to pursue their spiritual journeys on the Stanford campus.

STANFORD ALUMNI ASSOCIATION

Web Site: http://www.stanfordalumni.org
Phone: (800) 786-2586 or (650) 723-2021

The Stanford Alumni Association (SAA) seeks to serve all Stanford alumni and students by offering programs and services such as reunions, regional events, Stanford magazine, online services, volunteer and learning opportunities, and the alumni directory.

The Stanford Alumni Association's alumni and student class outreach department provides students with networking opportunities, celebratory and social events, and special programs that enhance their Stanford experience and help connect them to the 200,000 alumni, faculty, and students worldwide who make up the Stanford community. Alumni and student class outreach programs bring students and alumni together through Reunion Homecoming Weekend each autumn and Commencement weekend in the spring, along with alumni networking events throughout the year.

For students, SAA sponsors events such as student tailgates, alumni panels, Senior Send-off, Senior Dinner on the Quad, Class Day, the Graduation Picnic which follows Class Day, and the Senior Graduation Party. The Alumni Association gives out the J.E. Wallace Sterling award and the Stanford Award of Excellence annually to honor graduating seniors for exemplary service to the University. For more information on students programs at the Stanford Alumni Association, see http://www.stanfordalumni.org/students/home.html.

STANFORD EVENTS

Stanford Events supports the mission and goals of Stanford University through open engagement of the campus community and the worldwide public. The department has three divisions: Public Events, Stanford Lively Arts, and the Stanford Ticket Office.

Public Events oversees, advises, and produces University events and ceremonies as designated by the President's office such as: Commencement, Baccalaureate, the University President's inaugurations, New Student Orientation Convocation, Community Day/Founders' Celebration, and other high-profile university events. This division also serves in an advisory capacity to the schools, departments, and student groups on campus, and oversees University policy and procedure regarding campus events. The Public Events office has final approval authority of Stanford facility and open space use for non-academic public events on campus. For information about University event planning, policies, procedures, and University facilities,see http://stanfordevents.stanford.edu, or call (650) 723-2551.

Stanford Lively Arts, the University's presenting program, annually brings to campus a full season of music, dance, and theater by world-famous artists and exceptional newcomers. It furthers research and creativity through world premieres, collaborations, and commissions. In addition to on-stage performances, Lively Arts extends and supplements the academic life of the University through master classes, extended residencies, workshops, lectures and demonstrations, and group discussions. Internationally acclaimed artists perform serious work with Stanford students in classrooms as well as in residence halls. Discounts on performances are available for faculty, staff, and students. For tickets and more information, see http://livelyarts.stanford.edu, or call (650) 725-ARTS (2787).

Stanford Ticket Office provides ticketing services for the arts and entertainment events of Stanford University. Tickets for Stanford Lively Arts, Stanford music and drama departments, Stanford Jazz Workshop/Festival, and the ASSU Concert Network are among the event tickets that are available through this office. For more information, see http://tickets.stanford.edu, or call (650) 725-ARTS (2787).

AWARDS AND HONORS

FACULTY AND STAFF AWARDS

KENNETH M. CUTHBERTSON AWARD

The Kenneth M. Cuthbertson Award was established in 1981 to recognize of exceptional service to Stanford University. It was established by members of the faculty who wish to remain anonymous. All members of the Stanford community are eligible for the award; the sole criterion is the quality of the contribution that the recipients have made to the University. The award provides a way of honoring members of the staff and faculty for their efforts on behalf of the University.

Ordinarily, one award is made each year. The award was first presented in 1981 to the person for whom it is named. Kenneth M. Cuthbertson was one of the early architects of Stanford's long-term financial planning and fundraising program. His service to Stanford set an enduring standard for those who will come after him. The award is made annually at the University Commencement Ceremony.

LLOYD W. DINKELSPIEL AWARDS

The Lloyd W. Dinkelspiel Awards recognize distinctive and exceptional contributions to undergraduate education at Stanford University. The two principal awards are made to the faculty or staff members adjudged to have made the most distinctive contribution to the development and enrichment of undergraduate education in its broadest sense. Two awards are also made to graduating seniors who combine academic achievement with effective contributions to undergraduate student life. Preference is given to service in the School of Humanities and Sciences in the area of liberal education. The awards are made from an endowment fund established in memory of Lloyd W. Dinkelspiel, a Stanford alumnus and trustee. The awards are made annually at the University Commencement Ceremony.

WALTER J. GORES AWARDS

The Walter J. Gores Faculty Achievement Awards for excellence in teaching were established by bequest of Walter J. Gores, Stanford Alumnus of the Class of 1917 and a professor at the University of Michigan for 30 years. Teaching is understood in its broadest sense and includes, in particular, lecturing, leading discussions, tutoring, and advising at the undergraduate or graduate levels. Any member of the teaching staff of the University is eligible for an award, including all faculty of professorial rank, instructors, lecturers, teaching fellows, and teaching and course assistants. Ordinarily, awards are made to a senior faculty member (associate or full professor) or senior lecturer; a junior faculty member or member of the teaching staff; and a teaching assistant (graduate or undergraduate student). The awards are made annually at the University Commencement Ceremony.

ALLAN COX MEDAL FOR FACULTY EXCELLENCE FOSTERING UNDERGRADUATE RESEARCH

The Allan Cox Medal for Faculty Excellence Fostering Undergraduate Research is awarded annually to a faculty member who has established a record of excellence directing undergraduate research over a number of years. It may also go to a faculty member who has done an especially outstanding job with just one or two undergraduates who have demonstrated superior work. The medal was established in memory of the former professor of Geophysics and Dean of the School of Earth Sciences, a strong supporter of faculty-student research collaboration.

HERBERT HOOVER MEDAL FOR DISTINGUISHED SERVICE

David Starr Jordan's belief that every academic degree should represent work actually done in or under the direction of the institution granting it has meant that, since its founding, Stanford has awarded no honorary degrees. As a means of recognizing extraordinary individuals who deserve special acknowledgment, the Stanford Alumni Association in 1962 voted to establish the Herbert Hoover Medal for Distinguished Service. The name pays tribute to the former President's example of service to his University, to his country, and to the cause of world humanitarianism. Indeed, Mr. Hoover was the first award recipient. The gold medal is presented following selection by an anonymous committee appointed by the Chair of the Board of Directors of the Alumni Association.

STUDENT AWARDS

BOOTHE PRIZE FOR EXCELLENCE IN WRITING

Awarded during the freshman year, the Boothe Prize recognizes excellence in writing. Students are selected for this honor on the basis of essays written for courses fulfilling the Introduction to the Humanities or Writing and Rhetoric requirements. The prize is named for Mr. and Mrs. D. Power Boothe, Jr., whose gifts to the University reflect their interest in the humanities.

PRESIDENT'S AWARD FOR ACADEMIC EXCELLENCE IN THE FRESHMAN YEAR

The President's Award honors students who have exceptionally distinguished academic records that exemplify a strong program of study in the freshman year. Students eligible for the award normally have completed Writing and Rhetoric and Introduction to the Humanities requirements during their first year at Stanford.

DEANS' AWARD FOR ACADEMIC ACHIEVEMENT

The Deans of Earth Sciences, Engineering, and Humanities and Sciences recognize from five to ten undergraduate students each year for their academic endeavors. Honorees are cited for noteworthy accomplishments which represent more than a high grade point average or success in course work. Faculty nominate students who have exceptional tangible achievements in classes or independent research, national academic competitions, a presentation or publication for a regional or national audience, or exceptional performance in the creative arts.

FIRESTONE MEDAL FOR EXCELLENCE IN RESEARCH

The Firestone Medal is awarded to seniors in recognition of excellence in undergraduate research. Departments in the School of Humanities and Sciences nominate students who have completed outstanding honors projects in the social, physical, and natural sciences.

ROBERT M. GOLDEN MEDAL FOR EXCELLENCE IN THE HUMANITIES AND CREATIVE ARTS

The Golden Medal recognizes outstanding achievement in the humanities and the creative arts. Seniors receive these medals upon nomination by their major department.

HOEFER PRIZE FOR EXCELLENCE IN UNDERGRADUATE WRITING

The Hoefer Prize recognizes students and faculty for their work in courses that meet the University Writing Requirement for writing in the major. Prizes are awarded in each of the five areas of the undergraduate curriculum: humanities, social sciences, natural sciences, engineering, and earth sciences.

FREDERICK EMMONS TERMAN ENGINEERING SCHOLASTIC AWARD

The School of Engineering annually presents the Terman Award to seniors for outstanding academic achievement. The awardees share their award with a high school teacher of their nomination.

PHI BETA KAPPA

Phi Beta Kappa is a nationwide society honoring students for the excellence and breadth of their undergraduate scholarly accomplishments. Membership in the Stanford Chapter (Beta of California) is open to undergraduates of all majors. To be elected to Phi Beta Kappa at Stanford, a student must achieve academic distinction in the major as well as in courses across a broad range of fields.

Approximately a tenth of the members of a graduating class are elected to Phi Beta Kappa. Of this number, about one fifth are chosen in their junior year, the remainder in their senior year.

The chapter's election guidelines define breadth of study as excellence beyond the major field. To be considered for election, a student must have taken at least three courses of 3 units or more at Stanford by the time elections are held early in the Spring Quarter with a letter grade of 'B-' or better in each of the following three major domains of knowledge: humanities; science, engineering, and math; and social sciences. Students who transfer in their junior year must have taken at least two courses at Stanford in two of the major domains and at least one course in the third domain, and must have completed a minimum of 75 units of academic work at Stanford by the end of Winter Quarter. Students who transfer in their sophomore year must have taken at least two courses at Stanford in each of the major domains.

There is no direct correlation between Stanford University General Education Requirements (GER) and Phi Beta Kappa breadth requirements. The elections committee analyzes the content of individual courses to determine which major domain requirement they may satisfy. IHUM, PWR, and first-year language courses do not satisfy the PBK breadth criterion.

A grade of '+' or 'CR' is not considered a sign of distinction. Minimally satisfying the breadth criterion is not considered a sign of distinction.

The academic records of eligible students are automatically reviewed, so no special action is required for students wishing to be considered for membership. Anonymity in the election process is ensured by removal of the students' names from their academic records before consideration. Students who desire that their records not be made available for consideration by the Stanford chapter of Phi Beta Kappa should inform the Registrar, 630 Serra Street, Suite 120, Stanford, CA 94305-6032.

EXCHANGE PROGRAMS AND CROSS-ENROLLMENT AGREEMENTS

Stanford has exchange programs and cross-enrollment agreements with a number of other colleges and universities. The purpose of these programs and agreements is to offer Stanford students courses and training that are not available in the Stanford curriculum.

EXCHANGE PROGRAMS

UNDERGRADUATE

Stanford has exchange programs with four colleges and universities that allow students to exchange schools for a quarter/semester or for a year, depending on the school. These programs are best suited to students in their junior year, when the major area of study has been determined. Stanford students register for zero units at Stanford during the quarter(s) in which they are attending another college or university and pay the regular Stanford tuition. Courses taken at the other institution are treated as transfer credit back to Stanford. Students should contact the External Credit Evaluation section of the Office of the University Registrar to determine whether the courses taken through an exchange program may qualify for credit toward a Stanford degree. Only the number of units accepted in transfer, not the course titles or the grades received, are recorded on the Stanford transcript.

Exchange programs are currently available at three historically black institutions: Howard University in Washington D.C.; and Morehouse College and Spelman College in Atlanta, Georgia. The exchange program at Dartmouth College in Hanover, New Hampshire, focuses on Native American Studies. Further information is available at the Undergraduate Advising and Research Center.

GRADUATE

The Exchange Scholar Program is open to doctoral students in the fields of humanities, social sciences, and sciences who have completed one full year of study at one of the participating institutions. These students may apply to study at Stanford, and Stanford students may apply to one of these other institutions, for a maximum of one academic year (Autumn, Winter, and Spring quarters) to take advantage of particular educational opportunities not available on the home campus. The participating institutions are Brown University, University of Chicago, Columbia University, Cornell University, Harvard University, Massachusetts Institute of Technology, Princeton University, Stanford University, University of Pennsylvania, and Yale University. Further information on the program may be obtained from the Office of the University Registrar, or the graduate dean's office at participating institutions. Some institutions may place restrictions on specific departments.

Stanford also has separate exchange programs with the University of California, Berkeley, and the University of California, San Francisco. Further information may be obtained at the Office of the University Registrar.

CROSS-ENROLLMENT AGREEMENTS FOR ROTC

Stanford has cross-enrollment agreements for the Reserve Officers' Training Corps (ROTC) with the Navy and Marine Corps ROTC program at the University of California at Berkeley, the Army ROTC program at Santa Clara University, and the Air Force ROTC program at San Jose State University. The purpose of these agreements is to allow Stanford students to engage in military training while working on their degrees from Stanford. Courses taken in ROTC programs are offered by and through UC Berkeley, Santa Clara, and San Jose State. The courses do not qualify to be used towards the 12-unit requirement for full-time registration status or satisfactory academic progress requirements for Stanford undergraduates. Certain ROTC courses may be eligible to be used as transfer credit if they qualify under Stanford's transfer credit practices.

Normally, students who participate in ROTC training complete a four-year course of instruction at the respective institution that consists of two years of basic courses during the freshmen and sophomore years, and an advanced course of instruction during the junior and senior years. Students who accept ROTC scholarships are generally subject to a service obligation, depending on the regulation of the particular service.

Stanford students who are enrolled in ROTC programs under the cross-enrollment agreements are eligible to compete for scholarships to include full tuition and a monthly stipend (Navy and Air Force), or other varying amounts (Army). Students normally compete for national scholarships as high school seniors, although current Stanford students may be eligible to enroll in ROTC on a non-scholarship basis. Non-scholarship ROTC students are eligible to compete for scholarships, and individual services may offer additional scholarship programs to current qualifying undergraduate and graduate students. Interested students should contact the appropriate military professor at the host institution to obtain information on these programs and to initiate application procedures (see below).

Students who satisfactorily complete an ROTC program and are awarded a Stanford degree qualify for a commission as a Second Lieutenant in the U.S. Army, an Ensign in the U.S. Navy, a Second Lieutenant in the U.S. Marines, or a Second Lieutenant in the U.S. Air Force.

For questions concerning the ROTC programs, Stanford students should consult one of the following: Air Force ROTC, San Jose State University, San Jose, CA 95192-0051, telephone (408) 924-2960; Army ROTC, Department of Military Science, Santa Clara University, Santa Clara, CA 95053, telephone (408) 554-4034; Naval ROTC, 152 Hearst Gym, University of California, Berkeley, CA 94720-3640, telephone (510) 642-7602.

COURSES

AIR FORCE ROTC

The following are offered by San Jose State University:

AS 001A,B. The Foundation of the United States Air Force—Freshman year. Introduces students to the Air Force and AFROTC. The characteristics, missions, and organization of the Air Force. Officership and professionalism, career opportunities, military customs and courtesies, and communication skills. Required leadership lab.

AS 002A,B. The Evolution of the United States Air and Space Power—Sophomore year. Air and space power through historical study and analysis. The capabilities, function, and doctrinal employment of aerospace forces. Emphasis is on oral and written communication skills. Required leadership lab.

AS 131A,B. Air Force Leadership Studies—Junior year. Leadership, management fundamentals, professional knowledge, Air Force personnel system, ethics, and communication skills. Application-level knowledge of skills required of junior Air Force officer through case studies, practical exercises, and seminar discussion. Required leadership lab. Prerequisites: AS 001A,B, AS 002A,B, or as determined by department chair.

AS 141A. National Security Affairs—Senior year. The national security process, international and regional relations, advanced leadership ethics, and Air Force doctrine with focus on the military as a profession, officership, military justice, civilian control of the military, and current issues affecting military professionalism. Required leadership lab. Pre- or corequisites: AS 131A, or as determined by department chair.

AS 141B. Preparation for Active Duty—Senior year. The role of the Air Force officer in contemporary society emphasizing skills to facilitate a smooth transition from civilian to military life. Required leadership lab. Pre- or corequisites: AS 131A,B, or as determined by department chair.

Leadership Laboratory (LLAB)—Mandatory. Hands-on. Drill and ceremony; Air Force customs and courtesies; leadership and followership skills. Guest speakers.

ARMY ROTC

FRESHMAN YEAR

MILS 11. Leadership and Personal Development—Taught on Stanford campus. Personal challenges and competencies for effective leadership. How life skills such as goal setting, time management, physical fitness, and stress management relate to leadership and officership. Development of a personal fitness program under the guidance of an Army master fitness trainer. Two 60-minute classes per week. Weekly 3-hour leadership labs required. One four-day weekend field exercise away from the University.

MILS 12. Foundations in Leadership I—Taught on Stanford Campus. Leadership fundamentals such as setting direction, problem solving, listening, presenting briefs, providing feedback, and effective writing skills. Leadership dimensions and values. Two 60-minute classes per week. Weekly 3-hour leadership labs required. One evening military formal dinner.

MILS 13. Foundations in Leadership II—Taught on Stanford campus. Leadership framework; practical applications in fundamentals such as problem solving, listening, presenting briefs, and effective writing skills. Values, attributes, skills, and actions in the context of practical and interactive exercises. Two 60-minute classes per week. Weekly 3-hour leadership labs required. One four-day weekend field training exercise away from the University.

SOPHOMORE YEAR

MILS 21. Innovative Leadership—Taught on Stanford campus. Creative and innovative leadership strategies and styles through historical cases and interactive exercises. Personal motivation and team building through team exercises. Focus is on leadership values and attributes through organizational customs and courtesies. Leadership case studies; individual creeds and organizational ethos. Two 60-minute classes per week. Weekly 3-hour labs required. One four-day weekend field training exercise away from the University.

MILS 22. Leadership in Changing Environments—Taught on Stanford campus. The challenges of leading in contemporary operational environments. Crosscultural challenges and applications to leadership tasks and situations. Case studies. Two 60-minute classes per week. Weekly 3-hour labs required. One evening military formal dinner.

MILS 23. Team Leading Procedures—Taught on Stanford campus. Plans and orders that enable small units to complete assigned tasks and the decision making process. Planning techniques to develop orders, briefing plans, and decisions. Two 60-minute classes per week. Five 3-hour labs per quarter. One four-day weekend field training exercise away from the University.

JUNIOR YEAR

MILS 131. Adaptive Team Leadership—Taught at Santa Clara University. Adaptive leadership skills and the demands of the ROTC Leader Development Assessment Course (LDAC). Scenarios related to small-unit tactical operations to develop self awareness and thinking skills. Feedback on student leadership abilities. Two 90-minute classes per week. Weekly 3-hour labs required. One mandatory four-day field training exercise away from the University. Prerequisites: MILS 11, 12, 13, 21, 22, and 23, or consent of department chair.

MILS 132.Situational Leadership I—Taught at Santa Clara University. Skills in leading small units, including decision making, persuading, and motivating team members when under fire. Two 90 minute classes per week. Weekly 3-hour labs required. One evening military formal dinner. Prerequisite: MILS 131, or consent of department chair.

MILS 133. Situational Leadership II—Taught at Santa Clara University. Applications of situational leadership challenges in decision making, persuading, and motivating team members when under fire. Preparation for ROTC Leader Development Assessment Course (LDAC). Two 90-minute classes per week. Weekly 3-hour labs required. One mandatory four-day field training exercise away from the University. Prerequisite: MILS 132, or consent of department chair.

SENIOR YEAR

MILS 141. Developing Adaptive Leaders—Taught at Santa Clara University. Planning, executing, and assessing complex operations, functioning as a member of staff , and providing leadership performance feedback to subordinates. Situational opportunities to assess risk, make ethical decisions, and provide coaching to fellow ROTC students. Responsibilities of key staff. Two 90-minute seminars per week. Weekly 3-hour labs required. One mandatory four-day weekend field training exercise away from the University. Prerequisite: MILS 133, or consent of department chair.

MILS 142. Leadership in a Complex World I—Taught at Santa Clara University. Differences in customs and courtesies, military law, principles of war, and rules of engagement in the face of international terrorism. Interacting with nongovernmental organizations, civilians on the battlefield, and host nation support. Two 90-minute seminars per week. Weekly 3-hour labs required. One evening military formal dinner. Prerequisite: MILS 141.

MILS 143. Leadership in a Complex World II—Taught at Santa Clara University. Preparation for first unit of assignment and transition to Lieutenant. Case studies, scenarios, and exercises to prepare for complex ethical and practical demands as commissioned officers in the U.S. Army. Two 90-minute seminars per week. Weekly 3-hour labs required. One mandatory four-day weekend field training exercise away from the University. Prerequisite: MILS 142.

MILITARY HISTORY

MILS 199. Dynamics of Leadership in Military History—Taught at Santa Clara University. Dynamics that drive decisions made by history's military leaders and followers. Wars and battles from 1861 to present. Techniques and innovations in military training, weapon systems, political timing, and their effect they have on strategies. Combined arms experiences.

NAVAL ROTC

The Department of Naval Science at UC Berkeley offers programs of instruction for men and women leading to active duty reserve commissions in the U.S. Navy or U.S. Marine Corps. Navy option students enrolled in one of the four-year programs normally complete the following courses during the first two years. Students should consult http://navsci.berkeley.edu/ for more information and changes to course offerings.

NS 1. Introduction to Naval Science—Freshman year.

NS 2. Sea Power—Freshman year.

NS 3. Leadership and Management—Sophomore year.

NS 10. Naval Ship Systems I - Engineering—Sophomore year.

Navy option students enrolled in either the four- or two-year program normally complete the following courses during their junior and senior years.

NS 12A. Navigation and Naval Operations I—Junior year.

NS 12B. Navigation and Naval Operations II—Junior year.

NS 401. Naval Ship Systems—Senior year.

NS 412. Leadership and Ethics—Senior year.

In addition to the above courses, Navy option ROTC students are required to participate in weekly professional development laboratories (drill) at UC Berkeley and complete a number of other courses at Stanford including one year of calculus, physics, and English, and one quarter of computer science, and military history or national security policy.

In lieu of NS 401, NS 10, NS 12A and NS 12B, Marine option students participate in Marine Seminars and complete MA 154, History of Littoral Warfare, and MA 20, Evolution of Warfare, or a designated equivalent course. Marine option students also participate in the weekly professional development laboratories.

NONACADEMIC REGULATIONS

STATEMENT OF NONDISCRIMINATORY POLICY

Stanford University admits students of either sex and any race, color, religion, sexual orientation, or national and ethnic origin to all the rights, privileges, programs, and activities generally accorded or made available to students at the University. Consistent with its obligations under the law, it prohibits discrimination, including harassment, against students on the basis of sex, race, age, color, disability, religion, sexual orientation, gender identity, national and ethnic origin, and any other characteristic protected by applicable law in the administration of its educational policies, admissions policies, scholarships and loan programs, and athletic and other University-administered programs. The following person has been designated to handle inquiries regarding this policy: the Director of the Diversity and Access Office, Mariposa House, 585 Capistrano Way, Stanford University, Stanford, CA 94305-8230; (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax).

STUDENT ADA (AMERICANS WITH DISABILITIES ACT)/SECTION 504 GRIEVANCE PROCEDURE

For information concerning policies and procedures for students with disabilities, see http://www.stanford.edu/dept/ocr/access/student.html, or the ADA/Section 504 Compliance Officer, Diversity and Access Office, Mariposa House, 585 Capistrano Way, Stanford University, Stanford CA, 94305-8230, (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax); see also the Student Disability Resource Center at http://www.stanford.edu/group/DRC/.

POLICY

The following is quoted from the policy:

I. *Policy*

Stanford University, in compliance with state and federal laws and regulations, including the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973 (Section 504), does not discriminate on the basis of disability in administration of its education-related programs and activities, and has an institutional commitment to provide equal educational opportunities for disabled students who are otherwise qualified.

Students who believe they have been subjected to discrimination on the basis of disability, or have been denied access to services or accommodations required by law, have the right to use this grievance procedure.

II. *Applicability*

The grievance procedure set forth below is applicable to undergraduate and graduate students of the University. In general, it is designed to address disputes concerning the following:

A. Disagreements regarding a requested service, accommodation, or modification of a University practice or requirement;
B. Inaccessibility of a program or activity;
C. Harassment or discrimination on the basis of disability;
D. Violation of privacy in the context of disability.

For disputes regarding certain specific academic accommodations or modification of academic requirements (such as reduction in the number of academic course units taken quarterly or yearly, requests for substitution of courses, or issues relating to academic standing), the alternate procedure set forth in Section V (C) of the Stanford University Policy and Procedure for Student Requests for Services and Accommodations should be followed. For questions regarding which procedure is applicable, contact the Compliance Officer at the Diversity and Access Office.

These two sets of procedures supplant the Statement on Student Academic Grievance Procedures (set forth in the *Stanford Bulletin*) for disability-related grievances.

III. *Compliance Officers*

Stanford University's Compliance Officers are responsible for administering this grievance procedure as well as ensuring compliance with applicable laws. The Director of the Diversity and Access Office is the designated ADA/Section 504 Compliance Officer. The office is located in Mariposa House, 585 Capistrano Way, Stanford, CA 94305-8230, (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax).

Additional Compliance Officers may be designated from time to time by the Provost from those faculty and staff members knowledgeable concerning disability issues and the legal mandates of state and federal disability statutes.

IV. *Informal Resolution*

Prior to initiating the formal complaint procedure set forth below, the student should, in general, first discuss the matter orally or in writing with the individual(s) most directly responsible. If no resolution results, or if direct contact is inappropriate under the circumstances, the student should then consult with the Compliance Officer at the Diversity and Access Office who will attempt to facilitate a resolution.

If the Compliance Officer is not successful in quickly achieving a satisfactory resolution (that is, generally within seven calendar days), the Compliance Officer will inform the student of his or her efforts and the student's right to file a formal complaint.

V. *Formal Complaint*

If the procedure set forth above for informal resolution does not yield a successful resolution, then the student may file a formal complaint in the following manner:

A. *When to File Complaint:* Complaints shall be filed as soon as possible, but in no event later than 10 days after the end of the quarter in which the concern arose.
B. *What to File*: a complaint must be in writing and include the following:
    1. The grievant's name, address, email address, and phone number
    2. A full description of the problem
    3. A description of what efforts have been made to resolve the issue informally
    4. A statement of the remedy requested
C. *Where to File Complaint:* the complaint shall be filed with the Compliance Officer at the Diversity and Access Office, Mariposa House, 585 Capistrano Way, Stanford CA 94305-8230; (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax).
D. *Notice of Receipt*: upon receipt of the complaint, the Compliance Officer reviews the complaint for timeliness and appropriateness for this grievance procedure, and provides the grievant with written notice acknowledging its receipt.
E. *Investigation*: the Compliance Officer or his or her designee (hereafter collectively referred to as the "grievance officer") shall promptly initiate an investigation. In undertaking the investigation, the grievance officer may interview, consult with and/or request a written response to the issues raised in the grievance from any individual the grievance officer believes to have relevant information, including faculty, staff, and students.
F. *Representation*: the grievant and the party against whom the grievance is directed shall have the right to have a representative. The party shall indicate whether he or she is to be assisted by a representative and, if so, the name of that representative. For purposes of this procedure, an attorney is not an appropriate representative.
G. *Findings and Notification:* upon completion of the investigation, the grievance officer will prepare and transmit to the student, and to the party against whom the grievance is directed, a final report containing a summary of the investigation, written findings, and a proposed disposition. This transmission will be expected within 45 calendar days of the filing of the formal complaint. The deadline may be extended by the Compliance Office for good cause (including for reasons relating to breaks in the academic calendar). The final report shall also be provided, where appropriate, to any University officer whose authority

will be needed to carry out the proposed disposition or to determine whether any personnel action is appropriate.

H. *Final Disposition:* the disposition proposed by the grievance officer shall be put into effect promptly. The grievant or any party against whom the grievance or the proposed disposition is directed may appeal. The appeal to the Provost (as set forth below) will not suspend the implementation of the disposition proposed by the grievance officer, except in those circumstances where the Provost decides that good cause exists making the suspension of implementation appropriate.

VI. *Urgent Matters*

Whenever the application of any of the time deadlines or procedures set forth in this grievance procedure creates a problem due to the nature of the complaint, the urgency of the matter, or the proximity of the upcoming event, the Compliance Officer will, at the request of the grievant, determine whether an appropriate expedited procedure can be fashioned.

VII. *Remedies*

Possible remedies under this grievance procedure include corrective steps, actions to reverse the effects of discrimination or to end harassment, and measures to provide a reasonable accommodation or proper ongoing treatment. As stated above, a copy of the grievance officer's report may, where appropriate, be sent to University officer(s) to determine whether any personnel action should be pursued.

VIII. *Appeal*

Within ten calendar days of the issuance of the final report, the grievant or the party against whom the grievance is directed may appeal to the Provost the grievance officer's determination.

An appeal is taken by filing a written request for review with the Compliance Officer at the Diversity and Access Office, Mariposa House, 585 Capistrano Way, Stanford CA 94305-8230; (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax).

The written request for review must specify the particular substantive and/or procedural basis for the appeal, and must be made on grounds other than general dissatisfaction with the proposed disposition. Furthermore, the appeal must be directed only to issues raised in the formal complaint as filed or to procedural errors in the conduct of the grievance procedure itself, and not to new issues.

The Compliance Officer shall forward the appeal to the Provost, and also provide copies to the other party or parties. If the grievance involves a decision that is being challenged, the review by the Provost or his or her designee usually will be limited to the following considerations:

1. Were the proper facts and criteria brought to bear on the decision? Were improper or extraneous facts or criteria brought to bear that substantially affected the decision to the detriment of the grievant?
2. Were there any procedural irregularities that substantially affected the outcome of the matter to the detriment of the grievant?
3. Given the proper facts, criteria, and procedures, was the decision a reasonable one?

A copy of the Provost's written decision will be expected within 30 calendar days of the filing of the appeal and shall be sent to the parties, the Compliance Officer and, if appropriate, to the University officer whose authority will be needed to carry out the disposition. The deadline may be extended by the Provost for good cause (including for reasons relating to breaks in the academic calendar). The decision of the Provost on the appeal is final.

TITLE IX OF THE EDUCATION AMENDENTS OF 1972

It is the policy of Stanford University to comply with Title IX of the Education Amendment of 1972 and its regulations, which prohibit discrimination on the basis of sex. The Title IX Compliance Officer is the Special Counselor to the President for Campus Relations and has been appointed to coordinate the University's efforts to comply with the law. Anyone who believes that, in some respect, Stanford is not in compliance with Title IX and its regulations should contact the Title IX Compliance Officer, the Special Counselor to the President for Campus Relations, Building 170, Main Quad, Stanford University, Stanford, CA 94305-2100; (650) 725-8395 (voice), (650) 723-1216 (TTY), (650) 725-3577 (fax). Grievance procedures to address complaints of discrimination on the basis of sex are set forth in the "Student Non-Academic Grievance section" below. See also Administrative Guide Memo 23 at http://adminguide.stanford.edu/23.pdf.

STUDENT GRIEVANCES

A Stanford undergraduate or graduate student who believes that he or she has been subject to an improper decision on an academic matter may file a grievance pursuant to the Statement on Academic Grievance Procedures (see the "Academic Policies and Statements" section of this bulletin). For other types of grievances, students should review the section that follows on the Student Non-Academic Grievance Procedure, and consult concerning applicable proceedures with the Director of the Diversity and Access Office, Mariposa House, 585 Capistrano Way, Stanford University, Stanford, CA 94305-8230; (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax).

STUDENT NON-ACADEMIC GRIEVANCE PROCEDURE

POLICY

The following is the policy:

1. *Applicability*
   a. It is perhaps inevitable in any university that some students may at times feel improperly treated, and that concerns about unfairness (including potential discrimination and harassment) may also at times arise.

      In this regard (and although this grievance procedure is not limited to concerns of discrimination), Stanford University's Statement of Nondiscriminatory Policy provides in part: "Stanford University admits students of either sex and any race, color, religion, sexual orientation, or national and ethnic origin to all the rights, privileges, programs, and activities generally accorded or made available to students at the University. Consistent with its obligations under the law, it prohibits discrimination, including harassment, against students on the basis of sex, race, age, color, disability, religion, sexual orientation, gender identity, national and ethnic origin, and any other characteristic protected by applicable law in the administration of its educational policies, admissions policies, scholarships and loan programs, and athletic and other University-administered programs."

   b. At Stanford, there are a number of grievance procedures through which students can raise and seek redress for what they believe to be unfair, improper or discriminatory decisions, actions, or treatment. For example:
      1. If the matter involves an academic decision, the Student Academic Grievance Procedure may be the applicable procedure.
      2. If the matter involves a disability-related concern, the Student ADA/Section 504 Grievance Procedure may be applicable.
      3. If the matter involves a student-athlete and his or her sport, the Student-Athlete Grievance Procedure may be applicable.

   c. The purpose of the Student Non-Academic Grievance Procedure is to provide a process for students to seek resolution of disputes and grievances that may not fall within the scope of one of the other grievance processes, including those which may arise in a student's capacity as a student-employee.

   d. This procedure is available to undergraduate and graduate students at Stanford University. It is designed to address individual decisions or individual actions that affect the grievant personally in his or her capacity as a student. This is not a grievance procedure to address the concerns of student groups. Similarly and as a general proposition, dissatisfaction with a departmental, school or University policy or practice of broad or general application is not grounds for a grievance under this procedure; the Director of the Diversity and Access Office (hereafter "the Director") may, in his or her discretion, entertain an appeal in exceptional circumstances, such as where (for example) the policy or practice is alleged to be contrary to law.

   e. The Director is responsible for administering this Student Non-Academic Grievance Procedure.

    1. The Director may be contacted at: Director of the Diversity and Access Office, Mariposa House, 585 Capistrano Way, Stanford University, Stanford, CA 94305-8230; (650) 723-0755 (voice), (650) 723-1216 (TTY), (650) 723-1791 (fax); http://www.stanford.edu/dept/ocr/.
    2. The Director in his or her sole discretion can decide whether to refer a grievance brought under this procedure to another grievance process. In cases involving allegations of sexual harassment in particular, the Director may wish to consult with the Director of the Sexual Harassment Policy Office as to the most appropriate way to proceed; see Section 5.d below. In cases involving student employment, the Director may wish to consult with the University's Department of Human Resources.

2. *Informal Resolution*
   a. As a general proposition (and although particular circumstances may warrant an exception), the student should first discuss the problem and seek a solution with the individual(s) most directly involved.
   b. If no resolution results (or if circumstances make discussion inappropriate with the person most directly involved), the student should then consult with the individual at the next (higher) administrative level in the department, school, residence or University administrative unit. Serious efforts should be made to resolve the issue locally at an informal level without resort to a formal grievance; such efforts may continue even after the formal process is underway.
3. *Formal Grievance*
   a. If informal means of resolution prove inadequate, the student should set forth in writing the substance of the complaint, the grounds for it and the evidence on which it is based, and the efforts taken to date to resolve the matter. It is at this stage that the complaint becomes a formal grievance.
   b. The grievance document should be submitted to the Director. A grievance should be filed in a timely fashion, i.e., normally within thirty days of the end of the academic quarter in which the action that is the subject of the grievance occurred. A delay in filing a grievance may be grounds for rejection of that grievance.
   c. The Director shall promptly initiate a review, which should normally be completed within sixty days. The Director may attempt to resolve the matter informally, and may refer the matter (or any part of it) to a grievance officer or other designee, who will look into and/or address the matter as the Director directs. The Director may also, in appropriate cases, remand the matter to the appropriate administrator (including to the administrative level at which the grievance arose) for further consideration.
   d. In undertaking this review, either the Director, his or her designee, or the grievance officer may request a response to the issues raised in the grievance from any individuals believed to have information the reviewer considers relevant, including faculty, staff and students.
   e. The Director (or his or her designee) shall issue his or her decision in writing, and take steps to initiate such corrective action as is called for (if any). Conduct meriting discipline shall be brought to the attention of the appropriate disciplinary process.
4. *Appeal*
   a. If the student is dissatisfied with the disposition by the Director (or his or her designee), he or she may appeal to the Provost (Office of the President and Provost, Building 10, Stanford, CA 94305-2061; phone 650-725-4074; fax 650-725-1347). The appeal should be filed in writing with the Provost within ten days of the issuance of the decision by the Director (or his or her designee); a delay in filing the appeal may be grounds for rejection of that appeal.
   b. The Provost may attempt to resolve the matter informally, and may refer the matter (or any part of it) to a grievance appeal officer, who will review the matter at the Provost's direction. The Provost may also, in appropriate cases, remand the matter to the appropriate administrator (including to the administrative level at which the grievance arose) for further consideration.
   c. The Provost should normally complete his or her review of the appeal and issue his or her decision in writing within forty-five days. That decision is final.
5. *General Provisions*
   a. *Time Guidelines*—The time frames set forth herein are guidelines. They may be extended by the Director or Provost, as applicable, in his or her discretion for good cause (including for reasons relating to breaks in the academic calendar).
   b. *Advisers*—A student initiating or participating in a grievance under this procedure may be accompanied by an adviser in any discussion with the Director, the Provost or their designees, or a grievance or grievance appeal officer under this procedure; any adviser must be a current Stanford faculty, staff member or student.
   c. *Ombuds*—Students should be aware that the University Ombuds (http://www.stanford.edu/dept/ocr/ombuds/) and the School of Medicine's Ombuds (http://www.med.stanford.edu/ombuds) are available to discuss and advise on any matters of University concern and frequently help expedite resolution of such matters. Although they have no decision making authority, the Ombuds' Offices have wide powers of inquiry.
   d. *Sexual Harassment*—For further information and resources concerning sexual harassment, students should refer to the web page of the Sexual Harassment Policy Office at http://harass.stanford.edu.
   e. *No retaliation*—Stanford University prohibits retaliation or reprisals against individuals based on their pursuit in good faith of a grievance under this procedure, or their participation in good faith in the grievance process.

OWNERSHIP AND USE OF STANFORD NAME AND TRADEMARKS

Stanford registered marks, as well as other names, seals, logos, and other symbols and marks that are representative of Stanford, may be used solely with permission of Stanford University. Merchandise bearing Stanford's names and marks, such as t-shirts, glassware, and notebooks, must be licensed. For complete text of the currently applicable policy, including the University officers authorized to grant permission to use the Stanford name and marks, see Administrative Guide Memo 15.5, Ownership and Use of Stanford Name and Trademarks at http://adminguide.stanford.edu/15_5.pdf.

COPYRIGHT

Copyright laws protect original works of authorship and give the owners of copyrights the exclusive right to do and to authorize others to do certain things in regard to a copyrighted work, including: make copies, distribute the work, display or perform the work publicly, and create derivative works. Copyright laws apply to nearly all forms of captured content, including traditional works like books, photographs, music, drama and sculpture. The laws also adapt to changes in technologies, and include in their scope modern forms of works like motion pictures, electronic media, software, multimedia works and some databases. Registration is not required to obtain a copyright, so if in doubt, assume a copyright applies.

Unless an exception to the copyright owner's exclusive rights applies, you must obtain permission from the copyright owner to copy, distribute, display or perform a copyrighted work in any medium for any purpose. Be especially mindful of copyright principles when using the Internet. Just because a work is posted on the Internet does not mean that the owner of the copyright has given you permission to use it. And, you should not be posting material onto the Internet without copyright clearance.

Stanford University Libraires have licenses with many publishers, which permit copying of materials in accordance with the educational, research or administrative functions of the University. In addition, there are four major exceptions to the copyright owner's exclusive rights, which permit copying without permission under limited circumstances. These are: the fair use exception, the library exception, the face-to-face teaching exception, and the distance-learning exception. For a more detailed explanation of these exceptions, the copyright laws and Stanford's copyright policies, please review the Provost's Copyright Reminder, http://www.stanford.

edu/dept/ucomm/provost/copyright_reminder.html. It is each person's responsibility to be aware of and abide by copyright law; violation may result in civil or criminal liability, and constitutes grounds for University discipline, up to and including discharge, dismissal and expulsion.

PEER-TO-PEER FILE SHARING

The use of file-sharing networks and software to download and share copyrighted works like software, music, movies, television programs, and books can violate copyright laws. Both the person who makes an illegal copy of a copyrighted work available and the person who receives or downloads an illegal copy have violated the law and Stanford policies. Many file-sharing programs have default settings that share copyrighted files, such as music and movies, through the Internet. Before enabling any of these programs students, faculty, or staff must read the fine print, make sure to understand the program itself, and only use such programs lawfully. Under the Digital Millennium Copyright Act (DMCA), copyright owners are entitled to notify Internet service providers, such as Stanford, that IP addresses linked to the Stanford network are sharing copies of music, movies, or other content without authorization. The law requires the University to respond to such complaints by eliminating access to the infringing materials. Stanford will disconnect students who fail to respond to a DMCA complaint promptly, and Stanford will charge reconnection fees starting at $100 and going up as high as $1,000 for successive DMCA complaints. Furthermore, the University also will suspend or terminate computer access to the Stanford network, including termination of the SUNet ID, to members of the community who continue to violate copyright laws. Finally, the University will take action through the student, employee, or faculty disciplinary processes if necessary. Beyond University consequences, copyright holders may file civil lawsuits against copyright infringers seeking extensive monetary damages. If compelled by a lawful subpoena, Stanford may be required to identify students, faculty, staff, or others who have violated copyright law. For more information about file-sharing, refer to Residential Computing's online resource, File-Sharing and Copyright Law at http://rescomp.stanford.edu/info/dmca/.

DOMESTIC PARTNERS

In October 1990, Stanford University adopted a domestic partners policy. This policy, which implements the University's nondiscrimination policy, makes services that have historically been available to married students available on an equal basis to students with same-sex or opposite-sex domestic partners. These services include access to student housing, a courtesy card that provides access to University facilities, and the ability to purchase medical care at Vaden Health Service. A domestic partnership is defined as an established long-term partnership with an exclusive mutual commitment in which the partners share the necessities of life and ongoing responsibility for their common welfare.

SEXUAL HARASSMENT AND CONSENSUAL SEXUAL OR ROMANTIC RELATIONSHIPS

For the complete text of the currently applicable version of this policy, see Administrative Guide Memo 23.2, Sexual Harassment, http://adminguide.stanford.edu/23_2.pdf. It is also available from the Sexual Harassment Policy Office homepage, http://harass.stanford.edu/.

SUMMARY

Stanford University strives to provide a place of work and study free of sexual harassment, intimidation or exploitation. Where sexual harassment is found to have occurred, the University will act to stop the harassment, prevent its recurrence, and discipline and/or take other appropriate action against those responsible.

POLICY

The following is quoted from the policy:

1. *In General*
   a. *Applicability and Sanctions for Policy Violations*—This policy applies to all students, faculty and staff of Stanford University, as well as to others who participate in Stanford programs and activities. Its application includes Stanford programs and activities both on and off-campus, including overseas programs. Individuals who violate this policy are subject to discipline up to and including discharge, expulsion, and/or other appropriate sanction or action.
   b. *Respect for Each Other*—Stanford University strives to provide a place of work and study free of sexual harassment, intimidation or exploitation. It is expected that students, faculty, staff and other individuals covered by this policy will treat one another with respect.
   c. *Prompt Attention*—Reports of sexual harassment are taken seriously and will be dealt with promptly. The specific action taken in any particular case depends on the nature and gravity of the conduct reported, and may include intervention, mediation, investigation and the initiation of grievance and disciplinary processes as discussed more fully below. Where sexual harassment is found to have occurred, the University will act to stop the harassment, prevent its recurrence, and discipline and/or take other appropriate action against those responsible.
   d. *Confidentiality*—The University recognizes that confidentiality is important. Sexual harassment advisers and others responsible to implement this policy will respect the confidentiality and privacy of individuals reporting or accused of sexual harassment to the extent reasonably possible. Examples of situations where confidentiality cannot be maintained include circumstances when the University is required by law to disclose information (such as in response to legal process) and when disclosure is required by the University's outweighing interest in protecting the rights of others.
   e. *Protection Against Retaliation*—Retaliation and/or reprisals against an individual who in good faith reports or provides information in an investigation about behavior that may violate this policy are against the law and will not be tolerated. Intentionally making a false report or providing false information, however, is grounds for discipline.
   f. *Relationship to Freedom of Expression*—Stanford is committed to the principles of free inquiry and free expression. Vigorous discussion and debate are fundamental to the University, and this policy is not intended to stifle teaching methods or freedom of expression generally, nor will it be permitted to do so. Sexual harassment, however, is neither legally protected expression nor the proper exercise of academic freedom; it compromises the integrity of the University, its tradition of intellectual freedom and the trust placed in its members.
2. *What Is Sexual Harassment?*

Unwelcome sexual advances, requests for sexual favors, and other visual, verbal or physical conduct of a sexual nature constitute sexual harassment when:

   a. It is implicitly or explicitly suggested that submission to or rejection of the conduct will be a factor in academic or employment decisions or evaluations, or permission to participate in a University activity; *or*
   b. The conduct has the purpose or effect of unreasonably interfering with an individual's academic or work performance or creating an intimidating or hostile academic, work or student living environment.

Determining what constitutes sexual harassment depends upon the specific facts and the context in which the conduct occurs. Sexual harassment may take many forms—subtle and indirect, or blatant and overt. For example,

- It may be conduct toward an individual of the opposite sex or the same sex.
- It may occur between peers or between individuals in a hierarchical relationship.
- It may be aimed at coercing an individual to participate in an unwanted sexual relationship or it may have the effect of causing an individual to change behavior or work performance.
- It may consist of repeated actions or may even arise from a single incident if sufficiently egregious.

The University's Policy on Sexual Assault (see Guide Memo 23.3, Sexual Assault, (http://adminguide.stanford.edu/23_3.pdf) may also apply when sexual harassment involves physical contact.

3. *What To Do About Sexual Harassment*

Individuals seeking further information are directed to the following resources:

- The Sexual Harassment Policy Office (Mariposa House, 585 Capistrano Way, Room 208-209, Stanford University, Stanford, CA, 94305-8230; (650) 723-1583; email: harass@stanford.edu for information, consultation, advice, or to lodge a complaint. Note that anonymous inquiries can be made to the SHPO by phone during business hours.
- The Sexual Harassment Policy Office web page at http://harass.stanford.edu.
- Any designated Sexual Harassment Adviser or resource person listed in 3.a or 5.a.

The following are the primary methods for dealing with sexual harassment at Stanford. They are not required to be followed in any specific order. However, early informal methods are often effective in correcting questionable behavior.

a. *Consultation*—Consultation about sexual harassment is available from the Sexual Harassment Policy Office, Sexual Harassment Advisers (including residence deans), human resources officers, employee relations specialists, counselors at Counseling and Psychological Services (CAPS) or the Help Center, chaplains at Memorial Church, ombudspersons and others. A current list of Sexual Harassment Advisers is available from the Sexual Harassment Policy Office and at http://harass.stanford.edu/SHadvisers.html. Consultation is available for anyone who wants to discuss issues related to sexual harassment, whether or not "harassment" actually has occurred, and whether the person seeking information is a complainant, a person who believes his or her own actions may be the subject of criticism (even if unwarranted), or a third party.

Often there is a desire that a consultation be confidential or "off the record." This can usually be achieved when individuals discuss concerns about sexual harassment without identifying the other persons involved, and sometimes even without identifying themselves. Confidential consultations about sexual harassment also may be available from persons who, by law, have special professional status, such as:

- Counselors at Counseling and Psychological Services (CAPS), http://caps.stanford.edu/
- Counselors at the Help Center, http://www.stanford.edu/dept/helpcenter/
- Chaplains at Memorial Church
- The University Ombudsperson, http://www.stanford.edu/dept/ombuds/
- The Medical Center Ombudsperson, http://www.med.stanford.edu/ombuds/

In these latter cases, the level of confidentiality depends on what legal protections are held by the specific persons receiving the information and should be addressed with them before specific facts are disclosed. For more information see http://harass.stanford.edu/confidential.html.

For further information on confidentiality, see Section 1(d) above.

b. *Direct Communication*—An individual may act on concerns about sexual harassment directly, by addressing the other party in person or writing a letter describing the unwelcome behavior and its effect and stating that the behavior must stop. A Sexual Harassment Adviser can help the individual plan what to say or write, and likewise can counsel persons who receive such communications. Reprisals against an individual who in good faith initiates such a communication violate this policy.

c. *Third Party Intervention*—Depending on the circumstances, third party intervention in the workplace, student residence or academic setting may be attempted. Third party intervenors may be the Sexual Harassment Advisers, human resources professionals, the ombudspersons, other faculty or staff, or sometimes mediators unrelated to the University.

When third party intervention is used, typically the third party (or third parties) will meet privately with each of the persons involved, try to clarify their perceptions and attempt to develop a mutually acceptable understanding that can insure that the parties are comfortable with their future interactions. Other processes, such as a mediated discussion among the parties or with a supervisor, may also be explored in appropriate cases.

Possible outcomes of third party intervention include explicit agreements about future conduct, changes in workplace assignments, substitution of one class for another, or other relief, where appropriate.

d. *Formal Grievance, Appeal, and Disciplinary Processes*—Grievance, appeal, or disciplinary processes may be pursued as applicable.

1. *Grievances and Appeals*—The applicable procedure depends on the circumstances and the status of the person bringing the charge and the person against whom the charge is brought. Generally, the process consists of the individual's submission of a written statement, a process of fact-finding or investigation by a University representative, followed by a decision and, in some cases, the possibility of one or more appeals, usually to Stanford administrative officers at higher levels. The relevant procedure (see below) should be read carefully, since the procedures vary considerably.

If the identified University fact-finder or grievance officer has a conflict of interest, an alternate will be arranged, and the Director of the Sexual Harassment Policy Office or the Director of Employee and Labor Relations can help assure that this occurs.

In most cases, grievances and appeals must be brought within a specified time after the action complained of. While informal resolution efforts will not automatically extend the time limits for filing a grievance or appeal, in appropriate circumstances the complainant and the other relevant parties may mutually agree in writing to extend the time for filing a grievance or appeal.

A list of the established grievance and appeal procedures is located at http://hrweb.stanford.edu/elr/policies/list_grievance_procedures.html. Copies may also be obtained from the Sexual Harassment Policy Office, http://www.stanford.edu/group/SexHarass.

Copies of the following may be obtained from Employee and Labor Relations, 651 Serra Street:

- "Solving Workplace Problems at Stanford: Understanding the Staff Dispute Resolution Policy" (also at http://hrweb.stanford.edu/forms/staffresolution.pdf.)
- "Solving Workplace Problems at Stanford: Information for Academic Staff – Librarians and Academic Staff – Research Associates"
- "The Dispute Resolution Process (A User's Guide)"

2. *Disciplinary Procedures*—In appropriate cases, disciplinary procedures may be initiated. The applicable disciplinary procedure depends on the status of the individual whose conduct is in question. For example, faculty are subject to the Statement on Faculty Discipline http://www.stanford.edu/dept/provost/faculty/policies/handbook/ch4.html#statementonfacultydiscipline and students to the Fundamental Standard. For additional information related to student judicial affairs, see http://www.stanford.edu/dept/vpsa/judicialaffairs.

The individuals referenced in this section are available to discuss these options and differing methods for dealing with sexual harassment.

4. *Procedural Matters*

a. *Investigations*—If significant facts are contested, an investigation may be undertaken. The investigation will be conducted in a way that respects, to the extent possible, the privacy of all of the persons involved. In appropriate cases, professional investigators may be asked to assist in the investigation. The results of the investigation may be used in the third party intervention process or in a grievance or disciplinary action.

b. *Recordkeeping*—The Sexual Harassment Policy Office will track reports of sexual harassment for statistical purposes and report at least annually to the University President concerning their number, nature and disposition.

The Sexual Harassment Policy Office may keep confidential records of reports of sexual harassment and the actions taken in response to those reports, and use them for purposes such as to identify individuals or departments likely to benefit from training so that training priorities can be established. No identifying information will be retained in cases where the individual accused was not informed that there was a complaint.

c. *Indemnification and Costs*—The question sometimes arises as to whether the University will defend and indemnify a Stanford employee accused of sexual harassment. California law provides, in part, "An employer shall indemnify [its] employee for all that the employee necessarily expends or loses in direct consequence of the discharge of his [or her] duties as such … ." The issue of indemnification depends on the facts and circumstances of each situation. Individuals who violate this policy, however, should be aware that they and/or their schools, institutes, or other units may be required to pay or contribute to any judgments, costs and expenses incurred as a result of behavior that is wrongful and/or contrary to the discharge of the employee's duties. In general, see Administrative Guide Memo 15.7 (http://adminguide.stanford. edu/15_7.pdf).

5. *Resources for Dealing with Sexual Harassment*

a. *Advice*—Persons who have concerns about sexual harassment should contact the Sexual Harassment Policy Office, any Sexual Harassment Adviser at http://harass.stanford.edu/SHadvisers.html or one of the other individuals listed below. Reports should be made as soon as possible: the earlier the report, the easier it is to investigate and take appropriate remedial action. When reports are long delayed, the University will try to act to the extent it is reasonable to do so, but it may be impossible to achieve a satisfactory result after much time has passed.

Likewise, anyone who receives a report or a grievance involving sexual harassment should promptly consult with the Sexual Harassment Policy Office or with a Sexual Harassment Adviser.

There are a number of individuals specially trained and charged with specific responsibilities in the area of sexual harassment. In brief, they are:

- *Sexual Harassment Advisers* (http://harass.stanford.edu/SHadvisers.html) serve as resources to individuals who wish to discuss issues of sexual harassment, whether because they have been harassed or because they want information about the University's policy and procedures. There is usually at least one Adviser assigned to each of the schools at the University and to each large work unit; most of the residence deans also have been appointed as Sexual Harassment Advisers. Advisers are also authorized to receive complaints.
- *The Director of the Sexual Harassment Policy Office* is responsible for the implementation of this policy. The Director's Office also provides advice and consultation to individuals when requested; receives complaints and coordinates their handling; supervises the other Advisers; encourages and assists prevention education for students, faculty and staff; keeps records showing the disposition of complaints; and generally coordinates matters arising under this policy. Because education and awareness are the best ways to prevent sexual harassment, developing awareness, education and training programs and publishing informational material are among the most important functions of the Sexual Harassment Policy Office (http://harass.stanford.edu).
- As stated above, individuals with concerns about sexual harassment may also discuss their concerns informally with psychological counselors (for example through CAPS or the HELP Center), chaplains (through the Memorial Chapel), or University or Medical School ombudspersons. For more information, see http://harass.stanford.edu/resources.html.

b. *External Reporting*—Sexual harassment is prohibited by state and federal law. In addition to the internal resources described above, individuals may pursue complaints directly with the government agencies that deal with unlawful harassment and discrimination claims, e.g., the U.S. Equal Employment Opportunity Commission (EEOC), the Office for Civil Rights (OCR) of the U.S. Department of Education, and the State of California Department of Fair Employment and Housing (DFEH). These agencies are listed in the Government section of the telephone book. A violation of this policy may exist even where the conduct in question does not violate the law.

6. *Consensual Sexual or Romantic Relationships*

a. *In General*—There are special risks in any sexual or romantic relationship between individuals in inherently unequal positions, and parties in such a relationship assume those risks. In the University context, such positions include (but are not limited to) teacher and student, supervisor and employee, senior faculty and junior faculty, mentor and trainee, adviser and advisee, teaching assistant and student, coach and athlete, and the individuals who supervise the day-to-day student living environment and student residents. Because of the potential for conflict of interest, exploitation, favoritism, and bias, such relationships may undermine the real or perceived integrity of the supervision and evaluation provided, and the trust inherent particularly in the teacher-student context. They may, moreover, be less consensual than the individual whose position confers power or authority believes. The relationship is likely to be perceived in different ways by each of the parties to it, especially in retrospect.

Moreover, such relationships may harm or injure others in the academic or work environment. Relationships in which one party is in a position to review the work or influence the career of the other may provide grounds for complaint by third parties when that relationship gives undue access or advantage, restricts opportunities, or creates a perception of these problems. Furthermore, circumstances may change, and conduct that was previously welcome may become unwelcome. Even when both parties have consented at the outset to a romantic involvement, this past consent does not remove grounds for a charge based upon subsequent unwelcome conduct.

Where such a relationship exists, the person in the position of greater authority or power will bear the primary burden of accountability, and must ensure that he or she—and this is particularly important for teachers—does not exercise any supervisory or evaluative function over the other person in the relationship. Where such recusal is required, the recusing party must also notify his or her supervisor, department chair or dean, so that such chair, dean or supervisor can exercise his or her responsibility to evaluate the adequacy of the alternative supervisory or evaluative arrangements to be put in place. Staff members may notify their local human resources officers. To reiterate, the responsibility for recusal and notification rests with the person in the position of greater authority or power. Failure to comply with these recusal and notification requirements is a violation of this policy, and therefore grounds for discipline. The University has the option to take any action necessary to insure compliance with the spirit of this recusal policy, including transferring either or both employees in order to minimize disruption of the work group. In those extraordinarily rare situations where it is programmatically infeasible to provide alternative supervision or evaluation, the cognizant Dean or Director must approve all evaluative and compensation actions.

b. *With Students*—At a university, the role of the teacher is multifaceted, including serving as intellectual guide, counselor, mentor and advisor; the teacher's influence and authority extend far beyond the classroom. Consequently and as a general proposition, the University believes that a sexual or romantic relationship between a teacher and a student, even where consensual and whether or not the student would otherwise be subject to supervision or evaluation by the teacher, is inconsistent with the proper role of the teacher, and should be avoided. The University therefore very strongly discourages such relationships.

7. *Policy Review and Evaluation*

This policy went into effect on October 6, 1993, and was amended on November 30, 1995, and on May 30, 2002. It is subject to periodic review, and any comments or suggestions should be forwarded to the Director of the Sexual Harassment Policy Office.

RESOURCES

The following is a summary of resources concerning sexual harassment available to members of the Stanford Community:

A brochure containing the policy, a list of current sexual harassment advisers, confidential resources, and other helpful information is available online at http://harass.stanford.edu, and in printed form from the Sexual Harassment Policy Office at Mariposa House, 585 Capistrano Way, Room 208-209, Stanford University, Stanford, CA, 94305-8230; (650) 723-1583; email: harass@stanford.edu. Copies of the University policy on sexual assault, which complements this sexual harassment policy, as well as all other documents mentioned in this section, are also available at the Sexual Harassment Policy Office.

All faculty, staff, and students who have questions regarding this policy and its enforcement can consult with a Sexual Harassment Adviser or can be directed to the local Personnel Officer or Regional Human Resources Manager. Faculty members should contact their dean or department chair, and students should contact the Director of the Sexual Harassment Policy Office or the Dean of Student Affairs.

Sexual Harassment Policy Office—telephone: (650) 723-1583; email: harass@stanford.edu.

Director: *Laraine Zappert (Clinical Professor, Psychiatry and Behavioral Sciences)*

Assistant Director: *Nanette Andrews*

SEXUAL ASSAULT

The University's Policy on Sexual Assault is published in complete form in the Administrative Guide Memo 23.3, available at http://adminguide.stanford.edu/23_3.pdf, and on the Judicial Affairs Office web site at http://www.stanford.edu/dept/vpsa/judicialaffairs/index.html.

SUMMARY

The following summarizes the policy on Sexual Assault and provides information on resources available to members of the Stanford community.

Background—This policy has been enacted by Stanford University in accordance with California State Law, Assembly Bill 3098, Postsecondary Education: Student Safety, July, 1990.

Policy—Sexual assault is unacceptable and will not be tolerated at Stanford University. Any member of the Stanford community who commits sexual assault at or on the grounds of the University, or at any of the University's off-campus facilities or activities, or at the facilities or activities of any affiliated student organization, will face maximal institutional sanctions, in addition to any prosecutions external authorities may undertake. Stanford University is committed to providing information on services, resources, and treatment available to victims of sexual assault. A comprehensive website containing a list of resources can be found at http://www.stanford.edu/group/svab/.

Definition—For purposes of this policy, sexual assault is defined as the commission of an unwanted sexual act, occuring without consent of both individuals, or occuring under threat or coercion. It can occur either forcibly and/or against a person's will, or when a person is incapable of giving consent (if under 18 years of age; if intoxicated by drugs or alcohol; if developmentally disabled; if temporarily or permanently mentally or physically unable to do so). Sexual assault includes but is not limited to rape, forcible sodomy, forcible oral copulation, rape with an object, sexual battery, forcible fondling, and threat of sexual assault.

Notification—With the consent of the victim, charges of sexual assault received by University offices or personnel shall be communicated promptly to the Department of Public Safety, 711 Serra Street, telephone 9-911 for emergency response or (650) 723-9633 during normal business hours, or, in the case of a student, to the sexual assault response team at YWCA Sexual Assault Center at Stanford at Vaden Health Service, 866 Campus Drive, telephone 725-9955.

Legal Reporting Requirements—Health care professionals are expected to fulfill legally mandated reporting requirements.

Emergency Services Available to Victims—Victims of sexual assault are urged to seek immediate attention from emergency police, medical, and counseling services. On the Stanford campus and in the immediate vicinity, the following provide 24-hour response and will arrange for police assistance, medical assistance, emotional support services, and advocacy and support:

"911" Emergency Network: dial 9-911 from University phones or 911 from outside phones
Santa Clara Valley Medical Center, 751 South Bascom Avenue, San Jose, telephone (408) 885-5000
YWCA Sexual Assault Center at Stanford, for students, at the Vaden Health Service, telephone (650) 725-9955
Stanford Hospital and Clinics, 300 Pasteur Drive, Stanford, telephone (650) 723-5111

Non-Emergency Resources—Additional resources for students are available at Vaden Health Service at (650) 723-3785, including short-term counseling, referral to long-term therapy, follow-up pregnancy testing, and testing and treatment for sexually transmitted diseases. Additional services for faculty and staff are available at the University's HELP Center, Galvez House (723-4577), including general counseling, information, support, and referral. The University ombudsperson (723-3682) is available to all in the Stanford community for general counseling, advice, and advocacy.

Ongoing Case Management Procedures—Both informal procedures and formal grievance procedures for case management of sexual assault charges are given in the University's policy on Sexual Harassment appearing as Administrative Guide Memo 23.2 and published annually in the *Stanford Bulletin*. Victims are to be kept informed by those responsible for those procedures of the status of any disciplinary proceedings and the results of any disciplinary action or appeal, providing that the victim agrees in advance, in writing, to treat this information as confidential. The offices of the Dean of Students are available to help student victims deal with academic difficulties that may arise because of the victimization and its impact.

Information Requests and Confidentiality—The University offices responding to charges of sexual assault have established protocols for protecting confidentiality and for handling inquiries from the press, concerned students, and parents.

Information about Options—The University offices responding to charges of sexual assault will inform victims, at a minimum, of the options of: criminal prosecution, civil prosecution, the disciplinary process, the appropriate grievance procedure, the availability of mediation, alternative housing assignments, and academic assistance alternatives.

POLITICAL ACTIVITIES

For the complete text of the currently applicable version of this policy, see Administrative Guide Memo 15.1, Political Activities, available at http://adminguide.stanford.edu/15_1.pdf.

SUMMARY

The following summarizes the policy on Political Actvities:

Stanford University, as a charitable entity, is subject to federal, state, and local laws and regulations regarding political activities: campaign activities, lobbying, and the giving of gifts to public officials.

While all members of the University community are naturally free to express their political opinions and engage in political activities to whatever extent they wish, it is very important that they do so only in their individual capacities and avoid even the appearance that they are speaking or acting for the University in political matters.

In the limited circumstances where individuals must speak or act on behalf of the University in the political arena, they must do so in accordance with the provisions of this Guide Memo.

POLICY

The following is quoted from the policy:

1. *Summary of Legal Requirements and Restrictions*
   - a. *Campaign Activities:* contributions of money, goods, or services to candidates for political office and in support of or opposition to ballot measure campaigns are subject to a wide variety of political laws. Depending on the jurisdiction and the campaign, political contributions may be prohibited or limited and, in nearly all cases, are subject to a complicated series of disclosure rules. Because of the University's tax-exempt status, the University is legally prohibited from endorsing candidates for political office or making any contribution of money, goods, or services to candidates. It is important, therefore, that no person inadvertently cause the University to make such a contribution.
   - b. *Lobbying:* lobbying can generally be described as any attempt to influence the action of any legislative body (for example, Congress, state legislatures, county boards, city councils, and their staffs) or any federal, state, or local government agency. Laws regulating lobbying exist at the federal, state, and local levels but can differ widely in scope, depending on the jurisdiction. Some laws, for example, only regulate lobbying of the legislative branch. Others, however, also cover lobbying of administrative agencies and officers in the executive branch (for example, lobbying for federally-funded grants). To one degree or another, however, most lobbying laws require registration and reporting by individuals engaged in attempts to influence governmental action.

     Tax-exempt organizations are permitted to lobby, and the University engages in lobbying on a limited number of issues, mostly those affecting education, research, and related activities. There is usually some threshold of time or money spent on lobbying that triggers registration and reporting requirements. Regardless of thresholds, however, no University employee—other than the following individuals, on matters under their jurisdiction — may lobby on behalf of the University without specific authorization:

     President
     Provost
     Deans of the Seven Schools
     Vice Provost and Dean of Research
     Vice President for Business Affairs and Chief Financial Officer
     Executive Director of Human Resources
     Director of the Stanford Linear Accelerator Center
     Director of the Hoover Institution
     General Counsel
     Vice President for Public Affairs

     The Vice Provost and Dean of Research may grant permission to faculty members to lobby on behalf of the University for specific purposes. The Director of Government and Community Relations may grant permission to staff members to lobby on behalf of the University for specific purposes. All lobbying on behalf of the University should be coordinated with the Director of Government and Community Relations.
   - c. *Giving of Gifts to Public Officials and Staff:* almost all jurisdictions have strict rules on the extent to which gifts and honoraria may be given to public officials (both elected and non-elected officials and, often, staff). In some cases gifts and honoraria are prohibited; in others they are limited; and in most cases they are subject to detailed disclosure. In addition, in some jurisdictions such as California, gifts to both state and local public officials can result in a public official's disqualification from participation in any governmental action affecting the interests of the donor. Meals, travel, and entertainment are the most common types of gifts, but gift rules can also apply in cases where public officials attend a reception or receive tickets to sporting or other events.

     As a non-profit organization, the University generally does not give gifts to public officials and, in those limited cases where it does give such gifts, it must do so in accordance with all applicable laws and regulations. Therefore, any University employee who, on behalf of the University, wishes to make a gift to a public official must receive prior approval from the Director of Government and Community Relations before making such a gift.
   - d. *Reporting of Political Activities:* the University must report most of its political activities above certain thresholds. Therefore, any University employee engaging in such activities on behalf of the University should carefully review the remainder of this Guide Memo and should discuss the relevant activities in advance with the Director of Government and Community Relations.
2. *Prohibited and Restricted Political Activities*
   - a. *In General:*
     1. No person may, on behalf of the University, engage in any political activity in support of or opposition to any candidate for elective public office (including giving or receiving funds or endorsements), nor shall any University resources be used for such purpose.
     2. No person may, on behalf of the University, lobby (or use University resources to lobby) any federal, state, or local legislative or administrative official or staff member unless specifically authorized to do so. Any lobbying activity, even when authorized, must be conducted in compliance with this Guide Memo, other applicable University policies, and applicable law.
     3. No person may, on behalf of the University, give a gift (or use any University resources to give a gift) to any federal, state, or local official or staff member, except in compliance with this Guide Memo, other applicable University policies, and applicable law.
     4. No person supporting candidates for public office or engaging in other political activities may use University space or facilities or receive University support, except in the limited ways described in section 3A, below.
     5. No person may use for lobbying activities federally-funded contract or grant money received by the University.

     Even the foregoing activities that are only restricted, rather than prohibited, may be subject to limitations imposed by law. Therefore, any person engaging in the activity, or contemplating doing so, should consult with the Director of Government and Community Relations.
   - b. *Guidelines for Avoiding Prohibited Partisan Political Activities:* the following guidelines should assist in preventing the involvement or apparent involvement of the University in political activities in support of or opposition to any candidate for elective public office, that is, partisan political activities. Except in the limited circumstances set forth in section 3.b., below:
     1. *Use of Name and Seal:* neither the name nor seal of the University or of any of its schools, departments, or institutions should be used on letters or other materials intended for partisan political purposes.
     2. *Use of Address and Telephones:* no University office should be used as a return mailing address for partisan political mailings, and telephone service that is paid by the University, likewise, should not be used for partisan political purposes. (Obviously, a student's dormitory room and telephone service that are personal to the student may be used for these purposes.)
     3. *Use of Title:* the University title of a faculty or staff member or other person should be used only for identification and should be accompanied by a statement that the person is speaking as an individual and not as a representative of the University.
     4. *Use of Services and Equipment:* University services, such as Interdepartmental Mail; equipment, such as duplicating machines, computers, and telephones; and supplies should not be used for partisan political purposes.
     5. *Use of Personnel:* no University employee may, as part of his or her job, be requested to perform tasks in any way related to partisan political purposes.

3. *Permissible Activities*
   1. *In General:* as noted above, the federal, state, and local laws which limit the partisan political activities that can take place in University facilities and with University support in no way inhibit the expression of personal political views by any individual in the University community. Nor do they forbid faculty, students, or staff from joining with others in support of candidates for office or in furtherance of political causes. There is no restriction on discussion of political issues or teaching of political techniques. Academic endeavors which address public policy issues are in no way affected.

      Because the University encourages freedom of expression, political activities which do not reasonably imply University involvement or identification may be undertaken so long as regular University procedures are followed for use of facilities. Examples of permissible activities are:
      1. Use of areas, such as White Plaza, for tables, speeches, and similar activities.
      2. Use of auditoriums for speeches by political candidates, but subject to rules of the Internal Revenue Service, the Federal Election Commission, and the California Fair Political Practices Commission, and other applicable laws. Arrangements must be made with University Events and Services. (See also Guide Memo 82.1, Public Events, for more information.)

      To reiterate, because tax and political compliance laws impose restrictions, and even prohibitions, on certain political activities and on the use of buildings and equipment at a non-profit institution such as the University, any such activities must be in compliance with these legal requirements. Individuals taking political positions for themselves or groups with which they are associated, but not as representatives of the University, should clearly indicate, by words and actions, that their positions are not those of the University and are not being taken in an official capacity on behalf of the University.
   2. *Limited University Political Activities:* limited activities relating to specific federal, state, or local legislation or ballot initiatives are permissible where (1) the subject matter is directly related to core interests of the University's activities; (2) the President has determined that the University should take a position; and (3) the individuals who speak or write on the University's behalf are specifically authorized to do so.
4. *Responsibility for Interpretation:* the Director of Government and Community Relations, in consultation with the General Counsel, is the administrative officer responsible for interpretation and application of the above guidelines. Questions on whether planned student activities are consistent with the University's obligations should be directed to the Dean of Students, who will consult with the Director of Government and Community Relations and/or the General Counsel. All other questions on whether planned activities are consistent with the University's obligations should be addressed directly to the Director of Government and Community Relations or the General Counsel.

CAMPUS DISRUPTIONS

The University's policy on campus disruption applies to students, faculty, and staff. It is published in its complete form on the Judicial Affairs Office web site at http://www.stanford.edu/dept/vpsa/ judicialaffairs/index.html.

POLICY

The following is quoted from the policy:

Because the rights of free speech and peaceable assembly are fundamental to the democratic process, Stanford firmly supports the rights of all members of the University community to express their views or to protest against actions and opinions with which they disagree.

All members of the University also share a concurrent obligation to maintain on the campus an atmosphere conducive to scholarly pursuits, to preserve the dignity and seriousness of University ceremonies and public exercises, and to respect the rights of all individuals.

The following regulations are intended to reconcile these objectives.

It is a violation of University policy for a member of the faculty, staff, or student body to:

1. prevent or disrupt the effective carrying out of a University function or approved activity, such as lectures, meetings, interviews, ceremonies, the conduct of University business in a University office, and public events.

2 obstruct the legitimate movement of any person about the campus or in any University building or facility.

Members of the faculty, staff, and student body have an obligation to leave a University building or facility when asked to do so in the furtherance of the above regulations by a member of the University community acting in an official role and identifying himself or herself as such; members of the faculty, staff, or student body also have an obligation to identify themselves, when requested to do so by such a member of the University community who has reasonable grounds to believe that the person(s) has violated section (1) or (2) of this policy and who has so informed the person(s).

APPLICATION

The following are examples to illustrate the policy:

The policy has been applied to the following actions: refusal to leave a building which has been declared closed; obstructing the passage into or out of buildings by sitting in front of doorways; preventing University employees from entering their workplace; preventing members of a class from hearing a lecture or taking an examination, or preventing the instructor from giving a lecture, by means of shouts, interruptions, or chants; preventing others from hearing a scheduled speaker by means of shouts, interruptions, or chants; refusing to leave a closed meeting when unauthorized to attend; and intruding upon or refusing to leave a private interview.

It should be understood that while the above are examples of extraordinarily disruptive behavior, the application of the policy also takes situational factors into consideration. Thus, for example, conduct appropriate at a political rally might constitute a violation of the Policy on Campus Disruption if it occurred within a classroom.

There is no "ordinary" penalty which attaches to violations of the Policy on Campus Disruption. Each case is fact-specific; considerations would include: the gravity of the offense, and prior similar misconduct. As a general rule, the more serious the offense, the less it matters that the violation had otherwise not done wrong.

USE OF THE MAIN QUADRANGLE AND MEMORIAL COURT

POLICY

The following is quoted from the policy:

The Main Quadrangle and Memorial Court are part of Stanford University's academic preserve due to their locations at the heart of the campus. To protect and enhance their historic status, University policy limits activities primarily to established or traditional ceremonies and events.

Unscheduled events or activities are prohibited.

Requests for waivers to this policy must be submitted in writing to the Director of Public Events. Exceptions may be granted only in extraordinary cases.

RESOURCES

The following is a summary of resources available:

For instructions on use of the Main Quadrangle/Memorial Court, contact the Director of University Public Events at (650) 723-2551, http://stanfordevents.stanford.edu/. Note that other venues on campus (such as White Plaza) are made available for events other than scheduled "established or traditional ceremonies and events" including those that may involve amplified sound. For further information on the use of such other venues, contact the Office of Student Activities at (650) 723-2733, http://www.stanford.edu/dept/OSA/.

NOISE AND AMPLIFIED SOUND

POLICY

The following is quoted from the policy:

Stanford is not only an academic institution but a residential community as well. It is the responsibility of all faculty, students, and staff to moderate noise especially during an event or activity held on campus. Supporting the mission of the University and respecting those who are studying, researching, or otherwise carrying out academic-related activities is a Stanford priority. The campus must require a conducive atmosphere to ensure these endeavors are accomplished and supported. Disturbing noise in or around a residence or other campus buildings which infringe on the rights of other residents or members of the University community is considered a violation of this policy. As part of the event planning process, the event sponsor must obtain all appropriate approvals regarding the use of amplified sound during an event or activity.

RESOURCES

Information regarding whether and how the use of amplified sound is permitted is available from the following sources, which must be consulted for prior approval:

a. The Office of Student Activities: phone: 723-2733, or see http://osa.stanford.edu/publications/soh/2002-2003/
b. Registrar's Scheduling Office: phone (650) 723-6755, or see http://registrar.stanford.edu/event/.
c. The Stanford Events Office: phone (650) 723-2551, or see http://stanfordevents.stanford.edu.

PROHIBITION OF THE POSSESSION OF DANGEROUS WEAPONS ON CAMPUS

The University's policy prohibiting weapons on campus is published in its complete form on the Judicial Affairs Office web site http://stanford.edu/dept/vpsa.judicialaffairs/index.html.

POLICY

The following is quoted from the policy:

Except for authorized academic purposes, the knowing possession by any student on any Stanford campus of the following is prohibited: firearms, explosives, or any instrument or weapon of the kind commonly known as blackjack, slingshot, billy club, sandclub, sandbag, or metal knuckles.

Notwithstanding the paragraph above, a student who is a resident of a Stanford campus may store a weapon on such campus if both of the following conditions are met:

1. The student has complied with all state and federal regulations regarding the use and possession of said weapon, or, in the case of a foreign campus, with the laws of the country in which the campus is located.
2. The student stores such weapons with the Stanford Department of Public Safety (SDPS) or, in the case of a foreign campus, in a facility provided by the director of such campus.

Students may remove their weapons from storage only in accordance with regulations established by the SDPS or by the director of the foreign campus at which the weapon is stored. A student who is a resident of a Stanford campus may bring any of the above weapons on campus for purposes of storage only if the student has previously notified the SDPS of the intention to do so, but in no event more than six hours after arrival on the campus. When the student removes the weapon from storage, it must be taken off campus as soon as is practicable, but in no event more than one hour after such removal.

The term "Stanford campus" shall include all the lands and facilities of Leland Stanford Junior University, whether owned or leased, and whether located in the United States or abroad.

CONTROLLED SUBSTANCES AND ALCOHOL

STUDENT CONDUCT

Student conduct is guided by the Fundamental Standard. Implicit in the Standard is the understanding that students are responsible for making their own decisions and accepting the consequences of those decisions.

In order to make informed decisions about alcohol and other drug use, students should educate themselves about the health and safety risks associated with their use, as well as about state and local laws on possessing, serving, and consuming alcohol. It is widely recognized that the misuse and abuse of drugs ("controlled substances")* and the abuse of alcohol are major contributors to serious health problems, as well as to social and civic concerns. Among the health risks associated with the use of illicit drugs and the abuse of alcohol are various deleterious physical and mental consequences including dependency, severe disability, even death. Information concerning the known effects of alcohol and specific drugs is available from the Alcohol and Other Drug Abuse Prevention Program at Vaden Student Health Service.

The goal of this University's policy is to reduce the abuse and illegal use of alcohol and other drugs, and the human and material costs associated with it. The University, as an educational institution, approaches student conduct issues from a perspective that places emphasis on individual responsibility and development. Education about and prevention of alcohol and other drug-related problems will continue to be the primary emphasis and goal. However, the University expects students, as individuals and as members of groups, to conduct themselves in accordance with this and all other University policies governing student conduct.

POLICY

The University's policy on controlled substances and alcohol is published in its complete form in the Administrative Guide as Administrative Guide Memo 23.6, available at http://adminguide.stanford.edu/23_6.pdf, and on the Judicial Affairs Office web site http://stanford.edu/dept/vpsa/judicialaffairs/index.html.

The following is quoted from the policy:

It is the policy of the University to maintain a drug-free workplace and campus. The unlawful manufacture, distribution, dispensation, possession, and/or use of controlled substances or the unlawful possession, use, or distribution of alcohol is prohibited on the Stanford campus, in the workplace, or as part of any of the University's activities. The workplace and campus are presumed to include all Stanford premises where the activities of the University are conducted. Violation of this policy may result in disciplinary sanctions up to and including termination of employment or expulsion of students. Violations may also be referred to the appropriate authorities for prosecution.

This policy will be reviewed at least biennially.

APPLICATIONS

The following are examples to illustrate the policy:

No University funds or funds collected by the University may be used in a way that violates the alcohol policy. In student residences, house funds (funds collected by the University Bursar or other University offices) may not by used to buy alcohol because the majority of undergraduates are under the legal drinking age of 21. The decision to use student-collected funds to buy alcohol should be made lawfully, thoughtfully, fairly, and in a way that respects the views of all students. Students must not be required to contribute to a student-collected fund for the purposes of purchasing alcohol. No alcoholic beverages may be served at all-freshman house events in common area spaces (e.g., lounges, hallways, patios/outdoor areas).

Party planners are responsible for planning and carrying out events in compliance with this policy. At least one house or organization officer must assume responsibility for an event's compliance with the policy, and their names must be made available to Stanford's Department of Public Safety and the University upon request.

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* Controlled substances are those defined in 21 U.S.C. 812; they include, but are not limited to, such substances as marijuana, heroin, cocaine, and amphetamines.

CONSEQUENCES OF VIOLATION

Educational and rehabilitative measures will be the preferred response to infractions of the Policy unaccompanied by more egregious misconduct. Penalties are calibrated according to the severity of the violation. Misbehavior associated with drug or alcohol use and abuse may result in one or more of the following University consequences:

Individuals who violate the University Residence Agreement may lose their University student housing privileges and/or be reported to the Judicial Affairs Office.

Individuals who violate the University's terms and conditions for student organization recognition as defined in the *Student Organization Handbook* may be subject to expulsion from the student organization.

Student groups which violate the Policy may face suspension of social privileges, as well as the loss of University recognition, meeting space, and housing or other related privileges.

Students should understand that inebriation is never an excuse for misconduct, that the careless or willful reduction, through the use of alcohol or other intoxicants, of their own ability to think clearly, exercise good judgment, and respond to rational intervention may invoke more stringent penalties than otherwise might be levied.

Penalties will be imposed according to the facts and circumstances of each case. They can be imposed singly or in combination by the Office of Residential Education/Graduate Residences, the Office of Student Activities, the Dean of Students Office, and the Office of Judicial Affairs.

CIVIL LIABILITY

While the law regarding civil liability is complex, it is important to know that under some circumstances party hosts, sponsors, bartenders, or others might be held legally liable for the consequences of serving alcohol to underage drinkers or to obviously intoxicated persons. Social hosts or party planners could be sued and found personally responsible for damages to the injured party(ies) including:

Specific damages. These are damages which are measurable. For example, when bodily injury results in medical expenses or lost wages.

General damages. These are damages which cannot not be specifically measured in terms of dollar amount. For example, pain and suffering resulting from bodily injury.

Punitive damages. These are damages which are intended to serve as an example to others and to discourage behavior which is deemed highly undesirable to society.

CRIMINAL LIABILITY

Stanford University is not a sanctuary from the enforcement of state and local laws. Students and others on campus who violate the law may be and have been arrested and prosecuted. Primary responsibility for law enforcement, including that related to alcohol, rests with law enforcement agencies, primarily the Stanford University Department of Public Safety. Uniformed officers who patrol the campus and respond to calls are deputized by the Sheriff of Santa Clara County and are fully empowered and authorized to stop vehicles, make arrests, and enforce all laws. Laws are subject to change; consequently, the following information is illustrative but must not be relied on as a complete and current citing of relevant laws. More information is available at the Stanford Department of Public Safety, 711 Serra Street.

Generally, it is a criminal offense:

1. To provide any alcoholic beverage to a person under 21.
2. To provide any alcoholic beverage to an obviously intoxicated person.
3. For any person under age 21 to purchase alcohol.
4. To be under the influence of alcohol or another drug in a public place and unable to exercise care for one's own safety or that of others.
5. For persons under 21 to possess alcohol in any public place or any place open to the public (for example, public places in student residences).
6. To operate a motor vehicle while under the influence of alcohol or any other drug. Presumed to be driving under the influence (DUI) with a blood alcohol level (BAL) of 0.08% or higher.
7. To ride a bicycle while under the influence of alcohol, drugs, or both.
8. To have an open container of alcohol in a motor vehicle; and, for persons under 21 to drive a vehicle carrying alcohol or to possess alcohol while in a motor vehicle.
9. To have in one's possession, or to use, false evidence of age and identity to purchase alcohol.
10. To possess an open container of alcohol in a public place or any place open to the public. Applies in Palo Alto jurisdiction.
11. To be in possession of an unregistered keg. All kegs sold must be registered at the time of purchase. Identification tags must be placed on all kegs in order to allow kegs to be traced if the contents are used in violation of the law.

WHERE TO GET HELP

In the event of a life threatening emergencies call 9-911 from on-campus and 911 from off-campus.

Campus Resources—(Area Code 650) Counseling and Psychological Services, 24 hours (723-3785); The Alcohol and Other Drug Abuse Prevention Program (723-3429); Stanford Alcohol and Drug Treatment Center (723-6682); Vaden Health Service's Medical Advice Line, 24 hours (723-4841); The Bridge, 24-hour Peer Counseling (723-3392).

The Alcohol and Other Drug Abuse Prevention Program at Vaden Health Service: provides information and referral, educational trainings and workshops, and non-clinical consultations for groups and individuals. The program utilizes a harm reduction approach to prevent problems associated with the use of alcohol, tobacco, and other drugs (723-3429).

The Office of Student Activities at Tresidder Memorial Union: provides workshops and training, publications, and party planning consultations. Web site: http://www-leland.stanford.edu/dept/OSA/party/ (723-2733).

Community Resources—Alcoholics Anonymous (650) 592-2364, Alanon (650) 873-2356 or (408) 379-1051.

HAZING POLICY

Hazing is not permitted at Stanford University. No individual, recognized student organization, club, team, or any other Stanford-affiliated student group is permitted to plan, engage in, or condone hazing, on or off the Stanford campus.

DEFINITION OF HAZING AT STANFORD UNIVERSITY

Hazing includes any activity done in connection with a student organization, regardless of whether the organization is officially recognized at Stanford, that causes or is reasonably likely to cause another student to suffer bodily danger, physical harm, or significant personal degradation or humiliation, even if no bodily danger, physical harm, or significant degradation or humiliation in fact results. Hazing might occur during initiation or pre-initiation into a student organization, but is not limited to these time frames. Any individual who plans or intentionally assists in hazing activity has engaged in hazing, regardless of whether that individual is present when the hazing activity occurs.

CONSEQUENCES OF A VIOLATION

Stanford University expects its students to conduct themselves in socially responsible and respectful ways. Thus, participation in hazing, either as an individual or as part of any student group, may result in serious individual and organizational consequences including, but not limited to: disciplinary action up to and including expulsion; permanent loss of organizational recognition; and loss of eligibility to remain a member of any club, team, or other Stanford-affiliated student group. Consent, implied or expressed, is not a defense to any complaint or charge alleging a hazing violation.

A number of University offices may take institutional action, including: the Organizational Conduct Board; Judicial Affairs; or other University offices, such as the Vice Provost for Student Affairs or the Department of Athletics.

APPLICATIONS

Stanford's hazing policy is distinct from and broader than California Penal Code section 245.6, which prohibits: "any method of initiation or preinitiation into a student organization or student body, whether or not the organization or body is officially recognized by an educational institution, which is likely to cause serious bodily injury to any former, current, or prospective student of any school, community college, college, university or other educational institution in this state." A violation of Penal Code Section 245.6 that does not result in serious bodily injury is punishable as a misdemeanor, while a violation that results in death or injury is punishable as a felony or a misdemeanor.

Nothing in this hazing policy prevents Stanford from taking institutional action against hazing activity that falls outside the narrower definition of Penal Code section 245.6.

Stanford's hazing policy is not intended to prohibit student recruitment or new or continuing member activities that are positive and educational in nature, designed to instill a group ethos or unity. Its intent is to deter those behaviors that cause or are likely to cause danger, harm or humiliation to another student.

Stanford's hazing policy is not intended to apply to customary athletic events or other similar institutionally-approved contests or competitions.

Some examples of hazing activities or events may be found at http://osa.stanford.edu/publications/soh/critical_policies--hazing.shtml. Questions should be directed to the Office of Student Activities, (650) 723-2733.

SMOKE-FREE ENVIRONMENT

The University's policy on a smoke-free environment is published in its complete form in the Administrative Guide as Administrative Guide Memo 23.4, available at http://adminguide.stanford.edu/23_4.pdf, and Judicial Affairs Office web site at http://www.stanford.edu/dept/vpsa/judicialaffairs/index.html.

Applicability—This policy applies to all academic and administrative units of Stanford University, including SLAC, and all campus student housing. This policy does not supercede more restrictive policies which may be in force in compliance with federal, state, or local laws or ordinances.

Note also that the School of Medicine has adopted a more restrictive policy; see http://med.stanford.edu/tobaccofree/.

POLICY

The following is quoted from the policy:

1. *Policy*

   It is the policy of Stanford University that the smoking of tobacco products in enclosed buildings and facilities and during indoor or outdoor events (and the selling of tobacco products) on the campus is prohibited.

2. *Guidelines*
   a. *Smoking-Prohibited Areas*—Specifically, smoking is prohibited in classrooms and offices, all enclosed buildings and facilities, in covered walkways, in University vehicles, during indoor and outdoor athletic events, and during other University sponsored or designated indoor or outdoor events.
      - Ashtrays will not be provided in any enclosed University building or facility.
      - "Smoking Prohibited" signs will be posted.

   b. *Outdoor Smoking Areas*—Smoking is permitted in outdoor areas, except during organized events. Outdoor smoking areas should be located far enough away from doorways, open windows, covered walkways, and ventilation systems to prevent smoke from entering enclosed buildings and facilities. To accommodate faculty, staff, and students who smoke, Vice Presidents, Vice Provosts, and Deans may designate certain areas of existing courtyards and patios as smoking areas in which case ashtrays must be provided. Costs associated with providing designated smoking areas and ashtrays will be absorbed by the specific academic or administrative unit(s).

3. *Enforcement*—This policy relies on the consideration and cooperation of smokers and non-smokers. It is the responsibility of all members of the University community to observe and follow this policy and its guidelines.
   a. *Smoking Cessation Information*—Smoking cessation programs are available for faculty and staff through the Center for Research in Disease Prevention, and the Health Improvement Program (HIP). Students may contact the Health Promotion Program (HPP) through the Student Health Center for smoking cessation information or programs.

   b. *Repeated Violations*—Faculty, staff, and students repeatedly violating this policy may be subject to appropriate action to correct any violation(s) and prevent future occurrences.

4. *Implementation and Distribution*—Copies of this policy will be disseminated by the Manager of HR Policy/Staff and Labor Relations and the Vice Provost for Student Affairs to all faculty, staff, and students, and to all new members of the University community.

UNIVERSITY STATEMENT ON PRIVACY

Stanford University has an interest in ensuring that the privacy of its students, faculty, and staff is respected, and that no activities interfere with education, research, or residential life.

The University is private property; however, some areas of the campus typically are open to visitors. These areas include White Plaza, public eating areas (such as those at Tresidder Union), outdoor touring areas, and locations to which the public has been invited by advertised notice (such as for public educational, cultural, or athletic events). Even in these locations, visitors must not interfere with the privacy of students, faculty, and staff, or with educational, research, and residential activities. The University may revoke at any time permission to be present in these, or any other areas. Visitors should not be in academic or residential areas unless they have been invited for appropriate business or social purposes by the responsible faculty member, student, or staff member.

No commercial activity, including taking photos or similar audio or visual recordings that are sold to others or otherwise used for commercial purposes, may occur on the campus without the University's permission. Requests for permission should be submitted to the Director of University Communications or, as appropriate, the Dean of Students, the Department of Athletics, or the Office of Public Events. Recognized student groups and official units of the University will be granted such permission so long as they do not violate privacy or property interests of others; so long as any sale of their products is predominantly on campus to students, faculty, and staff; and so long as they comply with applicable University policies and procedures.

Violaters of this policy may be subject to criminal and/or civil liability, as well as University disciplinary action.

COMPUTER AND NETWORK USAGE

For a complete text of the currently applicable version of this policy, see Administrative Guide Memo 62, Computer and Network Usage Policy, available at http://adminguide.stanford.edu/62.pdf.

POLICY

The following is quoted from the policy:

Users of Stanford network and computer resources have a responsibility not to abuse the network and resources. This policy provides guidelines for the appropriate and inappropriate use of information technologies.

SUMMARY

The following summarizes the policy on Computer and Network Usage:

In particular, the policy provides that users of University information resources must respect software copyrights and licenses, respect the integrity of computer-based information resources, refrain from seeking to gain or permitting others to gain unauthorized access, including by sharing passwords, and respect the rights of other computer users.

This policy covers appropriate use of computers, networks, and information contained therein. As to political, personal and commercial use, the University is a non-profit, tax-exempt organization and, as such, is subject to specific federal, state, and local laws regarding sources of income, political activities, use of property, and similar matters. It also is a contractor with government and other entities, and thus must assure proper use of property under its control and allocation of overhead and similar costs. For these reasons, University information resources must not be used for partisan political activities where prohibited by federal, state, or other applicable laws, and may be used for other political activities only when in compliance with federal, state, and other laws, and in compliance with applicable University policies. Similarly, University information resources should not be used for personal activities not related to appropriate University functions, except in a purely incidental manner. In addition, University information resources should not be used for commercial purposes, except in a purely incidental manner or except as permitted under other written policies of the University or with the written approval of a University officer having the authority to give such approval. Any such commercial use should be properly related to University activities, take into account proper cost allocations for government and other overhead determinations, and provide for appropriate reimbursement to the University for taxes and other costs the University may incur by reason of the commercial use. Users also are reminded that the .edu domain on the Internet has rules restricting or prohibiting commercial use, and thus activities not appropriately within the .edu domain and which otherwise are permissible within the University computing resources should use one or more other domains, as appropriate.

The University's Information Security Officer is authorized in appropriate circumstances to inspect or monitor private data (including email), such as when there is a reasonable cause to suspect improper use of computer or network resources.

For further information on the topic of peer-to-peer file sharing, see the section above on Copyright.

CHAT ROOMS, BLOGS, AND OTHER FORUMS USING STANFORD DOMAINS OR COMPUTER SERVICES

For a complete text of the currently applicable version of this policy, see Administrative Guide Memo 66, Chat Rooms and Other Forums Using Stanford Domains or Computer Services, available at http://adminguide.stanford.edu/66.pdf.

POLICY

The following is quoted from the policy:

1. *Definition*

From time to time, University departments, faculty, students and others may host electronic communication forums, such as chat rooms, newsgroups, bulletin boards, blogs, or web sites, whereby various parties may contribute their thoughts on various subjects and where such communication is made available for others to read and comment upon. For purposes of this policy, these sites are collectively referred to as forums.

2. *Establishment of Forums*
   a. *Connection with University Activities*—Forums that either use the Stanford.edu, Stanford.org, or other Stanford domains, or use University computing facilities, should be established only in connection with legitimate activities of the University.
   b. *University Role*—Unless specifically sponsored by an academic administrative unit of the University, the University's role in connection with these forums will be solely as a passive Internet service provider.
   c. *Terms of Use*—In all cases, as a condition to establishing a forum, forum homepages (where they exist) and each individual forum page should contain a header that states: Subject to Terms of Use and all pages should include a link to the page maintained by the University entitled "Terms of Use." The URL is http://www. stanford.edu/home/atoz/terms.html.

3. *Operation of Forums*

All forums shall be operated in compliance with the Terms of Use, as modified from time to time, and the University's various policies regarding computer facilities and services.

PROTECTION OF CONFIDENTIAL DATA

Stanford University maintains confidential data including Social Security numbers, financial information, health information, and student records. It is incumbent on every member of the Stanford community with lawful access to confidential data to protect it. Confidential data in electronic form should not be stored locally on desktop machines. Members of the Stanford community should familiarize themselves with applicable laws and University policies on privacy as provided by the University, including Administrative Guide Memo 63, Information Security, http://adminguide.stanford.edu/63.pdf, Administrative Guide Memo 64, Identification and Authentication of Systems, http://adminguide.stanford.edu/64.pdf, Administrative Guide Memo 65, Electronic Commerce, http://adminguide.stanford.edu/65.pdf, and Administrative Guide Memo 67, Information Security Incident Response, http://adminguide.stanford. edu/67.pdf.

CAMPUS SAFETY AND CRIMINAL STATISTICS

Stanford University complies with the Jeanne Clery Disclosure of Campus Security Policy and Crime Statistics Act. A copy of Stanford's policies and statistics under this act are posted on the Department of Public Safety web site at http://police.stanford.edu/index2.html.

INDEX

APPENDIX: AXESS SUBJECT CODES

AA	Aeronautics and Astronautics
ACCT	Accounting
AFRICAAM	African and African American Studies
AFRICAST	African Studies, Center For
AMELANG	African and Middle Eastern Languages
AMSTUD	American Studies
ANES	Anesthesia
ANTHSCI	Anthropological Sciences
APPLLING	Applied Linguistics
APPPHYS	Applied Physics
ARCHLGY	Archaeology
ARTHIST	Art History
ARTSTUDI	Art Studio
ASNAMST	Asian American Studies
ASTRNMY	Astronomy
ATHLETIC	Athletics, Physical Education, and Recreation
BIOC	Biochemistry
BIOHOPK	Biological Sciences/Hopkins Marine
BIOE	Bioengineering
BIOMEDIN	Biomedical Informatics
BIOPHYS	Biophysics
BIOSCI	Biological Sciences
CASA	Cultural and Social Anthropology
CBIO	Cancer Biology
CEE	Civil and Environmental Engineering
CHEM	Chemistry
CHEMENG	Chemical Engineering
CHICANST	Chicana/o Studies
CHINGEN	Chinese General
CHINLANG	Chinese Language
CHINLIT	Chinese Literature
CLASSART	Classics Art/Archaeology
CLASSGEN	Classics General
CLASSGRK	Classics Greek
CLASSHIS	Classics History
CLASSLAT	Classics Latin
CME	Computational and Mathematical Engineering
COMM	Communication
COMPLIT	Comparative Literature
COMPMED	Comparative Medicine
CS	Computer Science
CSB	Chemical Systems Biology
CSP	Continuing Studies Program
CSRE	Comparative Studies in Race and Ethnicity
CTL	Center for Teaching and Learning
CTS	Cardiothoracic Surgery
DANCE	Dance
DBIO	Developmental Biology
DERM	Dermatology
DLCL	Division of Literatures, Cultures, and Languages
DRAMA	Drama
EARTHSYS	Earth Systems
EASTASN	East Asian Studies
ECON	Economics
EDUC	Education
EE	Electrical Engineering
EEES	Earth, Energy, and Environmental Sciences
EFSLANG	English for Foreign Students
ENERGY	Energy Resources Engineering
ENGLISH	English
ENGR	Engineering
ETHICSOC	Ethics in Society
FEMST	Feminist Studies
FILMSTUD	Film Studies
FILMPROD	Practice of Film
FINANCE	Finance
FRENGEN	French General
FRENLANG	French Language
FRENLIT	French Literature
GENE	Genetics
GEOPHYS	Geophysics
GERGEN	German General
GERLANG	German Language
GERLIT	German Literature
GES	Geological and Environmental Sciences
GSBGEN	GSB General and Interdisciplinary
HISTORY	History
HPS	History and Philosophy of Science
HRMGT	Human Resource Management
HRP	Health Research and Policy
HUMBIO	Human Biology
HUMNTIES	Interdisciplinary Studies in the Humanities
HUMSCI	Humanities and Sciences
ICA	International Comparative and Area Studies
IHUM	Introduction to the Humanities
IIS	Freeman Spogli Institute for International Studies
IMMUNOL	Immunology
INDE	Medicine Interdisciplinary
INTNLREL	International Relations
IPER	Interdisciplinary Program in Environment and Resources
IPS	International Policy Studies
ITALGEN	Italian General
ITALLANG	Italian Language
ITALLIT	Italian Literature
JAPANGEN	Japanese General
JAPANLIT	Japanese Literature
JAPANLNG	Japanese Language
JEWISHST	Jewish Studies
KORGEN	Korean General
KORLANG	Korean Language
LATINAM	Latin American Studies
LAW	Law
LAWGEN	Law, Nonprofessional
LINGUIST	Linguistics
MATH	Mathematics
MATSCI	Materials Science and Engineering
MCP	Molecular and Cellular Physiology
MCS	Mathematical and Computational Science
ME	Mechanical Engineering
MED	Medicine
MEDVLST	Medieval Studies
MGTECON	Economic Analysis and Policy
MI	Microbiology and Immunology
MKTG	Marketing
MLA	Master of Liberal Arts
MS&E	Management Science and Engineering
MTL	Modern Thought and Literature
MUSIC	Music
NATIVEAM	Native American Studies
NBIO	Neurobiology
NENS	Neurology and Neurological Sciences
NEPR	Neurosciences Program
NSUR	Neurosurgery
OB	Organizational Behavior
OBGYN	Obstetrics and Gynecology
OIT	Operations Information and Technology
OPHT	Ophthalmology
ORTHO	Orthopedic Surgery
OSPAUSTL	Stanford Program in Australia
OSPBEIJ	Stanford Program in Beijing
OSPBER	Stanford Program in Berlin
OSPFLOR	Stanford Program in Florence
OSPGEN	Overseas Seminars
OSPKYOCT	Kyoto Center for Japanese Studies
OSPKYOTO	Stanford Program in Kyoto—SCTI
OSPMOSC	Stanford Program in Moscow
OSPOXFRD	Stanford Program in Oxford
OSPPARIS	Stanford Program in Paris
OSPSANTG	Stanford Program in Santiago
OTOHNS	Otolaryngology
PATH	Pathology
PEDS	Pediatrics
PHIL	Philosophy
PHYSICS	Physics
POLECON	Political Economics
POLISCI	Political Science
PORTLANG	Portuguese Language
PORTLIT	Portuguese Literature
PSYC	Psychiatry
PSYCH	Psychology
PUBLPOL	Public Policy
PWR	Program in Writing and Rhetoric
RAD	Radiology
RADO	Radiation Oncology
REES	Russian, East European, and Eurasian Studies
RELIGST	Religious Studies
SBIO	Structural Biology
SIS	Stanford Introductory Seminars
SIW	Stanford in Washington
SLAVGEN	Slavic General
SLAVLANG	Slavic Language
SLAVLIT	Slavic Literature
SLE	Structured Liberal Education
SOC	Sociology
SOPHCOLL	Sophomore College
SPANLANG	Spanish Language
SPANLIT	Spanish Literature
SPECLANG	Special Language Program
STATS	Statistics
STRAMGT	Strategic Management
STS	Science, Technology, and Society
SURG	Surgery
SYMBSYS	Symbolic Systems
TIBETLNG	Tibetan Language
URBANST	Urban Studies
UROL	Urology