ME 355: COMPRESSIBLE FLOWS

Spring 2016

Course Syllabus

Course Description: This is an introductory course focused on theoretical aspects of Compressible Flows. A review of fundamental concepts of high-speed flows is performed in the first part. Topics include quasi-one dimensional flow in variable area ducts, normal and oblique shock waves and expansion fans, unsteady motion, two-dimensional supersonic flows and hypersonic flows.

Prerequisite*:* Introductory level fluid mechanics.

Instructor: Javier Urzay, Ph.D.
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Office: 206 CTR
Office Hours: Mondays 4:00 PM-6:00 PM.

Lectures: Tuesdays and Thursdays, 1:30 PM-2:50 PM at room 380-381T.

Reference Textbooks (not required):

- M. A. Saad, *"Compressible Flow"*, Prentice Hall, 1993.
- A.H. Shapiro, *"The Dynamics and Thermodynamics of Compressible Fluid Flow"*, Wiley, 1953.
- H.W. Liepmann & A. Roshko, *"Elements of Gas Dynamics"*, Dover, 1957.
- J.D. Anderson, *"Hypersonic and High-Temperature Gas Dynamics"*, AIAA, 2006.
- Y.B. Zel'dovich & Y.P. Raizer, "*Physics of Shock Waves and High-Temperature Hydrodynamic Phenomena"*, Dover, 2002.
- L.D. Landau & E.M. Lifshitz, *"Fluid Mechanics"*, BH, 1959.

Supplementary material shall be provided in class.

Homeworks: There will be 4 homework assignments. No late homeworks will be accepted.

Exams: Midterm Exam: Tuesday, May 10, in class.

Final Exam: TBA.

Both exams will consist of two parts: i) Short Questions (closed books, closed notes, no calculator), and ii) Problems (open book and open notes, calculator allowed).

Grading Scheme: 30% Homeworks + 30% Midterm Exam + 40% Final Exam.

Academic Integrity: The Stanford Honor Code will be followed: https://communitystandards.stanford.edu/student-conduct-process/honor-code-and-fundamental-standard

Website: http://www.stanford.edu/~jurzay/ME_355

OUTLINE

1. Conservation Equations
2. Shocks and Expansion Waves
3. Compressible Flows in Ducts and Nozzles
4. Wave Motion in Compressible Flows
5. Two-Dimensional Theory of Compressible Flows
6. Hypersonic Aerodynamics