APPPHYS 383

Introduction to Atomic Processes (Mabuchi)

Stanford University, Winter Quarter 2010

Course objectives

- to work through most of the material in Atom-Photon Interactions
  - ➢ fundamental concepts and modeling methods for cw laser measurement and control of low-energy internal/external states of *hydrogen-like* atoms
- to cover background material as necessary for enrolled students
- to explore applications in atomic physics via journal articles (as time permits)

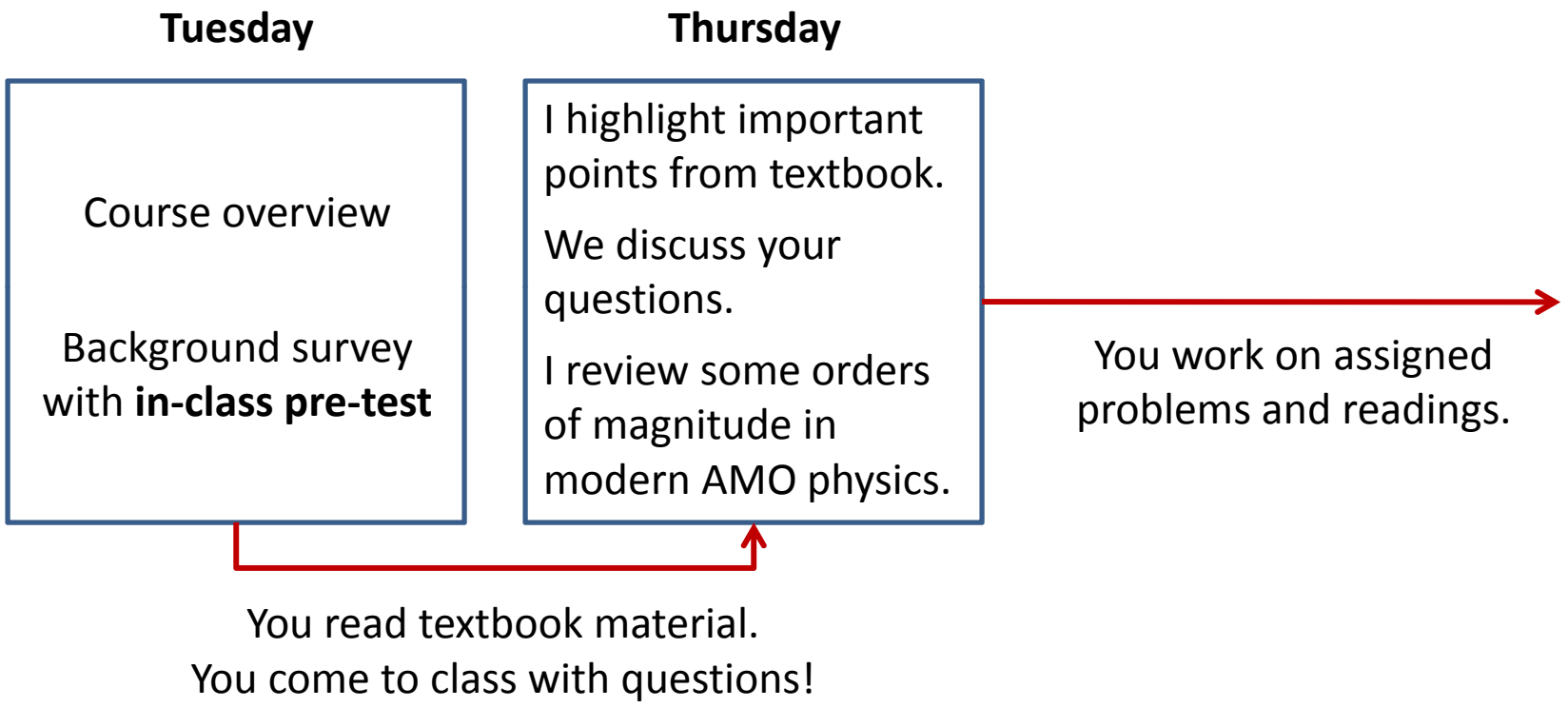
Logistics:

- Class meets Tue+Thu 2:15–3:30pm in 126 McCullough
- Instructor: Hideo Mabuchi (hmabuchi@stanford.edu)
- Required text: Atom-Photon Interactions: *Basic Processes and Applications*
- Course website: `http://minty.stanford.edu/AP383`

Tentative syllabus

Week of	**Topics**
January 4	Appendix: “Quantum electrodynamics in the Coulomb gauge—summary of the essential results”
January 11 *Shift 1/14 class earlier?	Chapter 1: “Transition amplitudes in electrodynamics” Complement A1 (Perturbative calculations)
January 18	Complement C1: “Discrete level coupled to a broad continuum: A simple model”
January 25	Chapter 2: “A survey of some interaction processes between photons and atoms”
February 1	Chapter 4: “Radiation considered as a reservoir…” Complement B4 (Harmonic oscillator master equation)
February 8	Complement A4: “Fluctuations and linear response, application to radiative processes”
February 15 *2/16 class to be rescheduled	Chapter 5: “Optical Bloch Equations”
February 22	Chapter 6: “The dressed atom approach”
March 1	Example applications: two-color dipole force traps, quantum state synthesis, …?
March 8	Student projects

This week



Pre-test: It doesn't count for anything; its purpose is to help me understand your prior preparation so that I can provide appropriate background materials. If you can't solve a given problem off-the-cuff, please provide some indication of whether you have absolutely no idea or are just a bit rusty with this sort of calculation…

Subsequent weeks