Syllabus Phys 438/538

Atomic, Molecular and Optical Physics

April 30, 2016

Instructor: Ceyhun Bulutay, SA 220, ×2511

Lectures: Tue: 8^{40}-10^{30} and Thu: 10^{40}-12^{30}, in SAZ-02

Office Hours: Anytime by e-mail appointment.

Lecture Notes: Scanned lecture notes for the full semester can be downloaded.

Main References:

- Wendell T., III Hill and Chi H. Lee, *Light-Matter Interaction: Atoms and Molecules in External Fields and Nonlinear Optics* (Wiley, 2007) [in Bilkent Library collection]
- C. J. Foot, *Atomic Physics* (Oxford, 2005) [in Bilkent Library collection]
- M. Auzinsh, D. Budker, and S. M. Rochester, *Optically polarized atoms* (Oxford, 2010) [electronic access from Bilkent Library]

Background: It is essential that students must have successfully completed undergraduate quantum mechanics I. Knowledge of QM-II and electromagnetic waves will also be highly instrumental to follow and benefit from the course.

Grading: will be according to two midterms (20% each), one comprehension final (25%), two term projects (10% each), participation and attendance (15%). All exams will be in-class and closed notes.

Week	**Subject** (Provisional)
#1	Motivation for AMO Physics, Hydrogen-Like Ion
#2	Hydrogen-Like Ion (Cont'd): Relativistic Effects
#3	Fine and Hyperfine Structures
#4	Angular Momentum Couplings: LS & jj
#5	Atoms in Static Magnetic Fields: Zeeman Effect
#6	*Midterm-I* tentatively: 8 March 2016
#7	Wigner-Eckart Theorem
#8	Radiative Transitions and Selection Rules
#9	Stimulated/Spontaneous Emission, Einstein Coefficients, Rate Equations
#10	Coherent and/or Strong Light Coupling Effects
#11	Coherent and/or Strong Light Coupling Effects (Cont'd)
#12	*Midterm-II* tentatively: 19 April 2016
#13	Molecules: Rotational & Vibrational Motion
#14	Franck-Condon Principle, Infrared and Raman Spectra