Course website: http://www.physics.utah.edu/~bolton/optics/

Instructor: Prof. Adam S. Bolton  
Email: bolton@astro.utah.edu  
Phone: 801-585-5383  
Campus mailing address: 115 South 1400 East (JFB 201)  
Office: INSCC 468 (inside the INSCC 452 suite)  
Office hour: Thursdays 11:00 AM – 12:00 noon  
Lecture time and location: Mondays and Wednesdays, 1:25–2:45 PM, JFB B-1

Recommended prerequisite: PHYS 2220 or equivalent (Physics for Scientists and Engineers)

Textbook: “Optics” by Eugene Hecht (4th Edition). This textbook can be purchased at the campus bookstore. The Marriott Library will also have a few copies on reserve.

Course description: This course will cover classical geometric optics; the electromagnetic and quantum mechanical foundations of optical phenomena; wave optics; and an introduction to modern optical systems including lasers. Most chapters of the textbook will be covered, roughly in sequence, over the course of the semester.

Laboratory sections: The associated laboratory sections provide hands-on experience with the phenomena presented in lectures. Concurrent enrollment in one of the lab sections is mandatory. Further information on organization and grading within the labs will be provided at the initial lab meetings.

Important dates:  
Monday 20 August 2012: First day of class  
Tuesday 28 August through Friday 31 August 2012: Introductory laboratory meetings  
Wednesday 03 October 2012: First mid-term examination  
Week of 08–12 October 2012: Fall Break (no classes)  
Wednesday 14 November 2012: Second mid-term examination  
Week of 19–23 November 2012: No lab meetings (due to Thanksgiving break)  
Wednesday 05 December 2012: Final lecture (labs continue through Friday 07 December)  
Friday 14 December 2012, 1:00PM-3:00PM: Final exam
Grading:
15% quizzes
20% mid-term examinations
30% final examination
35% lab grade

Problem sets and quizzes: Homework problems will be assigned during most weeks, primarily from the textbook. Generally, these assignments will be posted in PDF form to the class website before the start of class on Monday. One week following the assignment of problems, there will be a 10-minute quiz at the start of Monday’s class consisting of one of the homework problems (with possible minor modifications). The lowest two quiz grades will be dropped when determining your quiz grade for the term. Those enrolled at the graduate level (6750) will usually have a few more advanced problems assigned in addition to the problems assigned to undergraduates.

Mid-terms: There will be two mid-term examinations. For students enrolled at the undergraduate level (3410), the lower of the two mid-term scores will be dropped when computing the term grade. Students enrolled at the graduate level (6750) will have both mid-term grades used in the computation of their term grade.

Final examination: There will be a final exam on Friday 14 December 2012. Students enrolled at the graduate level (6750) may be given additional, more advanced problems on the final.

Lab section coordinator: Prof. Gernot Laicher
(phone 801-585-5553, email gernot@physics.utah.edu, office SP 410.)

Lab sections: (all meet in SP 305)
Section 005: Tuesdays 2:00–6:00 PM
Section 002: Wednesdays 3:00–7:00 PM
Section 003: Thursdays 2:00–6:00 PM
Section 004: Fridays 2:00–6:00 PM

Please feel free to contact Prof. Bolton with any and all concerns or questions.
Tentative Syllabus

The following list of topics, approximately one per lecture period, will be covered over the course of the semester. The exact content and sequence are subject to minor change as needed.

1. Review of electromagnetism.
2. From electromagnetism to light.
4. Reflection, refraction, and dispersion.
5. Electromagnetic boundary conditions for reflection and transmission.
8. Total internal reflection and fiber optics.
12. Polarization: Basic theory.
15. Dual-beam interferometry and the Michelson-Morley experiment.
16. Thin-film interference.
17. Multiple-beam interference and complex phasor analysis.
18. The Fabry-Perot interferometer.
20. Applied diffraction in imaging and spectroscopy.

22. Fourier analysis, beat frequencies, wave-packets.

23. Fourier treatment of Fraunhofer diffraction.


26. Applications in modern astronomy research.