

PHYSICS 330: OPTICS

FALL 2012

INSTRUCTOR

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TEXT

J. Peatross & M. Ware, Physics of light and optics, Brigham Young U, 2011c Edition, 3/2/2012.

OBJECTIVES

In this class we will study the physics of light and optics. We develop main concepts in wave and ray optics from our knowledge of Maxwell's equations. Topics are addressed from a physics perspective and include the propagation of light in matter, reflection and transmission at boundaries, polarization effects, dispersion, coherence, ray optics and imaging, and diffraction of light.

FORMAT

Lectures will present the main ideas of the course and include the topics that deserve emphasis. Apart from reading the text, it is essential that you do many practices. You will be given many opportunities to do so. Required and recommended problems will be assigned, including problems that would need the use of computer program such as Mathematica. These exercises are related to or compliment of the classes. They should help you in getting a better view of what's going on. All these exercises are very important.

MATHEMATICS

You should be familiar with differentiation, integration, and standard trigonometric and algebraic manipulation. A brief review of complex numbers, vector calculus, and Fourier transforms is provided in Chapter 0 of the text, but it is helpful if you already have some experience with these concepts. It will be a good idea to review the relevant part as we go along.

GRADING

The final grade will be based on your performance in two exams, a final exam, and three theoretical/computer homework assignments. The breakdown will be as follows:

Exam 1	16 %
Exam 2	16 %
Final Exam	16 %
Theoretical/ Computer Homeworks (3)	52 %

The exams and final will be close-book but one 8.5'' x 11'' sheet of paper that you think will help you with difficult *equations* will be permitted. You can use math handbook. The high boundaries for the letter grade are $A \geq 90\%$, $B \geq 80\%$, $C \geq 70\%$, $D \geq 50\%$. Joint homework is permitted, but independent work is expected for exams/final where copy will be prohibited.

LATE HOMEWORK AND ABSENCES

Make-up exams will be allowed only for excused absences due to serious illness, death in your immediate family, or other significant reasons. Make-up exams will not be the same but similar to the regular exams. Homework will be collected on the announced due date. Late homework will lose points 10% daily. Incomplete homework will be given partial credit. No homework will be accepted after the solutions have been discussed.

HOMEWORK AND COMPUTER PROJECTS

I will assign theoretical/computer homework regularly. The solutions that you hand in should include a brief description of what you did, program listing, appropriate graph or data outputs. Typed homework is expected.

Up to this point you are probably quite use to the computer assignments in this department. New algorithms and techniques for the assignments will be discussed in the assignment or in class or the assignments. You are expected to write out the programs on your own. The language can be Mathematica, Fortran or C and the machine will be Meitner accessed through terminals in our department. Anyone who has not an account should let me know. We will be using popular softwares of the department, Mathematica, g95, terminal (for mac users), and kaleidagraph (for mac). We may not use them all. An introductory manual about the use of the local computers and the above softwares is around in Moulton 308.

MISCELLANEOUS

Homework and test solutions will also be discussed in class.

POSSIBLE TOPICS

Below is a tentative list of the topics. I will be happy to adjust them to meet your needs.

Relevant chapters

- 1 Electromagnetic Phenomena
- 2 Plane Waves and Refractive Index
- 3 Reflection and Refraction
- 4 Multiple Parallel Interfaces

- 5 Propagation in Anisotropic Media
- 6 Polarization of Light
- 7 Superposition of Quasi-Parallel Plane Waves
- 8 Coherence Theory

- 9 Light as Rays
- 10 Diffraction
- 11 Diffraction Applications