

University of Maryland

Department of Physics

Fall 2010

Prof. Ian Appelbaum

Physics 375

Title: PHYS 375 Experimental Physics III: Electromagnetic Waves, Optics and Modern Physics. Third course in the three-semester introductory sequence. Methods and rationale of experimental physics. Experiments chosen from the areas of electromagnetic waves, optics and modern physics. It will nominally consist of lectures on topics in optics, and a series of six labs. **This is a 3 credit course.**

Prerequisite: PHYS 273 and PHYS 276. *Credit will be granted for only one of the following: PHYS 375 or former PHYS 296*

Instructor: Prof. Ian Appelbaum, Room 1368 (Physics / Center for Nanophysics and Advanced Materials). You can find the Center either by 1) going through the blue door labeled "Center for Nanophysics and Advanced Materials" in the basement of the physics building, or 2) entering from the plaza between the Math and Physics buildings. My office is right next to those of Profs. Lobb, Anlage and Paglione on the second floor of the Center for Nanophysics and Advanced Materials. A map is available at:

<http://appelbaumlaboratory.umd.edu/images/officemap.jpg>

Please note that the doors to the Center lock after 6:00 PM on weekdays, and remain locked all weekend.

Phone: x5-0890

e-mail: appelbaum@physics.umd.edu, or appeli@umd.edu

WWW: <http://appelbaumlaboratory.umd.edu/appelbaum.html>

Office Hours: While I won't be scheduling regular office hours, please feel free to arrange a meeting time, or just stop by my office to ask questions about the course material or just talk about physics in general.

Schedule: We will have one lecture and one lab meeting weekly:

Lecture: T..... 2:00pm- 2:50pm ([PHY 3112](#))

Lab: 0201: T..... 3:00pm- 5:50pm ([PHY 3104](#))

0202: Th..... 3:00pm- 5:50pm ([PHY 3104](#))

Required Text: *Introduction to Optics* (3rd Edition) by F. L. Pedrotti, L. S. Pedrotti, L. M. Pedrotti. ISBN: 0-13-149933-5.

Overview: PHYS375 is a three (3) credit course that meets four hours a week. It will include a substantial lecture component, so that students learn optics in a coherent fashion. The primary laboratory objective consists of learning physics through experimental investigation. Topics to be covered include electromagnetic waves, geometrical optics, polarization, interference and interferometers, diffraction, and atomic spectra. There will be six experiments, each lasting for two class periods, as well as lectures. This course will allow you to develop practical laboratory skills including experimental design and experimental uncertainty inherent in all measurement. You will be required to submit lab reports for each experiment completed, along with homework submitted on those weeks when a lab report is not due. There will be no final exam.

Lectures: The lectures are a required component of this class. This is an excellent opportunity to learn optics and to make connections to your other courses (electromagnetism, quantum mechanics, etc.) and deepen your understanding of physics. Important topics directly related to the lab will be covered in lecture. Note that no student shall be allowed into the lab unless they have participated in that week's lecture.

Computers: Developing a working knowledge of computers in the context of physics problem solving is an important skill. You will accumulate and analyze data with a computer-based system using MATLAB. *Use of MS Excel and spreadsheet work-alikes for data analysis or homework is specifically prohibited!* Preparation and submission of lab reports in electronic format is strongly encouraged.

Additional information: Regular communication is essential in this laboratory. Besides face-to-face discussions during the required attendance on your scheduled lab day, email is the next easiest way to stay in touch. You are expected to check your email and the course web page regularly for announcements.

Dropping the Course: Note: the last day to drop without a “W” is September 13. The last day to drop with a “W” is November 8. http://www.testudo.umd.edu/acad_cal/fall_2010.html

Grading: Your final grade will be determined by your lab reports (75%), laboratory skill (10%) and homework (15%).

Lab Reports: The lab report should consist of two main parts – the record of what you did in the lab, including notes on the apparatus, how you acquired data, and the raw data. The second part is data analysis, including plots, extraction of the actual quantities to be measured, and uncertainty analysis. It should end with a discussion of ways to improve the measurement. This may be a different form for a lab report than you are used to – rather than having you repeat the material we already know (what the problem is, what the equipment is,...) you should focus on what you did and what conclusions you drew. The grading will be as follows:

Laboratory record	50%
Data analysis	40%
Discussion of uncertainties and ways to improve	10%

You have 1 week to turn in your lab report after completion of the lab. The reports will be due by the beginning of class on the Tuesday/Thursday following the completion of the lab. Any lab reports submitted after the deadline will suffer an automatic **50% reduction** if they are up to 1 week late, and a **100% reduction** if they are more than 1 week late. **No Exceptions!!!!** Given that you have at least a week to turn in all assignments, and the fact that this assignment due date schedule is given to you on the first day, makes this is a **ZERO EXCUSE CLASS**. If you should miss any lab for any reason, you should contact the instructor as soon as possible to make an arrangement for makeup. **Any missing lab will result in failing the entire course.**

Homework: Homework is assigned for every week that a lab report is not due. This material is designed to compliment the lecture and laboratory segments of the course. Late homework will not be accepted and will receive a grade of 0.

Academic Dishonesty (cheating): Academic dishonesty is a serious offense that may result in suspension or expulsion from the university. In addition to any other action taken, the normal sanction is a grade of “XF”, denoting “failure due to academic dishonesty,” and will normally be recorded on the transcript of the offending student.

Office Hours: While I won’t be scheduling regular office hours, please feel free to arrange a meeting time, or just stop by my office to ask questions, discuss the lab, and talk about physics in general. My office is right next to those of Profs. Lobb, Anlage and Paglione in the Center for Nanophysics and Advanced Materials. Please note that the doors to the Center lock after 6:00 PM on weekdays, and remain locked all weekend.

Course Web Site: The course web site is located at: <http://www.physics.umd.edu/courses/Phys375/AppelbaumFall2010/> All of the lab instructions are located there, along with helpful notes, contact information, this syllabus, etc.

Hygiene: Please tidy up your lab bench at the end of the day so that the next student can start off quickly and efficiently. *Please do not bring any food or drink into the lab under any circumstances.*

Tips For Doing Well In This Course:

- 1) Read the lab description *before* the lab.
- 2) Freely ask questions in lab, and lecture. Also discuss problems with your friends and labmates.
- 3) Do the homework and turn it in on time.

What Should You Learn in this Class?: This is one of the few opportunities in our undergraduate curriculum to learn some geometrical and wave optics. You will also learn how to carefully take data, analyze it, understand the origins and propagation of errors, and to better appreciate the subtleties of experimental physics. You will also learn how to make useful written presentations of scientific results. Finally, we hope to convince you that *experimental physics is fun!*