General Information

PHYS 375 : Experimental Physics III
Electromagnetic Waves, Optics and Modern Physics

Spring 2012

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Class Schedule (Section 0301)

Tuesday, 02:00 – 03:00 pm; Room PHYS 3112
03:00 – 05:50 pm : Room PHYS 3203

Required Text

"Introduction to Optics" (3rd Edition)
by F.L. Pedrotti, L.S. Pedrotti, and L.M. Pedrotti

Recommended Texts

"An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurement" by John R. Taylor (University Science Books, 1997), and "Data Reduction and Error Analysis for the Physical Sciences" by Phillip R. Bevington and D. Keith Robinson (McGraw Hill, Inc., 2003)

Recommended Lab Notebook

Computation Notebook, 11 3/4" x 9 1/4", 4 x 4 Quad.,
~ 75 sheets, bound, numbered pages that are not perforated for tear-out

Course Overview: PHYS375 is a three (3) credit course that meets four hours a week. 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. Each lab will include a substantial lecture component. 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!

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 labs will be covered in the lectures.

Experiments: You shall be doing 6 experiments during the semester, spending two weeks on each experiment, in addition to the introductory lab during the first week to learn some basic features of the MATLAB, LAB JACK, He-Ne laser and the photodiode.

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. We will provide some elementary Matlab code for use in data collection and analysis.

Lab Manual: Because the course emphasizes your own experimental design, we will not be using a traditional Lab Manual (no more cookbooks!). Information necessary for each lab will be made available in the laboratory.

Lab Notebook: Keeping a detailed record of your experiments is important in Physics 375, and in experimental science in general. It is your responsibility to keep notes on all important aspects of your experiment. Remember that in order to do the analysis in this lab, you will often need a record of how you set up the experiment, including distances, angles, etc.; make sure you have this information recorded before you leave the lab.

Course Grading:

Lab Report 0 : 10 pts
Lab Reports 1 to 6 : 20 pts each (Total 120)
Homework 1 to 6 : 5 pts each (Total 30)
Final Exam : 40 pts
Total : 200 pts

Late submission of homework or lab reports: Loss of 20% of total points / day

Course incomplete for any missing homework or lab report.

Experiments Schedule:

Week	**Date**	**Expt : Topic**	Lecture	HW Due	Lab Rep Due
1	31 Jan	MATLAB, Lab 0	L 1		
2	7 Feb	MATLAB, Lab 0 Lab 1a: Reflection and Refraction	L 2	HW 1	
3	14 Feb	Lab 1b: Reflection and Refraction	L 3	HW 2	Lab 0 Rep
4	21 Feb	Lab 2a: Geometric Optics	L 4		Lab 1 Rep
5	28 Feb	Lab 2b: Geometric Optics	L 5	HW 3	
6	6 Mar	Lab 3a: Polarization of Light	L 6		Lab 2 Rep
7	13 Mar	Lab 3b: Polarization of Light	L 7	HW 4	
8	20 Mar	Spring Break – No Lab			
9	27 Mar	Lab 4a: Michelson Interferometer	L 8		Lab 3 Rep
10	3 Apr	Lab 4b: Michelson Interferometer	L 9	HW 5	
11	10 Apr	Lab 5a: Diffraction of Light	L 10		Lab 4 Rep
12	17 Apr	Lab 5b: Diffraction of Light	L 11	HW 6	
13	24 Apr	Lab 6a: Atomic Spectra	L 12		Lab 5 Rep
14	1 May	Lab 6b: Atomic Spectra	L 13		
16	**8 May**	**Final Exam**			Lab 6 Rep

Guidelines for Lab Reports: Lab reports must be written using either MS Word or Latex and must be submitted as a pdf file by e-mail to "tonwar@umd.edu" by the due date. The lab reports should include physics motivation and instrumental details, observations , data analysis, graphs and figures, discussion of results and conclusions and possible ways of improving the quality of results and suggestions for improving the experiment. Lab reports will be graded for the following:

Introduction - physics, method, apparatus	: 10 pts
Details of observations	: 20 pts
Data analysis	: 30 pts
Discussion of results and conclusions	: 20 pts
Discussion of uncertainties and ways to improve	: 10 pts
Overall presentation	: 10 pts.
Total	: 100 pts

Final Exam: There will be a final exam. It will consist of problems similar to your homework problems and data analysis and computations similar to those you did as part of your laboratory work and may involve an experimental component.

In case of Bad weather: Winter in the Washington Metro area can bring large snowstorms that make travel dangerous. Should this happen and the University is closed as a result during a scheduled lab, class will be canceled, and we will most likely reschedule the lab for the following week. Closing is announced over local radio and TV as well as on the University's homepage.

Academic Integrity : "The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism." For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studenthonorcouncil.umd.edu/whatis.html.

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