

General Information

PHYS 375 : Experimental Physics III **Electromagnetic Waves, Optics and Modern Physics** **Fall 2011**

Instructor : Dr. Suresh Tonwar

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Class Schedule: Lectures

Mon, 02:00 – 02:50 pm; Room PHYS 3112

Class Schedule: Laboratory

Section 0101: Mon, 03:00 – 05:50 pm; Room PHYS 3203

Section 0102: Wed, 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 per day. Course incomplete for any missing homework or lab report.

Experiments Schedule:

Week	Date	Expt : Topic	Lecture	HW Due	Lab Rep Due
1	7 Sep	MATLAB, Lab 0			
2	12,14 Sep	MATLAB, Lab 0 Lab 1: Reflection and Refraction	L 1		
3	19,21 Sep	Lab 1: Reflection and Refraction	L 2		Lab 0 Rep
4	26,28 Sep	Lab 2: Geometric Optics	L 3	HW 1	Lab 1 Rep
5	3,5 Oct	Lab 2: Geometric Optics	L 4		
6	10,12 Oct	Lab 3: Polarization of Light	L 5	HW 2	Lab 2 Rep
7	17,19 Oct	Lab 3: Polarization of Light	L 6		
8	24,26 Oct	Lab 4: Michelson Interferometer	L 7	HW 3	Lab 3 Rep
9	31 Oct, 2 Nov	Lab 4: Michelson Interferometer	L 8		
10	7,9 Nov	Lab 5: Diffraction of Light	L 9	HW 4	Lab 4 Rep
11	14,16 Nov	Lab 5: Diffraction of Light	L 10		
12	21,23 Nov	Thanksgiving Holiday			
13	28,30 Nov	Lab 6: Atomic Spectra	L 11	HW 5	Lab 5 Rep
14	5,7 Dec	Lab 6: Atomic Spectra	Review		
15	12,14 Dec			HW 6	Lab Rep 6
	12,14 Dec	Final Exam			

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” and denniswang@berkeley.edu” by the due date. The lab reports should include physics motivation and instrumental details, observations , data analysis, 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
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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