Physics 375 Syllabus
Fall 2011 - Section 201 (Paglione)

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. In keeping with efforts to improve the department curriculum, this course is evolving into a hybrid Lecture/Laboratory optics course. It will nominally consist of lectures on topics in optics, and a series of six labs. **This is a three-credit course (four hours per week).**

Course Web Site: http://www.physics.umd.edu/courses/Phys375/index.html

ELMS Web Site: http://www.elms.umd.edu (uploading work)

Prerequisite: Physics 273 and Physics 276

Laboratory Location - Room **3202** Physics Building

Meeting Times: **Lecture:** Tuesday 2:00 pm - 3:00 pm
Lab: Tuesday 3:00 pm - 5:50 pm

Instructor: Prof. Johnpierre Paglione
Office: Room 1367 Physics Building (CNAM annex)
email: paglione@umd.edu
Phone: 301-405-7115

Office Hours: please make an appointment by email.

Teaching Assistant: [TBA]

Overview: PHYS375 is a three (3) credit course that meets four hours a week. In a new configuration, 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.

Required Text and Other Materials:

- ***Introduction to Optics*** (3rd Edition) by F. L. Pedrotti, L. S. Pedrotti, L. M. Pedrotti. ISBN: 0-13-149933-5.
- ***Lab Notebook*** (for example: Computation Notebook, 11 3/4" x 9 1/4", 4x4 Quad., approx. 75 sheets, bound, numbered pages that are not perforated for tear-out)

- ***Lab Manual***: because the course is in transition, we will not be using a published manual. Information necessary for each lab will be posted on the course website for download.

Recommended:

- *Optics by* Eugene Hecht, 4th Edition, ISBN 0-8053-8566-5.
- "*An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurement*", John R. Taylor (University Science Books, 1997, ISBN 0-935702-75-X).
- "*Data Reduction and Error Analysis for the Physical Sciences*", Phillip R. Bevington and D. Keith Robinson (McGraw Hill, Inc., 2003, ISBN 0-07-247227-8).
- other books on optics and modern physics, including your Phys 171/272/273 texts.

Preliminary Schedule:

WEEK	DATE	LAB#	LAB	REPORT DUE	HW DUE
1	6-Sep	0	Introduction, Error Analysis, Matlab		
2	13-Sep	1	Reflection and Refraction	Lab 0	
3	20-Sep	1			Asmt 1
4	27-Sep	2	Geometrical Optics	Lab 1	
5	4-Oct	2			Asmt 2
6	11-Oct	3	Polarization of Light	Lab 2	
7	18-Oct	3			Asmt 3
8	25-Oct	4	Michelson Interferometer	Lab 3	
9	1-Nov	4			Asmt 4
10	8-Nov	5	Diffraction of Light	Lab 4	
11	15-Nov	5			Asmt 5
12	22-Nov	6	Atomic Spectra	Lab 5	
13	29-Nov	6			Asmt 6
14	6-Dec		[make-up week]	Lab 6	
15	13-Dec		[final exam - in class]		

Grading:

70 % Lab Reports and Performance
20 % Assignments
10 % Final Exam

NOTE: *All experiments must be completed to pass the course!*

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 data with a computer-based data acquisition system. We will provide some elementary MATLAB code for use in data collection and analysis.

Lab Reports: There are six experiments in this course, and you are required to submit a written report of your results for each experiment. The reports will be submitted electronically using Blackboard ELMS system and **will be due at the start of lecture the following week**. Lab report should be submitted as an **DOC or PDF file**, complete with embedded data and figures. They 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 what 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. Every report must have:

- title page, with name, title, abstract etc.
- record of experiment (provide a description of the actual experimental setup **you** used to do the experiment)
    - diagram of equipment and how it was used (you may want to draw a diagram while in the lab and scan it in)
    - notes on experiments tried
    - raw data (provide units!)
    - comments about experimental conditions/ discoveries
    - names of data files where data is stored
- data analysis
    - plots of data
    - formulae used to extract measured quantities
    - uncertainty analysis
    - sources of error
    - methods of error assignment
    - uncertainty propagation
    - systematic vs. statistical
- discussion of results
    - final results with uncertainty
    - identification of predominant source of uncertainty
    - discussion of ways to improve measurement
    - discussion of other possible measurements

Lab report grading will be follow this rubric:

Laboratory skill	**20 %**
Organization and logic of report	**20 %**
Data analysis	**50 %**
Discussion of results, uncertainties and methods of improvement	**10 %**
TOTAL	**100 %**

Late Reports: 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!!!!* You have at least a week to turn in all assignments, and the assignment due date schedule is given to you on the first day, so there are ZERO EXCUSES.

Making Up Missed Labs: If you should miss any lab for any reason, you should contact the instructor as soon as possible to make an arrangement for makeup. You should make every effort not to miss your regularly scheduled lab **Missing any of the six labs without a valid reason that is accepted by the instructor will result in failing the entire course - no exceptions.**

Homework: This material is designed to complement the lecture and laboratory segments of the course. Homework is assigned every two weeks, with due dates that fall in between the lab report due dates. **Late homework will not be accepted and will receive a zero grade**. As recompense, the single lowest homework grade will be dropped before the final homework grade calculation.

Tips for Doing Well:

- Read the lab instructions carefully **before** you go to the lab and attempt an experiment.
- During class, keep a neat, well-organized and **complete record** in your lab notebook of the experiment including diagrams of measurement configurations actually used to obtain data, your results, and the analysis used to obtain the results.
- When something in the lab isn't making sense or isn't working raise your hand and discuss with your instructor - **do not hesitate to ask** even the most trivial questions if you are not sure!
- Do not leave class unless you have finished your data analysis and discussed your results with your instructor or TA.
- Do the assigned homework and submit it for grading **on time**.

Academic Integrity - The University of Maryland, College Park 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 students. As a student, you are responsible for upholding the highest standards of academic integrity in this course and should 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.

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 cancelled, 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.