1361 Wave Motion and Optics Lab and Lecture Syllabus

Instructor: Hrvoje Petek G-01 Allen Hall (press the buzzer in front of the door or knock)
Office hours We. in lab or by appointment. Contact by Email: petek@pitt.edu
You can leave a message with my secretary, Ms. Huifen Chen (HUC49@pitt.edu; 4-9577)

Lab Instructor/Manager: Dr. Istvan Danko: Office: 329 OEH; Tel: 4-9030; izdanko@pitt.edu

Teaching assistant: Ms. Sonja Cwik (Wednesday lab); E-mail: SMC228@pitt.edu
Mr. Karan Kapoor (Friday lab); E-mail: KAK256@pitt.edu

Textbook: Hecht, *Optics,* 5th edition (Addison Wesley). If you have the 4th edition let me know

Other resources:

I will make assignments, lectures, and other materials available via a Dropbox folder. I plan to have lecture files distributed before my lecture. Lecture files will be on Courseweb.

Some of the labs will benefit from data analysis, simulation, and graphical plotting. The Department has installed Python interpretive programming language (preferred), Kaleidagraph, and Mathlab and on student computers, which can be used for data analysis and other mathematical modeling. Your TAs and Lab Instructor are certainly more skillful in using such programs than your Professor. The department has prepared several computers for your use in 210 Thaw Hall. You may use your software. All I care about is output.

Lab schedule and assignments:

You are expected to do labs in pairs if possible or individually. See your instructor if you cannot find a suitable partner. Labs should be done during the assigned week. If you cannot make it on your assigned day, make an alternative arrangement with Dr. Danko. There is a little space to do labs by switching between the Wed. and Fri. sections. Some exceptions for good reasons will be tolerated, but you should plan to do most work on your assigned day, and communicate your plans to do the lab on an alternate day with Dr. Danko, your TA, and myself. You should do labs with your partner, but write the lab notes by yourself. Your lab is due 1 week after you have performed the lab. Use the joint data obtained with your partner, but perform the data analysis, and write the lab report by yourself. If there is significant overlap of reports between partners, both could get deducted for not preparing labs independently.

Aug 29: Lab safety, instrumentation and data analysis lecture in lab if it is your assigned day (error analysis assignment)
Readings for Lab 1: Hecht 2.1-2.5, 2.7-2.9, 3.1-3.3, 3.5, 4.1-4.4, 4.7, 5.5.1

Aug 31: Lab safety, instrumentation and data analysis lecture in lab if it is your assigned day (error analysis assignment)
Readings for Lab 1: Hecht 2.1-2.5, 2.7-2.9, 3.1-3.3, 3.5, 4.1-4.4, 4.7, 5.5.1

Weekly schedule:

Sept 5: Lab 1 (Refraction)
Readings for Lab 2: Hecht 5.2-5.4, 5.5.2-5.6

Sept 12: Lab 2 (Lenses I):
Readings for Lab 3: Hecht 5.7, 6.1-6.3.1

Sept 19: Lab 3 (Lenses II)
Readings for Lab 4: Hecht 4.6, 8.6

Sept 26: Lab 4 (Linear Polarization)
Readings for Lab 5: Hecht 8.1-8.5, 8.7, 8.8, 8.10

Oct 3: Lab 5 (Circular Polarization)
Readings for Lab 6: Hecht 2.6, 9.1-9.7, 9.83

Oct 10: makeup lab

Oct. 12: MIDTERM

Oct 17: Lab 6 (Interference)
Readings for Lab 7: Hecht 10.1-10.2

Oct 24: Lab 7 (Diffraction by Slits)
Readings for Lab 8: Hecht 10.3

Oct 31: Lab 8 (Fresnel Diffraction)
Readings for (Fourier optics): Hecht 11.1-11.3

Special lab project 1: Nov. 7, 14

Nov 7: Readings for (holograms): Hecht 13.2.1, 13.2.2, 13.2.3, 13.3

Nov. 14: Readings for (lasers and nonlinear optics): 13.1, 13.4

Nov. 21-25: Thanksgiving Holiday

Special project 2: Nov. 28, Dec. 5

Nov. 29: Readings for (quantum optics and spectroscopy): Hecht 4.11

Dec 6:

SECOND INCLASS EXAM Dec. 7

Grading policy:

Lab assignments: 50%; Homework: 25%; Midterm exam: 10%; Second exam: 10%; **Class engagement 5%**

Lab Grading

There are 8 "recipe" lab assignments, each graded 30 points, as follows:

5 points: lab notes. You MUST have the outline for the lab and your lab notes signed by the TA before you start the lab and leave the lab to get credit for your notes. You should attach a copy of your notes, with the TA signature, to your lab report when you hand it in. All in lab work should be in your notebook (procedure, data recording, experimental schematic, etc.)

5 points: demonstrated understanding of the topic.

13 points: analysis. The labs give various assignments for quantitative analysis and plotting, and sometimes ask qualitative questions. The analysis grade includes proper accounting of error: points will be taken off for improper error analysis. It is not necessary to have a formal writeup, but the lab report should be intelligible and easy to follow; I will deduct points if I have to search for your answers or to understand what you did.

7 points: exercises. Each lab includes several assignments that you must do, in addition to the weekly assigned homework based on the lectures.

Late policy: Lab reports are due one week after the lab. They should go directly to your instructor (or TA).

I will deduct 2 points per weekday of lateness, up to a maximum of 10 points deducted for labs handed in a week, or more, late.

Excused absences from lab should be made up within two weeks (you should arrange with me and Dr. Danko to arrange for the time). You should contact me preferably before your absence. You should show up at the beginning of the lab to get any instructions. You may leave after you are confident that you have completed the required tasks.

Special Projects: In the final four weeks you will have your choice of one of several special projects, which will be posted. You can work on each for two weeks. These are more open to your own creativity, instead of just following recipes. There are no exercises. Each lab is worth 60 points based on our evaluation of your effort, creativity, and writeup.

In all cases, make your writing concise, use the correct terminology, show that you understand the material, and make it interesting to your grader who has to read 19 more reports.

Writing Option

For the writing option, you should take two of your labs and write them up formally, with complete English sentences, in the format of the *American Journal of Physics*, including abstract, citations, figures with captions, equation numbering, etc. Go to the American Journal of Physics online and download a paper, and follow its format! This is an English writing assignment: points will be taken off for bad grammar, spelling, style, etc., as well as for not following the proper journal format.

Alternatively, one of your writing assignments can be written in a style for general public on a scientific topic of your choice. You will be exposed to such writing in the class and be expected to lead in-class discussion on one of the available topics.

You may hand in a first draft of each paper in advance of the deadline if you would like feedback.

Writing Option paper #1 due Oct 19 paper #2 due Dec 7