

## 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](mailto:petek@pitt.edu)

You can leave a message with my secretary, "To be hired" ([xxx123@pitt.edu](mailto:xxx123@pitt.edu); 4-9577)

**Lab Instructor/Manager:** Dr. Istvan Danko: Office: 329 OEH; Tel: 4-9030; [izdanko@pitt.edu](mailto:izdanko@pitt.edu)

**Teaching assistant:** Mr. Shan Hao; 109 OEH; E-mail: [SHH114@pitt.edu](mailto:SHH114@pitt.edu); cell: (412)-726-3495

**Textbook:** Hecht, *Optics*, 4th edition (Addison Wesley).

### 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.

Some of the labs will benefit from data analysis, simulation, and graphical plotting. The Department has installed Python interpretive programming language, Kaleidagraph, and Matlab and on student computers, which can be used for data analysis and other mathematical modeling. Your TA is certainly more skillful in using such programs than your Professor. The department has prepared several computers for your use in 210 Thaw Hall.

### Lab schedule and assignments:

You are expected to do labs in pairs or individually. See your instructor if you cannot find a suitable arrangement. You are expected to do the lab during the assigned week. If you cannot make it on your assigned day, make alternative arrangements with Istvan Danko. Some exceptions for good reasons will be tolerated, but you should plan to do most work on your assigned day. This lab had a Friday session, which was cancelled. Istvan Danko has agreed to make the lab available on Fridays with prior arrangement.

**Aug 31:** Lab safety, instrumentation and data analysis lecture in lab (error analysis assignment)

**Sept 7:** Readings for Lab 1: Hecht 2.1-2.5, 2.7-2.9, 3.2, 4.3.1, 4.4.1, 4.7, 5.5.1  
Lab 1 (Refraction)

**Sept 14:** Readings for Lab 2: Hecht 5.2-5.4  
Lab 2 (Lenses I):

**Sept 21:** Readings for Lab 3: Hecht 5.7 (all subsections), 6.1  
Lab 3 (Lenses II)

**Sept 28:** Readings for Lab 4: Hecht 4.6 (all subsections), 8.6  
Lab 4 (Linear Polarization)

**Oct 5:** Readings for Lab 5: Hecht 8.1-8.5 (all subsections), 8.7, 8.8, 8.10  
Lab 5 (Circular Polarization)

**Oct 12:** makeup lab

## **MIDTERM Oct 14**

**Oct 19:** Readings for Lab 6: Hecht 2.6, 9.1-9.6 (all subsections)  
Lab 6 (Interference)

**Oct 26:** Readings for Lab 7: Hecht 10.1-10.2 (all subsections)  
Lab 7 (Diffraction by Slits)

**Nov 2:** Readings for Lab 8: Hecht 10.3 (all subsections)  
Lab 8 (Fresnel Diffraction):

**Nov 9:** Readings for (Fourier optics): Hecht 11.2 (all subsections), 11.3.1, 11.3.2, 11.3.3

**Nov 16:** Readings for (holograms): Hecht 13.2.1, 13.2.2, 13.2.3, 13.3 (all subsections)

Special project 1: Nov. 9, 16

**Dec 2, 4:** Readings for (nonlinear optics): Hecht 3.5, 13.4 (all subsections)

**Dec 9-11:** Readings for (quantum optics): Hecht 3.3 (all subsections), 4.11 (all subsections)

Special project 2: Nov. 30, Dec. 7

## **SECOND INCLASS EXAM Dec. 9**

### **Grading policy:**

Lab assignments: 50%; Homework: 20%; Midterm exam: 10%; Second exam: 10%

### **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.

10 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 they have to search for your answers or to understand what you did.

10 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 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 Isvan 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 before beginning. You may leave after you have completed the required tasks.

Special Projects: In the final four weeks you will have your choice of one of several special projects. 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 and writeup.

### **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 exactly! 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.

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

Writing Option paper #1 due Oct 19

Writing Option paper #2 due Dec 9