

PHYS313 Optics

LAB SCHEDULE

Week	Date	2021 Labs
1	15-Feb	Sources of Light
2	22-Feb	Light as Particles/Rays - Overview
3	1-Mar	Refraction and Reflection
4	8-Mar	Thin Lenses and Optical Instruments
5	15-Mar	Lens Aberrations
6	22-Mar	Light as Waves/Duality - Overview
7	29-Mar	Polarization
8	5-Apr	Interference
9	12-Apr	Double/Single Slits
10	19-Apr	Diffraction - Fraunhofer/Fresnel
11	26-Apr	Fourier Optics - Numerical FT/Spatial Filtering
12	3-May	Fourier Optics - Optical FT/Spatial Filtering
13	10-May	Holography
14	17-May	Lab Make-up
	18-May	Lab Make-up

LAB HOURS

Lab sections:

Monday	1:25-4:25
Tuesday	3:30-6:30
Wednesday	2:30-5:30
Thursday	3:30-6:30

Labs missed because of excused absences may be made up by attending a lab session later in the week, by appointment with the lab manager, or at the end of the semester.

WHAT YOU NEED TO PROVIDE

1. Laptop computer: The Optics Lab has two laptop computers available for each student team (one good and one not-so-good). You are encouraged to use your own laptop in the lab, if you have one. The software required is ToupSky (for ToupTek USB microscope camera), and ImageJ. Both are available for free download.
2. Flash drive: This is needed to save data and print graphs and images. A color laser printer is available in the lab for printing the images and graphs you paste in your lab notebooks.

LAB NOTEBOOKS

You will work in teams of two; however, each student will be required to keep their own lab notebook. There will be no lab reports.

Write to students taking the course next year. Assume they know what you knew coming into the course, but explain to them anything that you didn't already know. Make the report detailed enough that they could use it to duplicate your work without having access to the handout. Explain not just what you did, but why, and give them tips to avoid the mistakes that you made.

A. Homework – Complete and submit before coming to the lab:

1. Seek understanding of the lab handout. (Random quizzes to test this)
2. Record in your lab notebook:
 - a. Goals:
 - i. Why you are doing the experiments in this lab session
 - ii. What you will learn
 - b. Design:
 - i. Theory, models, and essential physics behind the phenomena you will study
 - ii. Clear predictive modeling results—calculations, tables, and plots—that will guide your design of apparatus, procedure, values of experimental parameters, and data analysis
 - iii. Your experimental plan/approach—We are looking for evidence of thought and analysis
 - iv. Answers to homework questions
 - v. Your own questions regarding concepts and apparatus
 - vi. When you arrive in the lab discuss your design with your lab partner and bring any unresolved questions to the attention of your TA.

B. Lab Work – Record of your work and discussion of your results during lab session:

1. Procedures:
 - a. Setup and Equipment: Diagrams, sketches, and/or photographs of the setup with dimensions, labeled instruments, and verification of instrument function
 - b. Diary of work—Errors made, problems encountered, trouble shooting, workarounds, and corrections
2. Data:
 - a. Tables of hand recorded data with equipment settings, units, and estimated uncertainties. Locations of saved data (directory and filename of files created)

- b. Plots of data **generated while taking data**, some done by hand directly in the lab notebook, others done by software and printed and taped in the lab notebook. Display model curves and error bars wherever possible. Label all axes and include units.
Locations of saved plots (directory and filename of files created)
3. Analysis
Validation: Comparison of measured results with modeling results
4. Debriefing
Record a 1-2 paragraph statement of what you learned by doing this experiment, how this knowledge relates to the physics courses you have had, or are currently taking, and the significance of this knowledge in the larger Physics picture.
5. Submit your lab work before leaving the lab. Your TA will quickly look it over and may ask you to redo unacceptable work. Failure to turn in your lab notebook results in a zero for the lab session.

During the lab the TA will circulate around the room to observe your work and to answer your questions. If the TA notices that your setup is wrong, or that you are not getting valid results, they will ask to redo the experiment. It is in your best interests to ask the TA to check your work often.