

Physics 4150: Optics

Fall 2016

Instructor: P.L. Gould

Office hours: Tu 4-5, Fri 11-12, or by appointment

Office: BPB-G45B (Biology/Physics Bldg.)

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Course website: HuskyCT

Lecture: MWF 1:25-2:15 pm, Rm. PB-103A

Lab: Wed 2:30-5:30 pm, Rm. PB-304

For each lab, a handout will be available via a link on HuskyCT. These should be read before coming to lab. You should bring a lab notebook (loose-leaf binder) to record your observations. For 5 of the labs (to be specified), brief reports will be required, presenting your fully analyzed results and your answers to any questions posed in the lab handout. For the remaining labs, your lab notebooks will be evaluated. The TA will base your lab grade (30% of the total grade) on your in-lab performance and on both your lab notebook and your write-ups.

Lab TA: Ekaterina Sergan: sergan@phys.uconn.edu; 486-3425; BPB-G44A (Bio/Phys Bldg.)

Office hours: Wed 11-12

[Note: Prof. Eyler, eyler@phys.uconn.edu, 486-3988, will also be involved with the labs, as long as his health permits.]

Description

Physics 4150 is an introduction to optics at an intermediate level, with an emphasis on the underlying physical concepts and the properties of waves. The course should be appropriate for physics and engineering students in their third or later years of physics study, and for other interested students with a strong background in the physical sciences. A sound mathematical background will be assumed.

Textbooks

Required: Eugene Hecht, Optics, 5th edition, Pearson, 2017; ISBN 10: 0-13397722-6

Optional: Eugene Hecht, Schaum's Outline of Optics

Optional: F.L. Pedrotti, L.S. Pedrotti, and L.M. Pedrotti, Introduction to Optics (3rd ed.)

Optional: G. Brooker, Modern Classical Optics

Grading	Lab:	30%
	Homework:	20%
	Midterm exam:	20%
	Final exam:	30%

You should be aware of "Academic Integrity in Undergraduate Education and Research": <http://www.dosa.uconn.edu>, Student Code, Appendix A.

Syllabus (topics and schedule subject to change, including labs)

<u>Week</u>	<u>Topic</u>	<u>Chapter</u>	<u>Lab*</u>
Aug. 29	Geometrical Opt: thin lenses, stops	5.1-5.3	Fund. of Geom. Opt.
Sept. 5 (W,F)	Geometrical Optics: - mirrors, prisms, fibers	5.4-5.6	Fund. of Geom. Opt.
Sept. 12	Geometrical Optics: - optical systems, thick lenses	5.7-6.1	Basic Optical Instruments
Sept. 19	Geometrical Optics: - matrices, ray tracing, aberrations	6.2-6.3	Ray Tracing and Aberrations
Sept. 26	Light as an EM Wave: - waves, electromagnetic theory	2.1-2.10, 3.1-3.3	Ray Tracing and Aberrations
Oct. 3	Light as an EM Wave: -waves in matter, spectrum, Huygen, reflection, refraction, Fresnel eqns.	3.5-3.6, 4.1-4-7	Thick Lenses and Prisms
Oct. 10	Superposition [Midterm Exam (Chs. 2-6)]	7.1-7.4	Multimode Optical Fibers
Oct. 17	Polarization: - polarizers, dichroism, birefringence	8.1-8.6	Light Scattering: AOMs and Colloidal Crystals
Oct. 24	Polarization: retarders, opt. activity, induced effects, Stokes parameters	8.7.1-8.13	Polarized Light
Oct. 31	Interference: interferometers	9.1-9.5	Polarized Light
Nov. 7	Interference: Fabry-Perot; thin films	9.6-9.8	Interferometers
Nov. 14	Diffraction: Fraunhofer	10.1-10.2	Interferometers, Spatial Light Modulator
Nov. 21	Thanksgiving Break		
Nov. 28	Diffraction: Fresnel	10.3	Diffraction, SLM
Dec. 5	Misc. Topics and Applications	TBA	Diffraction, SLM
Dec. 12	Final Exam Week		

*Minor lab rescheduling will be needed, likely on a group-by-group basis, to accommodate the limited equipment pool available for the course.