Ve334 Principles of Optics

Fall 2015

Instructor: Jigang Wu
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Office Hours: T/Th 12:30-1:30pm, or by appointment
Classroom: F-410
Time: T/Th 10:00-11:40am, F 8:00-9:40am (even weeks only)
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Course Description:
This course introduces basic principles of optics. Topics include light sources and propagation of light; geometrical optics, lenses and imaging; ray tracing and lens aberrations; interference of light waves, coherent and incoherent light beams; Fresnel and Fraunhofer diffraction; and other selected topics on modern optics.

Credits: 4

Prerequisites: Vp240 or Vp260.

Course Objectives:
1) To provide students with overviews of basic and modern optics;
2) To teach students the basics of geometrical optics, microscopes, telescopes, magnifiers, ray tracing;
3) To teach students basics of Fresnel & Fraunhofer diffraction & how to compute diffraction patterns;
4) To teach students the basics of interferometers (Michelson, Mach-Zehnder and Fabry-Perot.).

Course Outcomes:
After completing Ve334, students should be able to:
1) Use ray tracing to compute the location and magnification of an image;
2) Compute simple diffraction patterns (fringe profile and localization; periodicity);
3) Understand diffraction gratings, interference and their applications;
4) Understand polarization and coherence of a light beam;

Textbooks: Hecht, E.: Optics, 4th ed.

Course Policies:
- **Honor Code**: All students in the class are bound by the Honor Code of the Joint Institute (http://umji.sjtu.edu.cn/academics/academic-integrity/honor-code/). You may not seek to gain an

unfair advantage over your fellow students; you may not consult, look at, or possess the unpublished work of another without their permission; and you must appropriately acknowledge your use of another's work.

Course Outline: *Tentative and subject to change*.

Weeks	Contents	Reading	HWK	Due
1	• The nature of light • Geometrical optics: image formation, aperture and stops	Chap. 1, 5		
2	• Geometrical optics: lens system, ray tracing	Chap. 5, 6	Hwk #1	
3	• Geometrical optics: aberrations • National holiday	Chap. 5, 6	Hwk #2	Hwk #1
4	• National holiday • Geometrical optics: example optical systems	Chap. 5, 6		
5	• Wave motion, EM theory • EM theory, photons, and light	Chap. 2, 3	Hwk #3	Hwk #2
6	• The propagation of light	Chap. 4	Hwk #4	Hwk #3
7	• Superposition of waves, Coherence • Midterm	Chap. 7		Hwk #4
8	• Polarization	Chap. 8	Hwk #5	
9	• Birefringence, propagation of light in crystal	Chap. 8	Hwk #6	Hwk #5
10	• Interference: general considerations	Chap. 9	Hwk #7	Hwk #6
11	• Interference: interferometer systems and applications	Chap. 9	Hwk #8	Hwk #7
12	• Diffraction: Huygen's principle, Fraunhofer and Fresnel diffraction, zone plates	Chap. 10	Hwk #9	Hwk #8
13	• Diffraction: diffraction gratings, holography • Introduction to Fourier optics	Chap. 10, 11		Hwk #9
14	• Selected topics on modern optics • Final Exam	Chap. 13		

Course Assessment Methods:

Homework:

Homework are designed for students to revisit and synthesize the important concepts in optics that they have learned in preceding lectures, and for the instructor to ensure the appropriate delivery and comprehension of important knowledge. Homework are also assigned for students to gain confidence in solving practical engineering problems. Typically, one homework set is assigned each week and due in the next week.

Examinations:

There will be midterm exam and final exam. The examinations shall measure the ability to analyze and solve optical problems. Examinations are written based and close-book. However, one A4 paper of cheating sheet is allowed.

Grading Policy:

Homework	50%
Midterm exam	20%
Final exam	30%

Note: final letter grades will be curved.

Late Policy for homework:

20% off every day. Real score = Score * (1 – 20% * day). Exception can be made for special cases, for example, hospitalizations, and will be handled case by case.