

PHYS 480 (Radiation and Optics)

Course Information

Objective: To gain basic knowledge in the fields of radiation and modern optics, including ray optics and wave optics, fiber optics and holography, and some selected topics in lasers and nonlinear optics.

Instructor: Zhigang Chen

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Office hours: M 3-4pm (Please feel free to drop in or make an appointment at any time).

Meeting Time and Place:

TTH 1235 – 1350, [TH](#) 425

Textbook:

Primary reference:

Introduction to Optics, 3rd edition, by Pedrotti³ (Prentice-Hall, 2007)

Other references (optional):

Optics, 4th edition, by Hecht (Addison-Wesley, 2002)

Fundamentals of Photonics, by Saleh and Teich (John Wiley, 1991)

Optics and Lasers, 5th edition, by M. Young (Springer, 2000)

Prerequisites:

PHYS 230 and 240 (PHYS 320, 360, 385 recommended)

Grading:

Homework	20%
Presentation	20%
Midterm Exam	30%
Final Exam	30%

Homework:

Homework is an important part of learning. Weekly homework problems will be assigned before the midterm exam, and need to be turned in before the due date. (No late submission will be accepted). You should work independently, although discussion with others in general is allowed. What you submit must be your own work.

See <http://www.physics.sfsu.edu/policy/plagiarism.pdf> for department policy.

Presentation:

Modern optics is a very broad and active field. You are required to give a brief oral presentation in class on a selected topic in optics based on your reading. The purpose of this requirement is to give you experience in independent literature research and in presenting your work to scientific or public community. (A paper associated with your presentation is encouraged).

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Course Schedule

Week 1 (1/25, 27)

Introduction: A brief history of optics

Weeks 2-5

(2/1-2/22)

Geometric Optics (Ray Optics)

Reflection, Refraction (review)

Reflection and Refraction at a Spherical Surface, Mirrors

Thin Lenses, Combination of Thin Lenses

Optical fibers and Optical Instruments

Matrix Optics

Weeks 6-9

(3/1-3/22)

Physical Optics (Wave Optics)

Waves and Superposition of Waves

Interference: Two-beam interference

Types of Interference and Interference Fringes

Optical Interferometry and Multibeam Interference

Polarization

Electromagnetic Radiation

Birefringence and Double Refraction

Fraunhofer Diffraction: Single Slit, : Double Slits

Fresnel Diffraction

The Fresnel Equations

(TIR, Snells, Maliu, Brewster's laws, Evanescent Waves, etc)

Exam 1 (take-home)

Week 10 (3/27) Spring break

Week 11 (4/5, 7)

Presentation/Project

Double rainbow, Babinet's Principle, Airy beams, Talbot effect, Poisson's spot...

Weeks 12-15

(4/12 – 5/3) Modern Optics (selected topics)

Introduction to Laser Physics

Laser Types, Laser Characteristics

Basic of Coherence, Coherent and Incoherent Light Sources

Introduction to Fourier Optics

Holography

Guided-Wave Optics

Photonic crystals

Introduction to Nonlinear Optics

Week 16 (5/10, 12)

Presentation/Project on selected topics on modern optics

Demonstrations, Laser Tour in the Department

Final Exam

Students with disabilities who need reasonable accommodations are encouraged to let the instructor know. The Disability Programs and Resource Center is available to facilitate the reasonable accommodations process. The DPRC, located in SSB 110, can be reached by telephone at 338-2472 (voice/TTY) or by e-mail at dprc@sfsu.edu. Special accommodations will be provided only with a formal request letter from DPRC