

**Course Syllabus**  
**Southeast Missouri State University**

**Department of Physics**  
**Title of Course: Optics**

**Course No. PH341/PH501**  
**Revision: Spring 1999**

**I. Catalog Description**

Selected topics in geometrical and physical optics including simple ray tracing, pupils and stops, aberrations, matrix and computer ray tracing, Maxwell's equations, the Fresnel laws of refraction and reflection, Fourier analysis, polarization and birefringence, interference, Fraunhofer diffraction, and Fourier optics. Spring of even years only. Prerequisites: PH231/031; MA245. (3)

**II. Prerequisites**

PH231/031 General Physics II  
MA245 Vector Calculus

**III. Course Objectives:**

- A. To learn the fundamental principles of classical geometrical and physical optics.
- B. To learn the mathematical techniques employed in geometrical and physical optics.
- C. To use these principles and techniques to solve problems in optics.
- D. To become familiar with the ray-tracing program BEAM-2 used in optical design.

**IV. Expectation of Students:**

- A. All students
  - 1. Read textbook assignments in order to be well prepared for class.
  - 2. Attend class regularly and participate in classroom discussions.
  - 3. Complete all assigned homework.
  - 4. Demonstrate knowledge and understanding by performing acceptably on homework and tests.
- B. Graduate students - Demonstrate the ability to conduct independent research on a topic in optics by completing an original term project. The project will involve both literature research and either experimental or computational work. The project will be mutually agreed upon by the student and the instructor before the sixth week of the semester, and the student will present a talk on the project during the last week of the semester.

**V. Course Outline (Hours)**

- A. Topics in Geometrical Optics (6)
- B. Mathematics of Wave Motion (3)
- C. Electromagnetic Theory (Maxwell's Equations) (5)  
*Test 1* (1)
- D. Propagation of Light (4)
- E. Superposition of Waves (Fourier Analysis) (6)
- F. Polarization & Birefringence (5)  
*Test 2* (1)
- G. Interference (3)
- H. Diffraction (4)
- I. Fourier Optics (2)  
*Talks and Test 3* (5)

**Total: 45**

## VI. Textbook

Eugene Hecht, *Optics*, 3<sup>rd</sup> ed., Reading Ma: Addison Wesley Longman, 1998.

## VII. Student Evaluation

- A. Undergraduate students
  1. Homework - 20%
  2. Tests (3) - 60%
  3. Final - 20%
  4. Option: Give a 20 minute talk on a topic of contemporary interest in optics instead of the third test.
- B. Graduate students
  1. Homework - 10%
  2. Tests (3) - 60%
  3. Final - 20%
  4. Project - 10% (includes presentation)