

Course Title	Course Code	Number of Study Hours			Year	Level	Prerequisites
		Theoretical	Laboratory	Credit			
Physical Optics	312PHYS	3	2	4	3 rd	5 th	211PHYS

(1) Brief Course Description

The course provides background knowledge of several optics phenomena with an emphasis on the light as electromagnetic waves. It covers the concepts of superposition, interference, diffraction and polarization of light. The course also covers applications and experiments related to these concepts. The course material will be covered in traditional lecture format as well as laboratory demonstrations and hands-on activities.

(2) Course Objectives

This course is designed to provide students with:

- The concept of the nature of light and wave theory of light.
- The concept of superposition of light
- The interference of light and related experiments.
- The concept of the diffraction of light.
- The concept of polarization of light.
- Hands on experience with the laboratory experiments to understand the related concepts.

(3) Course Contents

Theoretical Part:

- **Nature of light and wave theory of light:** Concept of light as a particle, Concept of light as a wave and Concept of light as an electromagnetic wave
- **Vibrations and waves:** Simple harmonic motion (SHM), Transverse wave and Wave velocity
- **Superposition of waves:** Addition of SHM, Superposition of two waves, Superposition of many waves, and Group velocity
- **Interference of light:** Huygen's principle, Young's experiment, Thin film interference, Film thickness by interference, Newton's ring, and Others interferometers apparatuses
- **Diffraction of light:** Single slit diffraction, Resolving power, Diffraction grating, Rayleigh's criterion, Fraunhofer diffraction, Double slit diffraction, Diffraction from many slits. Diffraction grating, and Fresnel diffraction
- **Polarization of light:** State of polarization and polarizer, Malus' law, Dichorism, Birefringence, Brewster's angle, and Polarization by reflection

Experimental Part:

- The dispersion and the resolving power of a prism.
- Interferences of light using
- Young's double-slit experiment.
- Diffraction of light through a single-slit.
- Newton's interference rings.
- Malus' law of polarization.
- Optical activity and polarization.
- Diffraction grating spectrometer.
- Kerr effect.
- Michelson interferometer.

(4) Assessment Criteria

- Periodic Exams: 20%
- Oral, Student Activity and Essay: 10%
- Laboratory Work: 20%
- Final Exam: 50%

(5) Course Teaching Strategies

- Lectures, Reports and Essay Assignments, Homeworks, and Web-based Assignments.

(6) Text Book:

- Fundamental of optics; F. A. Jenkins and H. S. White, McGraw-Hill Princl Custom Publishing, 2001.

(7) Reference Books:

- Optics; Eugene Hecht, 4th Edition, Addison- Wesley, 2001.
- Modern Optics; Robert D. Guenther, John Wiley&Sons, Inc., 1990