

Lasers and Optical Systems

ECSE/PHYS 4630

M/T, 2 – 3:20pm (changes every semester)

Professor: Z. Rena Huang

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Office: CII 6207

Office hours: Friday 2-4pm

Textbooks:

1. *Optics* by Miles Klein and Thomas E. Furtak, Wiley & Sons, Inc., 2nd ed. 1985
2. *Laser Electronics* by Joseph T. Verdeyen, Prentice-Hall, 1995
3. Class handouts

Course Pre-Requisites:

PHYS – 1200 Physics II (Required)

PHYS – 2620 Fundamentals of Optics or Equivalent (Recommended)

ECSE – 4961 Introduction to Optoelectronics Technology (Recommended)

Course Objectives:

This course provides a systematic study of the basics of wave optics and the operation fundamentals of the laser radiation beams. The class consists of two parts. In the first part, it uses the Klein and Furtak textbook and covers the topics of basic electromagnetic theory, two beam and multiple beam interferences, near field diffractions and diffraction gratings. The second part of the class uses Verdeyen textbook and covers the topics of ray tracing in an optical system, Gaussian beam characteristics and propagation, resonant optical cavities and ABCD matrix, atomic radiation and laser amplification, and general lasers such as CW laser, Q switch and mode lock laser etc. Particular emphasis is placed on the practical aspect of laser beam characterizations and operation principles of various laser systems.

This class is designed for undergraduate senior students or first-year graduate students with major in electrical engineering, applied physics or related. A graduate level course (ECSE 6XXX) based on this class is possible with added materials. Contact the instructor for detailed information.

Grade Composition:

Homework: 10%

Quiz 1: 30%

Quiz 2: 30%

Final exam: 30% (or replaced by term paper and presentation)