

ECEN 5016 - FUNDAMENTALS OF PHOTONICS

Fall Semester 2001, University of Colorado at Boulder

This is a core course for the optics program. The course deals with the control of light in free-space and in matter. Topics include ray optics, wave and Fourier optics, electromagnetic waves, guided waves, and photon optics.

Topics:

1. Fundamentals of Geometrical Optics
2. Wave Optics: Interference, Diffraction, Gaussian beams
3. Fourier Optics: Optical Fourier transform, Imaging, Holography
4. Electromagnetic Optics: EM Wave propagation, Dielectric materials, Absorption and Dispersion, Polarization, Anisotropic media.
5. Guided wave optics: optical waveguides, waveguide modes, coupling, pulse propagation
6. Photon Optics: the concept of a photon, photon statistics, interaction of photons and atoms

Prerequisites:

ECEN 3300, Linear System Theory

ECEN 3400, Electromagnetic Fields and Waves

References:

Fundamentals of Photonics, B.E.A Saleh and M.C. Teich, Wiley, New York, 1991

Introduction to Fourier Optics, Joseph W. Goodman: McGraw-Hill, New York, 1996.

Optical systems and processes, J. Shamir, SPIE – Optical Engineering Press, Bellingham, 1999.

Optical Physics, S.G. Lipson, H. Lipson, D.S. Tannhauser, Cambridge University Press, 1998.

Principles of Optics, M. Born and E. Wolf, Cambridge University Press, 7th (expanded) edition, 1999.

Articles from contemporary journals.

Grading: Homework 15%, Midterm 35%, Final 50%. Project, optional for graduate students.