

Spring 2015: OSE-6115 Interference, Diffraction, and Coherence

Mon & Wed 10:30 – 11:45 Dr. Aristide Dogariu, adogariu@mail.ucf.edu

- 1- Review
 - a. integral transforms, FT properties and theorems
 - b. 2D and 3D transforms and applications

- 2- Wave interference
 - a. Plane waves – optical path difference
 - b. Spherical waves interference
 - c. Three/multiple waves interference
 - d. Angular spectrum of plane waves

- 3- Diffraction
 - a. Rayleigh-Sommerfeld integral
 - b. Huyghens principle
 - c. Fresnel diffraction
 - d. Babinet's, Poisson's spot, Talbot
 - e. Fraunhofer diffraction
 - f. Asymptotic transforms and singularities
 - g. Propagation, linear systems, image formation

- 4- Interferometry
 - a. Division of amplitude, division of wavefront
 - b. Fizeau, Newton, Loyd, Michelson, Mach Zehnder, Sagnac
 - c. Multiple beams interferometers, Fabry Perot, gratings
 - d. Extended incoherent sources

- 5- Elements of coherence
 - a. White light phenomena, Michelson
 - b. Temporal and spatial coherence, Michelson & Young interferometers
 - c. Coherence propagation, VanCittert Zernike
 - d. Space-frequency representation, Stationarity, Wiener Khinchin
 - e. Fourier transform spectroscopy

Supplementary reading (recommended chapters):

Papoulis, *Systems & Transforms with Applications in Optics* (1)
Goodman, *Introduction to Fourier Optics* (2,3)
Gaskill, *Linear Systems, Fourier Transforms, and Optics* (2,3)
Goodman, *Statistical Optics* (5)
Mandel and Wolf, *Optical Coherence* (3,5)
Hecht, *Optics* (2,3,4,5)
Hariharan, *Optical Interferometry* (4,5)

Grading:

25% Exam 1 and Exam 2
10% Homework
40% Final (Comprehensive)