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)