Fall 2020: OSE-5115 Interference, Diffraction, and Coherence

Tue & Thu 13:30 – 14:45   **Dr. Aristide Dogariu, adogariu@mail.ucf.edu**

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

2- Wave interference
   a. Wavefront - angular spectrum of plane waves
   b. Optical path difference
   c. Spherical waves interference
   d. Three/multiple waves interference

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

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
   e. Optical testing
   f. Interferometric imaging
   g. Phase shifting, heterodyning, time delay, laser-ranging

5- Elements of coherence
   a. White light phenomena, Michelson
   b. Temporal and spatial coherence, Michelson & Young interfereometers
   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)