COURSE: EECS 435. **TITLE:** Fourier Optics. **PREREQUISITES:** EECS 306, junior standing, co-requisite EECS 334. **ELECTIVE.**

TEXTBOOK: J. Goodman, *Introduction to Fourier Optics*

CATALOG DESCRIPTION: Basic physical optics treated from the viewpoint of Fourier analysis. Fourier-transform relations in optical systems. Theory of image formation and Fourier transformation by lenses. Frequency response of diffraction-limited and aberrated imaging systems. Coherent and incoherent light. Comparison of imagery with coherent and with incoherent light. Resolution limitations. Optical information processing, including spatial matched filtering.

COURSE OBJECTIVES:

1. To teach students how to use Fourier transform techniques in optical diffraction and interferometry;
2. To teach students how image formation occurs using both coherent and incoherent light;
3. To teach students how spatial filtering can be used to extract information from, and modify, images.

COURSE OUTCOMES [Program Outcomes Addressed]

1. Ability to compute Fraunhofer & Fresnel diffraction patterns using convolution or spatial filters; [1]
2. Ability to analyze optical system performance under diffraction and aberration limitation; [1,11,14]
3. Ability to design lens systems to produce or modify (edge-sharpen, noise-filter) specified images. ["]

PROGRAM OUTCOMES ADDRESSED: 1,11
PROFESSIONAL COMPONENT ADDRESSED: 14
PREPARED BY: Andrew E. Yagle on Nov. 25, 2004

CLASS/LABORATORY SCHEDULE:
LECTURES: 3 per week @ 50 minutes.

TOPICS COVERED:

1. Fourier transforms & linear system
2. Fourier diffraction theory
3. Lenses: Fourier transforming props
4. Theory of Fourier image formation
5. Coherence theory and imaging
6. Spatial filtering & info. processing

ASSESSMENT (Course outcomes)

1. Weekly problem sets [1,2,3]
2. In-class open-book exams [1,2,3]

COURSE DESCRIPTION: University of Michigan, College of Engineering, ELECTRICAL ENGINEERING PROGRAM