1. ECE 457: Fourier Optics

2. 3 credits: 2-75 minute lecture sessions/week

3. Randy Bartels

4. Fourier Optics and Computational Imaging. K. Khare. 2016.

5. Course Information
    a. Introduction to optical systems for signal and information processing with emphasis on Fourier optics
    b. Prerequisites: ECE 311 with a C or higher; ECE 342 with a C or higher
    c. Required: Lasers & Optical Engineering
       Selected Elective: Electrical Engineering; Computer Engineering

6. Goals for the Course
    a. Course Learning Objectives
        i. Design and analyze a simple optical system
        ii. Compute diffraction of optical fields numerically and analyze with Fresnel and Fraughafer propagation
        iii. Calculate imaging transfer functions for coherent and incoherent imaging systems
        iv. Analyze and design optical Fourier processing systems
        v. Design and numerically simulate a full complex optical system
    b. Student Outcomes
        1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
        3. An ability to communicate effectively with a range of audiences
        4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
        6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. Topics Covered
    Review: Linear Systems Theory, Fourier Transforms and their physical meaning, brief optics refresher
    Principles of Wave Optics: Wave theory, Optical components from the viewpoint of wave optics, Interference
    Fourier Transforms in Optics
    Diffraction Theory: Fresnel and Fraunhofer diffraction, Applications of diffraction
    Optical Systems: Lens theory, Coherent-noncoherent systems, Frequency response of optical systems
    Diffractive Optics