1. ECE 457: Fourier Optics

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

3. Randy Bartels


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 Fraunhofer 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