1. **ECE 434, Photonics**
2. **Credits:** 3  **Contact Hours:** 3.0
3. **Textbook and Materials:**
   Fundamentals of Photonics, by B. E. A. Saleh and M. Teich, 2007

   a. **Other Supplemental Materials:** None

   b. **Specific Course Information:**
      a. **Brief description of the content of the course (Course Catalog Description):**
         Introduction to ray optics, physical optics and interference, applications of Fourier optics, absorption, dispersion, and polarization of light. Second half of the course treats light sources, including lasers (gas, solid state, and semiconductor), modulation and detection of light.
      b. **Pre-requisites or Co-requisites:** ECE 320, ECE 335 or con reg
      c. **This is a Selected Elective course.**

   c. **Specific Goals for the Course:**

      a. **Course Outcomes:**
         1. Students will have mastered the physical principles governing all of the commonly used elements of optoelectronic and fiber optic systems (e.g., lasers, laser diodes, LEDs, photodetectors, optical fiber).
         2. Students will have sufficient background to design optical systems for applications as
diverse as manufacturing, biotechnology, remote characterization and detection, and tactical defense.

- **ABET Student Learning Outcomes:**

  (a) Ability to apply mathematics, science and engineering principles.
  (e) Ability to identify, formulate and solve engineering problems.
  (i) Recognition of the need for and an ability to engage in life-long learning.
  (j) Knowledge of contemporary issues.
  (k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

- **Brief List of Topics to be Covered:**

  1. Ray and electromagnetic analysis of optical propagation.
  2. Holography
  3. Gaussian beams
  4. Optical properties of waveguides; evanescent coupling; index guiding
  5. Dispersion and attenuation in insulators, semiconductors, and conductors.
  6. Photon statistics
  7. Direct bandgap materials (III-Vs)
  8. Optical sources: thermal, electro-luminescent, LEDs, lasers, laser diodes
  9. Optical detectors: photoconductive, pn junctions
  10. Optical nonlinearities