

1. ECE 481A3: Intro to Optical Techniques in Biomedical Eng
2. 3 credits: 2-75 minute lecture sessions/week
3. Randy Bartels
4. Fundamentals of Biomedical Optics. Boudoux, C. 2017.
5. Course Information
  - a. Engineering design principles of advanced optical imaging techniques and image formation theory
  - b. Prerequisites: ECE 342 or MATH340 or MATH345
  - c. Selected Elective: Electrical Engineering; Computer Engineering; Lasers and Optics Engineering
6. Goals for the Course
  - a. Course Learning Objectives
    - i. Utilize engineering design principles of optical measure in biomedical engineering
    - ii. Describe the methods by which light can be used to interrogate biomedical specimens, subjects, and materials
    - iii. Evaluate the capabilities of optical spectroscopic and imaging tools for obtaining chemical, mechanical, functional, and physiological properties of specimens and materials
    - iv. Evaluate and interpret data from biomedical optical measurements, and design optical experiments
  - b. Student Outcomes
    1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
    6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Topics Covered
  - Motivation for optical tools such as spectroscopic and imaging measurements
  - Electromagnetic waves, optics, photons, and light
  - Light spectroscopy
  - Optical spectroscopy and microscopy based on optical scattering
  - Force spectroscopy
  - Single molecule spectroscopy and particle tracking
  - Optical techniques for DNA sequencing
  - Optical techniques for RNA tracking
  - Optigenic and transgenic expression of optical probes

