ECE 3223: Optical Engineering

Credits and contact hours: 3 Credits (Three 50-minute lectures per week)

Instructor: Eric Donkor

Textbook: Introduction to Optics by F. L. Pedrotti, L. S. Pedrotti, L. M. Pedrotti, Addison Wesley, (2007)

a. *Other supplemental materials* : none

***Specific course information*:**

a. *Catalog Description*: Principles and techniques of optical engineering, including geometric optics, optical fibers and systems, sources and detectors, measurements, imaging, lens, wave optics, polarization, interference, diffraction, optical Fourier transforms, holography, interferometry, integrated optics, frequency conversion, interaction of light with matter.

b. *Prerequisite*: ECE 3001 or PHYS 3201

c. *Required, elective, or selected elective:* Elective

***Specific goals for the course*:**

a. *Specific outcomes of instruction*:

- apply principles of physical optics to analyze light propagation in free-space optics and in fiber optics

- Employ EM field theory to analyze and design fiber-optics, laser-optics, Fourier-optics, and diffractive-optics components and systems with applications to optical communication, sensors, image processing, and spectroscopy.

b. *ABET Criterion 3 Student Outcomes addressed by the course*:

1. **an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics**
   Assigned exercises and problems require students to be able to formulate and solve problems using analytical tools in engineering, science and mathematics.

2. **an ability to apply engineering design to produce solutions that meet specified needs with considerations of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors**
   n/a

3. **an ability to communicate effectively with a range of audience**

Students learn to communicate through class discussion sections.

4. **An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts**
   n/a

5. **an ability to function effectively on a team whose members together provide leaderships, create a collaborative and inclusive environment, establish goals, plan task, and meet objectives**
   n/a
   .
6. **an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusion**
   n/a

7. **an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.**
   Students use the WEB and other online resource materials to research contemporary issues in photonics sensors, information storage, lasers, fiber communications.

Topics covered:

- Introduction: Review of Maxwell's' equations.
- Superposition of waves
- Interference of light
- Optical interferometry
- Coherence of light
- Fraunhover and Fresnel diffraction
- The diffraction grating
- Lasers
- Fiber optics
- Holography