

**ELN 236**  
**FIBER OPTICS AND LASERS**

**COURSE DESCRIPTION:**

Prerequisites: ELN 234

Corequisites: None

This course introduces the fundamentals of fiber optics and lasers. Topics include the transmission of light, characteristics of fiber optic and lasers and their systems, fiber optic production, types of lasers, and laser safety. Upon completion, students should be able to understand fiber optic communications and basic laser fundamentals. Course Hours Per Week: Class, 3. Lab, 2. Semester Hours Credit, 4.

**COURSE OBJECTIVES:**

Upon completion of this course, the student will be able to:

- a. Analyze optoelectronic components.
- b. Analyze optoelectronic circuits.
- c. Explain the operation of LEDs and lasers as light sources.
- d. Explain the operation of fiber optic transmitters and receivers.
- e. Explain the transmission of light in an optical fiber
- f. Explain the operation of photodetectors.
- g. Explain the characteristics of light-detecting components.
- h. Select and apply optical measurement tools
- i. Explain the properties of light
- j. Conduct voltage and power gain measurements.
- k. Conduct optical power measurements.

**OUTLINE OF INSTRUCTION:**

- I. The Communication Revolution
  - A. History of telephony
  - B. History of telegraphy
  - C. History of fiber optics
  
- II. Information Transmission
  - A. Analog and digital signaling
  - B. Information-carrying capacity
  - C. Basic communications math

- III. Fiber Optics for Communication
  - A. Bandwidth
  - B. Physical and optical characteristics
- IV. Light
  - A. Wave and particles
  - B. Optics and light
  - C. Snell's law
  - D. Fresnel reflections
- V. Optical Fibers
  - A. Construction
  - B. Classification
  - C. Single-mode fibers
  - D. Multi-mode fibers
- VI. Fiber Characteristics
  - A. Dispersion
  - B. Bandwidth
  - C. Fiber losses
  - D. Mode distribution
- VII. Fiber Optic Cable
  - A. Parts of a fiber optic cable
  - B. Types of fiber optic cable
- VIII. Fiber Optic Light Sources
  - A. LED
  - B. Laser
  - C. Output of LEDs and lasers
  - D. Spectral width of LEDs and lasers
  - E. Packaging of LEDs and lasers
- IX. Detectors
  - A. Photodiode
  - B. Avalanche photodiode
  - C. Detector noise
  - D. Detector responsivity
  - E. Detector response time
- X. Fiber Optic Transmitters and Receivers
  - A. Modulation codes
  - B. Data rate and signal rate
  - C. Transmitter characteristics
  - D. Receiver characteristics

- XI. Fiber Connectors and Splices
  - A. Connector requirements
  - B. Connector losses
  - C. Fiber termination
  - D. Connector types
  - E. Splices

**REQUIRED TEXTBOOKS AND MATERIALS:**

Sterling, Donald. Technician's Guide to Fiber Optics. Delmar Publishing.

**STATEMENT FOR STUDENTS WITH DISABILITIES:**

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.