**EE458-Fiber Optics Communication (Elective Course)**

**Code and Name:** EE458 Fiber Optics Communication
**Credit Hours:** 3 (Lecture: 3, Tutorial: 1)

**Textbook:**
- Optical Fiber Communications, Gerd Keiser, Fourth Edition, McGraw-Hill Edition, 2008.

**Other References:**
- Optical Communication Systems, John Gowar, Second Edition, Prentice Hall, 1993.
- Fiber Optic Communication Systems, Govind P. Agrawal, Third Edition, 2011.

**Course Description:**
Basics of light, Ray representation of light, Fiber optic types, transmission characteristics: attenuation and dispersion, Bit rate and distance limits: link budget calculations, Light sources: LEDs and Semiconductor Lasers, Light detectors: PIN and APDs, Digital transmission: PDH, SDH/SONET, WDM systems.

**Pre-requisites:** EE451 and EE 223
**Co-requisites: None**

**Course Learning Outcomes:**
With relation to ABET Student Outcomes (SOs: 1-7)
1. Learn the fundamentals of light, lasers, photodetectors, and the basic structure of fiber optics. (1)
2. Learn light propagation in an optical fiber and identify the various types of optical fibers. (1)
3. Determine the dispersion characteristics for various types of optical fibers and Discuss fiber losses and loss mechanism. (1)
4. Learn the principle of operation of optical detector – PIN photodiode and evaluate a typical fiber optics transmitter and receiver. (1)
5. Calculate and design of link budgets of fiber optic networks and architectures. (1,2)
6. Do an oral presentation of any subject in the area of fiber optic communications. (3)

**Topics to be covered:**
- Optical Fibers: Basics of light, and ray representation of light.
- Fiber optic types: Step index fiber, graded index fiber, multimode fiber, single mode fiber.
- Signal degradation in Optical Fibers: Transmission characteristics of fibers: attenuation and dispersion.
- Bit rate and distance limits: Link budget calculations.
- Optical Sources: Photon matter interaction, spontaneous and stimulated interaction.
- spontaneous and stimulated interaction.
- Light Emitting Diode LED, structure, characteristics, quantum efficiency, modulation bandwidth, source to fiber power launching.
- Semiconductor Laser source, structure, characteristics, heterostructure, modulation bandwidth.
- Photodetectors: Light detection, photodetector noise, detector response time, PIN photodetector.
- Avalanche photodiode, Avalanche multiplication, structure, temperature effect on Avalanche gain, comparison of photodetectors.
- Optical Amplifiers: Optical amplifiers, Raman amplifier, erbium doped fiber amplifier.
- WDM Concepts and Components: Wavelength division multiplexing.
- Optical fiber components, fiber couplers, fiber isolator, fiber Bragg grating, Intensity and phase modulators.
- Optical networks: Optical Networks.

**Grading Policy:**
The grading for the course are 60% coursework and 40% Final Exam. The coursework consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, homework, and projects for the remaining 20% that is modified by the course instructor.