

**Course Title: Optical Fiber Communication**

**Course Code: ETEG 422**

**Credit Hours: 3**

**Course Description:**

This course intends to introduce light wave technology in optical communication and optoelectronic technologies their circuit and system applications.

**Course Contents:**

**Unit 1: Introduction to Optoelectronics**

Historical perspective, the basic optical communication system, Prime components employed in this system

**Unit 2: Optical Fibers**

Ray propagation in optical fiber- numerical aperture, Step index, Graded index; Ray propagation in step index fiber, Graded index fiber; Effect of material dispersion, Combined effect of multipath and material dispersion; Review of dielectric wave guide; Planar optical waveguide TE mode and TM modes; Wave propagation in cylindrical wave guides; Wave propagation in an ideal step index fiber and graded index fiber; Multimode and monomode fibers; Signal distortion in optical fiber; Attenuation mechanisms in optical fibers; Optimum wavelengths in silica fibers; Single mode fibres ; Fiber material, Fiber fabrication methods; Optical fiber cables and connections, Optical fiber connections and related losses, Fiber splices and connectors

**Unit 3: Optical Sources**

Review of semiconductor p-n junction, Injection luminescence and light emitting diode LED, LED materials, Heterojunctions, LED designs, LASER optical sources, The basic principles of laser action, Spontaneous emission, Stimulated emission and absorption, The condition for laser action, Different types of laser - solid state laser, Gas laser, Semiconductor laser, DFB laser, Feature of laser radiation

**Unit 4: Detector**

Principles of photodetections, Absorption, Quantum efficiency, Responsivity, Photo diode, p-i-n diode, Avalanche photodiode

**Unit 5: Other Devices**

Modulators, Extrinsic modulator devices - electro-optic modulator, Acousto-optic modulators, Practical amplifiers and beam splitters, Switches, Optical directional couplers, Modulators devices-fiber coupling, Numerical aperture match

**Unit 6: Optoelectronic Integrated Circuits**

Slab and strip waveguides, Emitter and detectors

**Unit 7: Optical communication Systems**

Optical sources and detectors, Optical transmitter circuit, Optical receiver circuits, Regeneration of digital signals in an optical system, Coherent systems, Homodyne and heterodyne detection,

Wavelength division multiplexing, Optical amplifiers, Examination of existing systems in Nepal, Case study

### **Unit 8: Non-Communications Applications of Fibers**

Optical fiber sensors

#### **References:**

1. J.Gowar, *Optical Communications Systems*, Prentice Hall 1993
2. J.M. Senior, *Optical Fiber Communications*, Prentice Hall 1992
3. D. C. Agrawal, *Fiber Optic Communication*, Wheeler Publishing 1993
4. J.Wilson and J.F.B.Hawkes, *Optoelectronics*, Prentice Hall 1996
5. W.B. Jones, *Optical Fiber Communication Systems*, HRW 1988