

## 4/4 B.Tech - SEVENTH SEMESTER

EC 7T1

Optical Communications

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

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**Prerequisites:** Digital Communications (EC5T3)

### Course Objectives:

- To introduce the students to various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- To study about various optical sources and optical detectors and their use in the optical communication system.
- To learn about optical transmitter circuits & receiver circuits and digital optical system.
- To familiar with measurements of Attenuation, Dispersion, Refractive Index.

### Learning Outcomes:

Students are able to

- Design an optical fiber communication link.
- Analyze the characteristics of LED, LASER source and Photo detectors
- Measure dispersion and attenuation in OFC.

### UNIT- I

**Optical Fiber Waveguides:** Historical Development, General System, Advantages of Optical Fibers, Applications of Optical Fiber Communication.

Ray Theory Transmission, Cylindrical Fibers, Single Mode Fibers.

### UNIT- II

**Transmission Characteristics of Optical Fibers:** Introduction, Attenuation, Material Absorption Losses in Silicon Glass Fibers, Linear Scattering Losses, Non Linear Scattering Losses, Fiber Bend Loss. Intramodal Dispersion, Intermodal Dispersion, Dispersion in Single Mode Fibers. Fiber Optic Components: Fiber Alignment & Joint Loss, Fiber Splices, Fiber Connectors.

### **UNIT- III**

**Optical Sources:** - **LED:** Introduction, LED Power & Efficiency, LED Structures, LED Characteristics, **LASER** Basic Concepts, Optical Emission from Semiconductors, Semi-Conductor Injection Laser, Laser Structures, Single Frequency Injection Lasers.

### **UNIT- VI**

**Detectors:** Introduction, Optical Detection Principles, Absorption, Quantum Efficiency, Responsivity, Semi- Conductor Photo Diode with Internal Gain, Semi-Conductor Photo Diode without Internal Gain.

### **UNIT- V**

**Optical Fiber Systems, Measurements & Networks:** Optical Transmitter Circuits, Optical Receiver Circuits, Digital Systems, Digital System Planning Considerations. Attenuation Measurement, Dispersion Measurement, Refractive Index, Optical Time Domain Reflectometer (OTDR), Basic networks, SONET/SDIT, Broadcast and select WDM Networks.

## **Learning Resources**

### **Text Books:**

1. Optical fiber Communication, Gerd Keiser, Mc Graw Hill. 3rd Edition , 2003
2. Optical Fiber Communications: Principles and Practice, John M Senior, PHI, 2nd Edition, 2002

### **References:**

1. Fiber Optic Communication Technology, Djafar K Mynbaev and Lowell L. Scheiner, Pearson Education, 2006
2. Fiber Optics Communication, Kolimbiris, McGraw Hill. , 1st Edition, 2003,
3. Fiber Optic Communication Technology, Djafar K Mynbaev and Lowell L. Scheiner, Pearson Education, 2006