

## EC 517: OPTICAL COMMUNICATIONS (3-0-2: 4)

### Introduction

General Communication system, Elements of fiber communication link, Advantages and disadvantages of optical fiber communication ,Application of optical fiber communications, limitation of optical fiber communications

### Optical Fiber Cross Section

Index profile, propagation of light wave in optical fiber, Ray theory and electromagnetic mode theory for optical propagation, step index and graded index fibers, critical angle, Acceptance angle, Numerical Aperture. Attenuation, Material Absorption, scattering losses (Rayleigh Scattering),Fiber bend losses, Core and Cladding losses, Dispersion in optical fiber, Intermodal dispersion, Intermodal dispersion , pulse spread by material dispersion ,dispersion shifted and dispersion flattened fiber.

### Optical Sources

Principal of light emitting diode (LED), LED Power and Efficiency, Characteristic of LED , LASER , Basic concept: Absorption and Emission of Radiation, population inversion , spontaneous emission , Efficiency of LASER ,Laser to fiber Coupling ,Advantages of LASER over LED.

### Optical Detector

Principal for optical detection ,Characteristics of Photo Detectors , P.N Photo Diodes , P.I.N Photo Diodes, Response time of photodiode , Avalanche photodiode , Silicon Reach through Avalanche photodiode, Multiplication factor , Noise in APD.

### Introduction of Optical Communication System

Drive circuits for LED operation , Drive circuits for LASER operation, Optical receiver , Preamplifier , Automatic gain control ,Link power Budget ,Rise time budget, Homodyne and heterodyne detection ,Phase diversity receiver ,Optical TDM ,WDM.

### Suggested list of Experiments:

1. Introduction optical fiber
2. Analog link set up using a fiber
3. Digital link-set up using a fiber
4. Measurement of losses in optical fiber
5. Measurement of numerical aperture
6. Time division multiplexing of the signal
7. Photo-detection at zero bias , forward bias, and reverse bias.
8. Characteristic of led
9. Characteristic of laser
10. Fabry-perot laser

### Text Books and References

1. John Gowar, "Optical Communication Systems", PHI.
2. Gerd Keiser, "Optical Fiber Communication", TMH

3. Franz JH & Jain VK, "Optical Communication", Narosa Pub Ins
4. John M. Senior, "Optical Communication", PHI