FIBER OPTIC COMMUNICATION SYSTEMS

Course Code: 13EC2103

L	P	C
4	0	3

Course Educational Objectives:

1. To teach basic concepts of Fiber Optic Communications.
2. To teachmanufacturing techniques of optical fiber and cable.
3. To teach construction of Optical components.
4. To teach Optical measurements techniques and principles of SDH.

Course Outcomes:

1. Able to understand the fiber and cable manufacturing techniques.
2. Able to understand Analog and digital design for optical communication links.
3. Simple Designs for short haul links using LED and PIN, and long haul links using LD and APD.

UNIT-I

INTRODUCTION:

Historical development, advantages of OFC, Ray theory transmission-total internal reflection, acceptance angle, numerical aperture, skew rays, fiber materials-glass fibers, halide glass fibers, active glass fibers, plastic clad glass fibers, plastic fibers, Step Index Fiber, Graded Index Fiber, Modes in Step Index Fibers, Modes in Graded Index Fibers, Pulse Distortion and Information Rate in Optic Fibers.

UNIT-II

SIGNAL DEGRADATION AND MANUFACTURING TECHNIQUES:

Attenuation-absorption, scattering, radiation losses, intramodal and intermodal dispersion, polarization mode dispersion, Construction of Optic Fibers, Optic Fibers, Optic Fiber Cables.

UNIT-III

LIGHT SOURCES AND DETECTORS:

Light Emitting Diodes, Light Emitting Diodes Operating Characteristics, Laser Principles, Laser Diodes, Laser Diode Operating Characteristics, Distributed Feedback Laser Diode, Optical Amplifiers, Fiber Laser, Vertical Cavity Surface Emitting Laser Diodes, Principles of Photo detection, Photomultiplier, Semiconductor Photodiode, PIN Photodiode, Avalanche Photodiode.

UNIT-1V

COUPLERS, CONNECTORS AND MODULATION:

Principles, Fiber end Preparation, Splices, Connectors, Source Coupling, Distribution Networks and Fiber Components, Distribution Networks, Directional Couplers, Star Couplers, Switches, Fiber Optical Isolator, Attenuator, Circulator and Polarization Controller.

Light Emitting Diode Modulation and Circuits, Laser-Diode Modulation and Circuits, Analog-Modulation Formats, Digital-Modulation Formats, Optic Heterodyne Receivers, Thermal and Shot Noise, Signal-to-Noise Ratio, Error Rates, Modal Noise, Amplifier Noise, Laser Noise, receiver Circuit Design.

UNIT-V

SYSTEM DESIGN AND OPTICAL FIBER MEASUREMENT

Analog System Design, Digital System Design, Introduction, measurement of attenuation, dispersion, refractive index profile, numerical aperture, diameter and field, principles of DWDM, introduction to Synchronous Digital Hierarchy, Optical switching.

TEXT BOOKS:

[1] Joseph. C. Palais, "*Fiber Optic Communications*", Pearson Education, Asia, 2002.

[2] John M Senior, "*Optical Fiber Communications principles and practice*", II edition.

REFERENCE BOOKS:

[1] B.Gerd Keiser, "*Optical Communications*", PHI.