FIBER OPTIC COMMUNICATION SYSTEMS

Course Code:15EC2103   **L   P   C**
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Course Outcomes: After completion of the course, the student is able to

CO1: Distinguish Step Index, Graded index fibers and compute mode volume.

CO2: Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.

CO3: Classify the construction and characteristics of optical sources and detectors.

CO4: Discuss splicing techniques, passive optical components and explain noise in optical system.

CO5: Design short haul and long haul Analog/ Digital optical communication system and explain advanced optical transmission systems.

UNIT-I   (10-Lectures)
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   (10-Lectures)
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   (10-Lectures)
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-IV   (10-Lectures)
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   (10-Lectures)
SYSTEM DESIGN AND OPTICAL FIBER MEASUREMENTS:
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. Senior, John M., and M. Yousif Jamro, "*Optical fiber communications: principles and practice*" Pearson Education, 2009.

REFERENCE BOOKS:
1. Keiser, Gerd, "*Optical fiber communications*", John Wiley & Sons, Inc., 2003.