IV B.Tech – I Semester

(20EC7720) Optical Fiber Communication Systems
(Minors)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	4

Pre-Requisites: Analog and Digital Communication

Course Objectives:

- To understand the concept of optical communication and types of fibers.
- To study the charactertics of fiber material, losses and dispersion.
- To identify with the connectors and couplers concept in optical fiber
- To learn the concept of various optical sources.
- To analyse various optical system design.

UNIT-I: Overview of Optical Fiber Communication

Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Step Index fibers, Graded Index fibers.

UNIT-II: Transmission Characteristics of Optical Fibers

Fiber materials: - Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion.

UNIT-III: Fiber Couplers and Connectors

Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing-Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss-Multimode fiber joints, single mode fiber joints.

UNIT-IV: Optical Sources

LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, and Laser diode rate equations.

UNIT-V: Optical System Design

Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion.

Course Outcomes:

After successful completion of the course, the students can be able to

S.No	Course Outcome	BTL
1	Choose necessary components required in modern optical communications systems	L2
2	Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers	L3
3	Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.	L3
4	Understand the optical sources structures, material, threshold conditions	L2
5	Choose the optical cables for better communication with minimum losses Design, build, and demonstrate optical fiber experiments in the laboratory.	L3

Correlation of Cos with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	2	-	-	-	-	-	-	-	-	1	2	-
CO 2	2	2	2	-	-	-	-	-	-	-	-	1	2	-
CO 3	2	2	2	-	2	-	-	-	-	-	-	2	2	-
CO 4	2	2	2	-	-	-	-	-	-	-	-	1	2	-
CO 5	2	-	-	-	2	-	-	-	-	-	-	2	2	-

Text Books:

1. Gerd Keiser - Optical Fiber Communication – 4th Ed., MGH, 3rd Edition, 2000.
2. John M. Senior - Optical Fiber Communications – PHI, 2nd Edition, 2002.

Reference Books:

1. Joseph C Palais - Fiber optic communication 4th Edition, Pearson Education, 2004.