

COURSE CODE	COURSE TITLE	L	T	P	C
1152IT107	OPTICAL COMMUNICATION	3	0	0	3

Course Category:

~~Foundation (0)/ Program Core (1)/~~ **Program Elective (2)** / Allied Elective (3) / ~~University Elective (4) / Value Education Elective (5) / Independent Learning (6) / Industry – Higher Learning Institute Interaction (7)~~

a.Preamble:

To introduce the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber, various optical sources and optical detectors and their use in the optical communication system.

b. Pre-requisites:

Sl. No	Course Code	Course Name
1		Computer networks

c. Related Courses:

Sl. No	Course Code	Course Name
1		Multimedia Communication Networks
3		Project Work

d. Course Educational Objectives:

Students undergoing this course are expected to

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
- To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

e.Course Outcomes:

CONos	Course Outcomes	Level of learning domain(Based on revised Bloom's taxonomy)
CO1	Provides thorough knowledge of different optical communication systems	K2
CO2	A thorough knowledge of optical components and its performances	K2
CO3	Details of impairments in optical fiber links and schemes to mitigate them	K2

UNIT - 1 : INTRODUCTION TO OPTICAL FIBERS

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics- Optical Fiber Modes and Configurations -Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure.

UNIT - 2 : SIGNAL DEGRADATION OPTICAL FIBERS

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers- Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling -Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT - 3 : FIBER OPTICAL SOURCES AND COUPLING

Direct and indirect Band gap materials-LED structures -Light source materials -Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies -Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fibre -to- Fibre joints, Fibre splicing.

UNIT - 4 : FIBER OPTICAL RECEIVERS

PIN and APD diodes -Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise -Comparison of Photo detectors -Fundamental Receiver Operation - preamplifiers, Error Sources -Receiver Configuration -Probability of Error - Quantum Limit.

UNIT - 5 : DIGITAL TRANSMISSION SYSTEM

Point-to-Point links System considerations -Link Power budget -Rise - time budget -Noise Effects on System Performance-Operational Principles of WDM, Solitons-Erbium-doped Amplifiers.

TEXT BOOKS

1. Gerd Keiser, "Optical Fiber Communication" McGraw -Hill International, Singapore, 3rd ed., 2000

REFERENCES

J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001