

Branch Name:	Information and Communication Technology
Semester/Year:	Semester VII / Fourth Year
Subject Title:	Optical Communication
Subject Code:	1ET1070703
Pre-requisite:	Semiconductor Physics, Electromagnetic, Basics of Communication System

Course Objective:

To introduce the students to various optical fiber modes, configurations and various signal degradation factors associated with optical fiber and to study about various optical sources and optical detectors and their use in the optical communication system, optical amplifiers, fiber network elements, basic optical components, and techniques of fiber optic measurement.

Teaching and Examination Scheme:

Teaching Scheme (Hours Per Week)				Examination Scheme (Marks)				Total
L	T	P	Credit	Theory		Practical		
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Topic	Total Hrs.	Weightage %
1	Introduction to optical fiber Communication: Basic network information rates, Evolution of fiber optic systems, Elements of an optical fiber transmission link, Advantages and disadvantages of optical fiber system. Fundamentals of Light Propagation in Optical Fiber, Numerical aperture, Multimode Fibers, Single Mode Fibers, Step Index and Graded Index (GI) fibers, Attenuation and Dispersion.	10	22
2	Optical Sources and Photo Detectors: Light emitting diode (LEDs) - Structures, Materials, Characteristics & Modulation, Laser Diodes -Modes & threshold condition, Structures, Single mode lasers Photo Detectors Principles of operation, types, characteristics, figure of merits of detectors photodiode materials, photo detector noise	9	20
3	Optical Amplifiers: Semiconductor optical Amplifier, EDFA, Raman Amplifier, Wideband Optical Amplifiers.	4	12
4	Overview of Optical Components: Optical couplers, Tunable sources and Filters, optical MUX/DEMUX, Arrayed waveguide grating, optical add drop multiplexer (OADM), optical circulators, attenuators, optical cross connects, wavelength converter, Mach-Zender Interferometer.	8	18

5	Advances in Optical Fiber Systems: Principles of WDM, DWDM, Telecommunications & broadband application, SONET/SDH, MUX, Analog & Digital broadband, optical switching.	7	16
6	Fiber Optical Measurements: Test equipment, OTDR, Set ups for Measurement of Attenuation, Dispersion, NA and EYE pattern.	4	12

Course Outcome: After learning the course the students will be able

	CO Statement
CO-1	Understand and classify the structures of optical fibers.
CO-2	Analyze the different optical sources and detectors.
CO-3	Performance evaluation of optical receiver.
CO-4	Design and analyze optical transmission systems.
CO-5	Identify the various components for optical communication.
CO-6	Use the various optical measurement techniques.

List of Reference Books:

1. Optical Fiber Communications by Gerd Keiser, 4th Edition (Mc Graw Hill).
2. Optical Fiber Communication by John M. Senior (PHI/Pearson).
3. Fiber optical communication Technology by Djafar Mymbaev & Lowell L, Scheiner. (Pearson).
4. Fiber optic Communication Systems by G. Agrawal (John Wiley and sons).

List of Suggested titles of Experiments:

1. Setting-up of Analog/ Digital Optical communication Link.
2. Measurement of attenuation characteristics of an optical fiber.
3. Measurement of NA of a multimode fiber.
4. Measurement of Mode field diameter of a single mode fiber.
5. Measurement of Dispersion of optical fiber.
6. Performance of PAM on fiber optic link.
7. Performance of PWM on fiber optic link.
8. Performance of PPM on fiber optic link.
9. Measurement of attenuation with OTDR.
10. Measurement of emission wavelength of LED/LASER source.
11. Measurement of Data quality with EYE PATTERN.
12. Preparation of optical fiber end and practices on splicing
13. Performance of TDM on fiber optic link.
14. Setting -up of voice link on Optical communication Link.
15. Performing Experiments on the VI characteristics of the optical Sources.
16. Performing Experiments on the characteristics of the optical detectors.

e-Resources (If any):

1. <https://nptel.ac.in/courses/108/106/108106167/>