GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: VI
Electronics Engineering/Electronics &Communication Engineering/Electronics &Telecommunication

Subject Name: **Optical Communication**
Subject Code: **161005**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
4	0	2	6	70	30	50

Sr. No	Course Content	Total Hrs.
1.	**Overview of Optical fiber Communications :** Electromagnetic spectrum, Optical Spectral bands, Evolution of fiber optic system, Multiplexing Techniques, Elements of an optical fiber transmission link with the functional description of each block, WDM concepts, transmission widows, advantages of optical fiber link over conventional copper systems, applications of fiber optic transmission systems.	3
2.	**Optical fibers : Structures, Waveguiding and Fabrication** : Optical laws and definitions, optical fiber modes and configurations, Mode theory, Step Index and Graded Index (GI) fibers ,single mode and graded index fibers, Derivation for numerical aperture, V number and modes supported by step index fiber, mode field ,Numerical aperture and modes supported by GI fibers, fiber materials, linearly Polarized modes fiber fabrication techniques, and mechanical properties of fibers, fiber optic cables.	7
3.	**Signal Degradation in Optical Fibers :** Attenuation, signal distortion in optical waveguides, pulse broadening in graded index fiber, Characteristics of Single Mode Fibers, mode coupling, International Standards for optical transmission fibers.	5

4.	**Optical Sources :** Semiconductor Physics background, Light emitting diode (LEDs)-structures, materials, Figure of merits, characteristics & Modulation. Laser Diodes -Modes & threshold conditions, Diode Rate equations, resonant frequencies, structures, characteristics and figure of merits, single mode lasers, Modulation of laser diodes, Spectral width , temperature effects, and Light source linearity.	6
5.	**Power Launching and Coupling :** Source to fiber power launching, Lensing schemes, fiber-to-fiber joints, LED coupling to single mode fibers, fiber splicing, Optical fiber connectors.	4
6.	**Photodetectors :** Principles of operation, types, characteristics, figure of merits of detectors photodiode materials, photodetector noise, detector response time, temperature effects on gain, comparison of photodetectors.	4
7.	**Optical Receiver Operation :** Receiver operation, Preamplifier types, receiver performance and sensitivity, Eye diagrams, Coherent detection, Specification of receivers.	5
8.	**Transmission Systems :** Point –to-point link –system considerations, Link power budget and rise time budget methods for design of optical link, BER calculation	3
9.	**Optical Amplifiers :** Semiconductor optical Amplifier, EDFA, Raman Amplifier, Wideband Optical Amplifiers	3
10.	**Advances in Optical Fiber Systems :** Principles of WDM, DWDM, Telecommunications & broadband application, SONET/SDH, MUX, Analog & Digital broadband, optical switching.	5
11.	**Overview of Optical Components :** Optical couplers, Tunable sources and Filters ,optical MUX/DEMUX, Arrayed waveguide grating, optical add drop multiplexer (OADM), optical cirulators, attenuators, optical cross connects, wavelength converter, Mach-Zender Interferometer,	3
12.	**Fiber Optical Measurements :** Test Equipments, OTDR , Set ups for Measurement of Attenuation, Dispersion, NA and EYE pattern .	3

Text Book:

1. Optical Fiber Communications by Gerd Keiser, 4th Edition (Mc Graw Hill)

Reference Books:

1. Optical Fiber Communication by John M. Senior (PHI/Pearson)
2. Fiber optical communication Technology by Djafar Mymbaev & Lowell L, Scheiner. (Pearson)
3. Fiber optic Communication Systems by G. Agrawal (John Wiley and sons)

List of Suggested Practical Assignments:

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/connectorization.
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.