GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER: V

Subject Name: **Fiber Optic Communication**

Sr. No.	Course Content
1.	**Principles of Optical Ray Transmission:** 1.1 Elementary fiber optic communication system 1.2 Advantages of fiber optic communication 1.3 Basic optical laws: reflection, Snell's law, refraction, critical angle 1.4 Optical waveguide: Basic structure, launching and propagation of optical ray in the waveguide, acceptance angle, numerical aperture, modes of propagation 1.5 Refractive index profiles, single-mode and multi-mode step index fiber, graded index fiber 1.6 Losses in fiber: absorption, scattering, bending 1.7 Signal distortions in fiber
2.	**Optical Fibers and Cables:** 2.1 Fiber materials: glass, Halide, Active glass, Chalgenide, plastic 2.2 Fiber fabrication: double crucible method, plasma-activated chemical vapour deposition 2.3 Structure of a typical fiber cable 2.4 Joining of fibres: alignment, fusion splicing, mechanical splicing 2.5 Cylindrical ferrule connector, GRIN-rod lens, expanded beam connector
3.	**Optical Sources and Detectors:** 3.1 Characteristics of an ideal optical source 3.2 Light emitting diodes: heterojunction structure, surface emitting LED, edge emitting LED 3.3 Semiconductor LASER Diode: construction and operation 3.4 Comparision of LED and LASER 3.5 Source to fibre coupling 3.6 Characteristics of an ideal optical detector 3.7 PIN Diode 3.8 Avalanche photo diode 3.9 Photo transistor 3.10 Coupling of fibres to detectors
4.	**Optical Components:** 4.1 Optical amplifiers: semiconductor laser amplifier, fiber amplifier 4.2 Optical couplers and isolators 4.3 Optical switches 4.4 Beam splitter 4.5 Optic multiplexer and demultiplexer 4.6 Optical wavelength convertor 4.7 Bragg grating 4.8 MEMS mirrors and MEMS switches

5.	**Optical Communication Systems:** 5.1 LED modulation: analog, digital 5.2 LASER modulation: analog, digital 5.3 Optical receiver block diagram 5.4 Common source FET preamplifier 5.5 Regenerative repeater 5.6 Optical heterodyne detection 5.7 Time divison multiplexing in optical domain 5.8 Frequency divison multiplexing in optical domain
6.	**Fibre Optic Measurements:** 6.1 Performance measurement parameters for a typical optical link 6.2 Optical power meter 6.3 Optical attenuator 6.4 Tunable LASER source 6.5 Optical spectrum analyzer 6.6 Optical time domain reflectometer 6.7 Attenuation measurement: cutback technique, insertion-loss method 6.8 Intermodal dispersion measurement in time domain 6.9 Refractive index profile measurement using nearfield scanning method, numeric aperture measurement usung scanning photodetector.

The sample experiments to be performed include, but are not limited to the following.

1. Study of Optical fiber cable
2. Study of splicing and joining of fibers
3. To find N.A. of optical fiber
4. Characteristics of LED
5. Characteristics of LASER Diode
6. Study of losses
7. Characteristics of phototransistor
8. Characteristics of PIN photo diode
9. Characteristics of APD photo diode
10. To build and test LED and LASER drive circuits
11. Study of Optical transmitter
12. Study of Optical receiver
13. Measurement of optical attenuation
14. Measurement of dispersion
15. Study of optical time domain reflectometer
16. Study of tunable LASER source
17. Study of optical spectrum analyzer

References Books:

1. Optical Fiber Communications: Principles and Practices, J. M. Senior.
2. Optical Fiber Communications, Gerd Keiser.
3. Fiber Optic Communications, J. C. Palais.
4. Fiber Optics abd Optoelectronics, R. P. Khare.