IV B.Tech I Semester

15AEC52 - OPTICAL FIBRE COMMUNICATIONS

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Course Objectives:

1. *To learn the basic concepts of fibre optics communications.*
2. *To make the students learn the system with various components or process for various applications.*
3. *To enlighten the student with latest trends in optical communications.*

UNIT-I

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-II

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-III

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 –Temperature effects, Introduction to Quantum laser, source-to-fiber Power Launching, Lensing schemes, Fibre –to- Fibre joints, Fibre splicing.

UNIT-IV

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-V

System Design and Applications: Design of Analog Systems: system specification, power budget, bandwidth budget

Design of Digital Systems: system specification, rise time budget, power budget, Receiver sensitivity, Overview of WDM.

Applications: Telephony, Telemetry, video distribution, military applications, passive and active sensing.
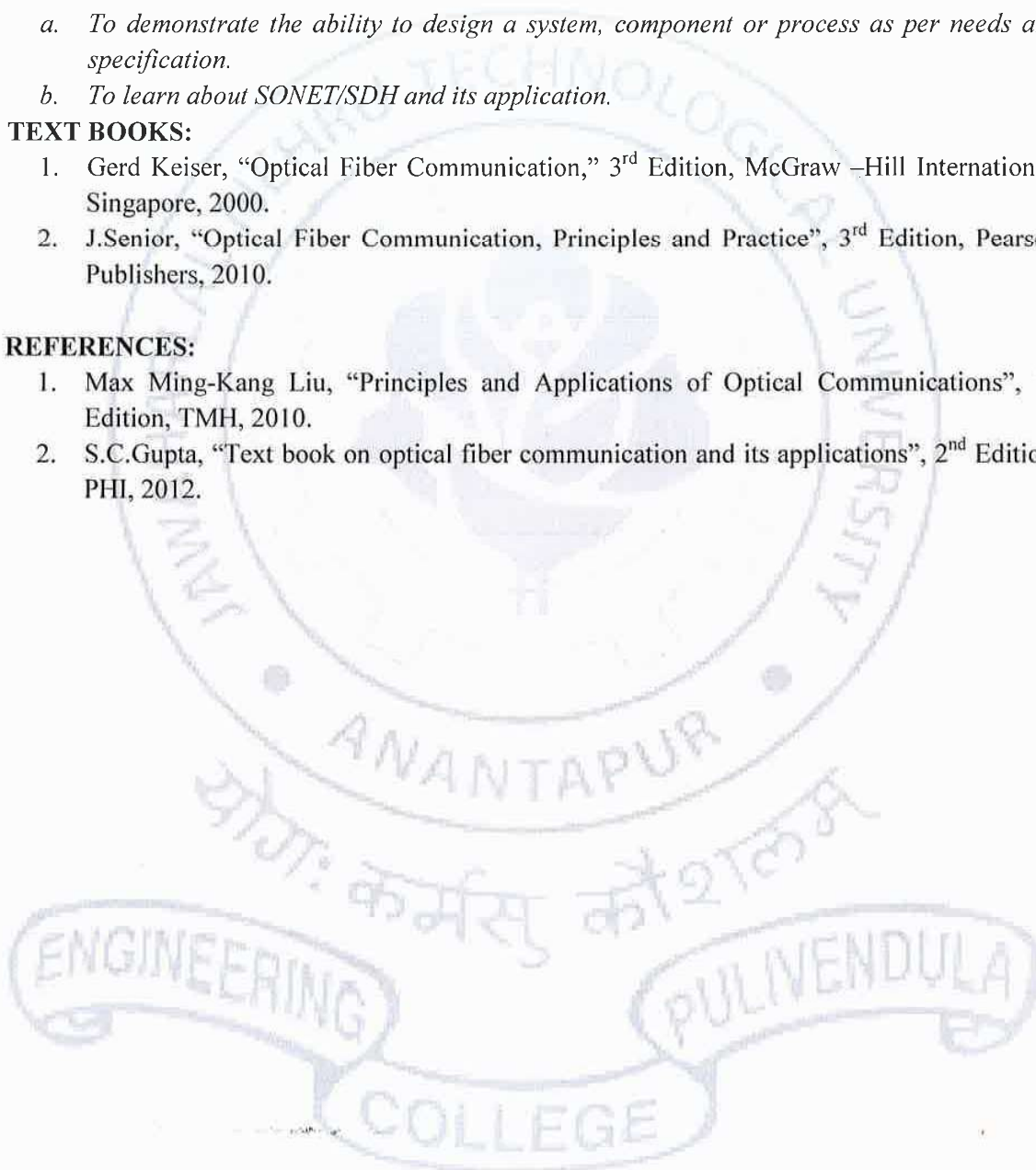
Course Outcomes: The students can able

    a. *To demonstrate the ability to design a system, component or process as per needs and specification.*

    b. *To learn about SONET/SDH and its application.*

TEXT BOOKS:

1. Gerd Keiser, "Optical Fiber Communication," 3rd Edition, McGraw –Hill International, Singapore, 2000.
2. J.Senior, "Optical Fiber Communication, Principles and Practice", 3rd Edition, Pearson Publishers, 2010.

REFERENCES:

1. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", 1st Edition, TMH, 2010.
2. S.C.Gupta, "Text book on optical fiber communication and its applications", 2nd Edition, PHI, 2012.