Department of Electronics & Telecommunication Engineering
B.Tech. VII Sem (Electronics & Telecommunication Engineering)

Faculty Name: **Dr. Anjulata Yadav** **Course Code: EC45208**

Course Name: Optical Communications **Year: 2024-2025**

Lecture Plan

Lecture No.	Topics covered	Remarks
1.	**CHAPTER 1: REVIEW OF BASIC OPTICAL COMMUNICATION** Overview of optical fiber communications system: history and elements of an optical fibre transmission link, applications	
2.	Basic block diagram of optical communication, advantages, structure of an optical fiber, Principle of TIR	
3.	Types of Optical fiber, Comparison of SIMMF, GIMMF and SMF, Physical and electrical characteristics of fiber	
4.	analysis of optical waveguide using ray theory, Derivation of Numerical Aperture, Modes in planar guide, hybrid modes their formation, LP modes	
5.	Wave propagation in optical fiber, Condition for Modes in cylindrical guide, Normalized frequency (V number), Phase & group velocity, wave model,	
6.	Mode coupling, Mode field diameter, Numericals	
7.	**CHAPTER 2: TRANSMISSION CHARACTERISTICS OF OPTICAL FIBER** Introduction to Transmission characteristics, Attenuation, Causes of attenuation, Types, Material absorption loss- a) Intrinsic loss,	
8.	Material absorption loss- b) Extrinsic loss, Scattering loss- a) Linear (Mie and Rayleigh, b) Non linear (Stimulated Brillouin Scattering & Stimulated Raman Scattering)	
9.	Bending loss, a) Micro Bending loss , b) Macro bending loss, pulse broadening in graded index and step index wave guides Dispersion- Intramodal and intermodal, effect of dispersion on data rate- ISI	
10.	Derivation of RMS value of time delay in Intramodal dispersion and Intermodal dispersion	
11.	Intermodal, Polarization mode dispersion Dispersion shifted & Dispersion Flattened fibers	
12.	Fabrication of fibers, overview of fibre materials and measurement techniques like OTDR.	
13.	**CHAPTER 3: LASER, LED & DETECTOR** Introduction, requisite characteristics of an optical source, Characteristics, Basic phenomenon, Einstein relation	

14.	Two level population inversion, Basic principle, Direct & Indirect band gap, Double heterojunctions	
15.	LASER rate equation, internal and external quantum Efficiencies, Stripe geometry, Multimode Lasers,	
16.	Injection Laser characteristics, Laser structures their comparison	
17.	Temperature dependence, Dynamic response, Frequency chirp, Noise, Mode hopping,	
18.	Introduction to LED, Advantages & disadvantages , Lambertian pattern, Rate equations,	
19.	LED structures, their Comparison	
20.	Modulation bandwidth, Introduction to detectors, Requirements & desirable properties, Absorption, Quantum efficiency, Responsivity, Long wavelength cutoff, Photodiode without internal gain	
21.	PN photodiode, PIN photodiode, Speed of response	
22.	Detector Noise, Photodiode with internal gain, Avalanche photodiode, Parameters to find noise performance	
23.	**CHAPTER 4: OPTICAL POWER BUDGET-** Link power budget, Rise time budget	
24.	Fiber jointing- types Fiber splices- Fusion, Mechanical,	
25.	Types o Fiber connectors	
26.	Fiber joint losses- Intrinsic, Extrinsic	
27.	Receiver performance, Block diagram of receiver, Electrical equivalent circuit of receiver	
28.	SNR calculation of APD & PIN detectors, direct and indirect intensity modulation	
29.	**CHAPTER 5: OPTICAL NETWORKS-** Introduction, basic elements of optical network, comparison of three generations of digital transport hierarchy	
30.	SONET/SDH- data rates, features, frame format	
31.	WDM network : Broadcast – and –select WDM Networks, wavelength routed networks, DWDM	
32.	Passive Optical Access Networks, optical switches	
33.	Introduction to optical amplifiers (EDFA, SOA)	