SCHEME OF COURSE WORK

Course Title	: Optical Communications		
Course Code	: 13EC1130	L T P C	4 0 0 3
Program:	:B.Tech		
Specialization:	: Electronics and Communication Engineering		
Semester	: VII		
Prerequisites	: Analog and Digital Communications, Electronic Devices		
Courses to which it is a prerequisite	: Data Communication		

Course Outcomes (COs):

1	Comprehend fiber Optic Communications and fiber materials
2	Assess the transmission Characteristics of signals through fibers.
3	Compare and analyze the characteristics of various optical sources and detectors.
4	Design optical links for Analog and Digital optical communication systems and estimate power budget.
5	Measure attenuation and Dispersion of SONET/SDH, WDM and DWDM.

Course Outcomes versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		S			S	S					M
CO2	M		M			M	S					M
CO3	S		M		M	M						M
CO4	S	S	M		M	M						M
CO5	S	S	S		M	M						M

S - Strongly correlated, M - Moderately correlated, Blank - No correlation

Assessment Methods:	Assignment/ Quiz/Mid Exam/Surprise test/Open book test

Week	Topic /Contents	Course Outcomes	Sample questions	Teaching-Learning Strategy	Assessment Method & Schedule
1	Historical Development, The General System, Advantages of Fiber Optic communications, Total Internal Reflection, Acceptance Angle, Numerical Aperture,	CO - 1	1. Write two advantages of OFC 2. What is Snells law? 3. Explain Numerical Aperture.	Lecture/ Problem solving	Assignment I/Quiz-I/Mid-I

	Skew rays.				
2	Modes, V number, Step index, Graded index Fibers. Cutoff Wave length, Mode Field Diameter, Effective Refractive Index. Glass, Halide, Plastic Optical fibers, Characteristics of Optical Cable.	CO - 1	1. What is the range of V-number for SM fiber? 2. What are the advanteges of Halide optical fiber 3. What is spot size?	Lecture/ Problem solving	Assignment I/Quiz-I/Mid-I
3	Attenuation, Material Absorption Losses, Linear Scattering lossesRayleigh, Mie, Non Linear Scattering losses- SBS, SRS, Fiber Bend losses,	CO - 2	1. What is intrinsic Absorption? 2. Differentiate between SBS and SRS 3. What is the effect of Hydroxl ionson attenuation	Lecture	Assignment I/Quiz-I/Mid-I
4	Group delay, Dispersion- Intermodal dispersion, Material dispersion, Waveguide dispersion	CO - 2	1. Explain is intramodal dispersion? 2. Differentiate waveguide and material dispersion	Lecture/ Problem solving	Assignment I/Quiz-I/Mid-I
5	Polarization mode dispersion. Fiber Splices – Fusion Splices, Mechanical Splices,	C0-2	1. What is birefrengec 2. Explainis fusion Splicing	Lecture/ Problem solving	Assignment I/Quiz-I/Mid-I
6	Optical Fiber connectors – connector types, Single Mode Fiber Connectors, Connector Return loss. Lensing schemes for coupling improvement	CO – 2	1. Explain Straight sleeve connector. 2. What is Fresnel reflection? 3. How lensing mechanism improve loss?	Lecture/ Problem solving	Assignment I/Quiz-I/Mid-I
7	LED structures- Surface Emitter LED,	CO – 3	1. Differentiate Surface emitting LED	Lecture/ Problem	Assignment I/Quiz-I/Mid-I

	Edge Emitter LED, Quantum Efficiency, LED characteristics-output power, Modulation		and edge emitting LED. 2. What is Quantum efficiency? 3. Explain the relationship between optical and electrical bandwidth.	solving	
8	Lasers – The Einstein relations, Population Inversion, Threshold condition for Laser oscillation, Laser diode modes, External Quantum Efficiency, Resonant frequencies	CO – 3	1. What is population inversion? 2. What is 4-level laser? 3. What is mode spacing?	Lecture/ Problem solving	Assignment I/Quiz-I/Mid-I
9	Mid-I				
10	Single mode Lasers, modulation of Lasers, Temperature Effects,	CO-3	1. What are the advantages of single mode laser? 2. What is the temperature effect on lasing?	Lecture/	Assignment II/Quiz-II/Mid-II
11	Reliability considerations of LED and LD. Physical principles of Photodiodes.	CO – 3	1. Define lifetime of LED? 2. What is photomultiplier?	Lecture/ Problem solving	Assignment II/Quiz-II/Mid-II
12	Detector response tme,Structure of InGaAs APD, Temperature effect on Avalanche Gain, Comparison of Photodetectors	CO – 3	1. What is response time? What is the effect of temperature on Avalanche gain?	Lecture/ Problem solving	Assignment II/Quiz-II/Mid-II
13	Fundamental receiver operation – Digital signal transmission, Quantum limit, Error sources,	CO – 4	1. What is dark current? 2. What is shot noise? 3. Define Quantum limit	Lecture/ Problem solving	Assignment II/Quiz-II/Mid-II
14	Eye diagrams, Point to Point Links – System considerations,	CO – 4	Explain any two points for point-point link 2. What is center of eye	Lecture	Assignment II/Quiz-II/Mid-II/ Open book test
15	Link Power Budget,	CO – 4	1. What is connector loss for link power	Lecture/ Problem	Assignment II/Quiz-II/Mid-II

	Rise Time Budget		budget? 2. Define system rise time	solving	
16	Measurements of Attenuation and Dispersion,	CO – 5	1. Briefly explain cutback technique 2. With neat diagram draw the setup for attenuation measurement	Lecture/ Problem solving	Assignment II/Quiz-II/Mid-II
17	Basics of WDM, DWDM,PDH, SDH	CO – 5	1. What is the wavelength spacing in WDM? 2. What are ITU-T standards for WDM 3. How many columns are there in STM-1?	Lecture	Assignment II/Quiz-II/Mid-II
18	Mid-Test 2				
19/ 20	END EXAM				

Course Coordinator

Module Coordinator