SCHEME OF COURSE WORK

Course Details:

Course Title	**: FIBER OPTIC COMMUNICATION SYSTEMS**		
Course Code	**: 13EC2103**	**L P C**	**: 4 0 3**
Program:	**: M.Tech.**		
Specialization:	**: Communication Engineering and Signal Processing**		
Semester	**: II**		
Prerequisites	**: COMMUNICATION ENGINEERING, LIGHT THEORY**		
Courses to which it is a prerequisite	**: --**		

Course Outcomes (COs):

1	. Distinguish Step Index, Graded index fibers and compute mode volume.
2	Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.
3	Classify the construction and characteristics of optical sources and detectors.
4	Discuss splicing techniques, passive optical components and explain noise in optical system.
5	Design short haul and long haul Analog/ Digital optical communication system and explain advanced optical transmission systems..

Program Outcomes (POs):

1) Able to apply the knowledge of Electronics and Communication Engineering fundamentals to solve complex problems in communications and signal processing.
2) Able to identify, formulate and analyze problems related to communications and signal processing area and substantiate the conclusions using the first principles of sciences and engineering.

3) Able to Design solutions for communications and signal processing problems and design system components and processes that meet the specified needs with appropriate consideration for public health and safety.

4) Able to perform analysis and interpretation of data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions.

5) Able to select and apply appropriate techniques from the available resources and modern tools, and will be able to predict and model complex engineering activities with an understanding of the practical limitations.

6) Able to collaborate with engineers of other disciplines and work on projects which require multi-disciplinary skills.

7) Able to demonstrate knowledge and understanding of the engineering and management principles and apply the same while managing projects in multidisciplinary environments.

8) Able to communicate fluently on complex engineering activities with the engineering community and society, and will be able to prepare reports and make presentations effectively.
9) Engage themselves in independent and life-long learning in the broadest context of technological change while continuing professional practice in the Communication technologies.

10) Transform into responsible citizens by resorting to professional ethics and norms of the engineering practice.

11) Able to carry out tasks by working independently and also in a group of members.

Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	S	S	S	S	M			M		
CO-2	S	S	S	S	S	M			M		
CO-3	S	S	S	S	S	M	M		M		
CO-4	S	S	S	S	S	M			M		
CO-5	S	S	S	S	S	M			M		

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	**UNIT – I** INTRODUCTION: Historical development, advantages of OFC, Ray theory transmission total internal reflection, acceptance angle, numerical aperture, skew rays, fiber materials-glass fibers, halide glass fibers, active glass fibers, plastic clad glass fibers, plastic fibers,	CO-1	1. Discuss the ADVANTAGES OF OFC systems. 2.Difine and Explain acceptance angle, numerical aperture, skew rays .	▫ Lecture ▫ Discussion ▫ PPT	Assignment 1 (Week 1 - 4)
2	Step Index Fiber, Graded Index Fiber, Modes in Step Index Fibers, Modes in Graded Index Fibers, Pulse Distortion and Information Rate in Optic Fibers..	CO-1	1.Derive the Performance of Step Index Fibers, 2.Modes in Graded Index Fibers	▫ Lecture ▫ Discussion ▫ PPT	Mid-Test 1 (Week 9)
3	**UNIT – II** SIGNAL DEGRADATION AND MANUFACTURING TECHNIQUES: Attenuation-absorption, scattering, radiation losses, intramodal and intermodal dispersion, polarization mode dispersion, Construction of Optic Fibers, Optic Fibers, Optic Fiber Cables	CO-2	1. Derive an expression of material dispersion in fibers 2. Explain different lossess in fibers?	▫ Lecture ▫ Discussion ▫ PPT	(Week5-6)
4	**UNIT-III:**LIGHT SOURCES AND DETECTORS: Light Emitting Diodes, Light Emitting Diodes Operating Characteristics, Laser Principles, Laser Diodes, Laser Diode Operating Characteristics, Distributed Feedback Laser Diode, Optical Amplifiers, Fiber Laser, Vertical Cavity Surface	CO-3	1.Explain the concept of Absorption, Spontaneous emission? 2.Describe Laser principle and explain double hetero junction laser with neat sketch.	▫ Lecture ▫ Discussion NPTEL	(Week-7-8)

	Emitting Laser Diodes, Principles of Photo detection, Photomultiplier, Semiconductor Photodiode, PIN Photodiode, Avalanche Photodiode.				
5	**Mid-Test 1**				(Week 9)
6	**UNIT-IV** COUPLERS, CONNECTORS AND MODULATION: Principles, Fiber end Preparation, Splices, Connectors, Source Coupling, Distribution Networks and Fiber Components, Distribution Networks, Directional Couplers, Star Couplers, Switches, Fiber Optical Isolator, Attenuator, Circulator and Polarization Controller.	CO-4	1. What is mode coupling and explain pulse Broadening in graded index fibers. 2. Describe different types of networks with their advantages and disadvantages.	▫ Lecture ▫ Discussion ▫ Problem solving ▫ NPTEL	(Week 10-11)
7	Light Emitting Diode Modulation and Circuits, Laser-Diode Modulation and Circuits, Analog-Modulation Formats, Digital-Modulation Formats, Optic Heterodyne Receivers, Thermal and Shot Noise, Signal-to-Noise Ratio, Error Rates, Modal Noise, Amplifier Noise, Laser Noise, receiver Circuit Design.	C0-4	1. Define the following terms with respect to LED. Modulation capacity Power band width product 2. Explain block diagram of digital modulation process along with its digital formats.	▫ Lecture ▫ Discussion ▫ NPTEL	Assignment 2 (Week 12 - 15)
8	**UNIT-V** SYSTEM DESIGN AND OPTICAL FIBER MEASUREMENT Analog System Design, Digital System Design, Introduction, measurement of attenuation, dispersion, refractive index profile, numerical aperture, diameter and field, principles of DWDM, introduction to Synchronous Digital Hierarchy, Optical switching.	C0-5	1. Discuss different measurement techniques of attenuation. 2. Write a short notes on WDM and DWDM.	▫ Lecture ▫ Discussion	(Week 16 - 18)
9	**Mid-Test 2**				Mid-Test 2 (Week 18)
10/10	**END EXAM**				