OPTICAL COMMUNICATION AND NETWORKS

Course code:	17TE7GCOCN		**Credits:**	04
L: P: T: S:	4:0:0:0		**CIE Marks:**	50
Exam Hours:	03		**SEE Marks:**	50

Course Objectives	
1.	To illustrate the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2.	To distinguish and demonstrate different kind of losses in optical fibers, signal distortion in optical wave guides and other signal degradation factors.
3.	To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles of WDM.
4.	To design and develop the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles of WDM.

Course Outcomes :After completion of the course, the graduates will be able to	
CO1	To apply the fundamental strategies for solving practical problems of different losses of optical fiber, optical sources, deployment problems of connectors in optical networks.
CO2	To solve practical problems prevalent in computer communication and optical networks having appraised Optical protocols, standards & amplifiers.
CO3	To categorize more bandwidth intensive communication applications in order to meet these growing demands for efficient, cost-effective, reliable, high service level, worldwide communication.
CO4	To categorize the basic applications of optical amplifiers like Erbium Doped Fiber Amplifier (EDFA) to look into the widely used networks like SONET/SDH.
CO5	To describe the Wavelength Division Multiplexing (WDM) principles and concepts and apply the principles to advanced devices like MachZehnder Interferometers.
CO6	To design and reconstruct the optical receiver and its various effects introducing noise in the system and evaluate the performance of digital receiver by calculating the probability of error.

Mapping of Course outcomes to Program outcomes															
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS0	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1		3
CO1	3	2	2	2						1	2		2		2
CO2	3	3	2	2						1	1		2		2
CO3	3	3	2	2						1	1		2	1	2
CO4	3	3	2	2						1	1		1	1	1
CO5	3	2	1	1	1					1	1		1	1	1
CO6	3	1	1	1	1					1	1		1	1	1

Course Content			
Module	**Contents**	**Hours**	**CO's**
1.	**MODULE-1:** **OVERVIEW OF OPTICAL FIBER COMMUNICATION:** Introduction, advantages, optical fiber waveguides, Ray theory transmission, cylindrical fiber, single mode fiber, cutoff wave length, mode field diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables. **TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS:** Introduction, **A**ttenuation, absorption, scattering losses, Fiber bend loss, dispersion, Intra model dispersion, Inter model dispersion.	10	C01
2.	**OPTICAL SOURCES:** LASER diodes. Optical Detectors: Photo detectors, Photo-detector noise, detector Response time, Avalanche multiplication noise, comparison of Photo detectors, Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, Coherent detection. FIBER COUPLERS AND CONNECTORS: Introduction, single mode fiber joints, fiber splices.	10	C02
3.	**ANALOG AND DIGITAL LINKS: Analog links –** Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters. **Digital links –** Introduction, point–to–point links, System considerations, link power budget, rise time budget, short wave length band.	10	C03,C04
4.	**WDM CONCEPTS AND COMPONENTS:** WDM concepts, overview of WDM operation principles, WDM standards. Optical components: Couplers, Isolators and circulators, Multiplexers and filters: Gratings, fiber Gratings, Fabry Perot filters, Mach-Zehnder Interferometers, Arrayed Waveguide Grating, Acousto-optic tunable filters.	10	C05
5.	Optical Amplifiers and Networks – optical amplifiers, semiconductor optical amplifiers, EDFA. **OPTICAL NETWORKS:** Introduction, SONET / SDH, Optical	10	C05, CO6

	Interfaces, SONET/SDH rings. WDM Network elements: Optical line terminals, Optical line amplifiers, Optical add/drop Multiplexers, OADM architectures.		

Self-Study Component	
Module-1	Historical development, general system, disadvantages, and applications of optical fiber communication.
Module-2	LED'S AND fiber alignment and joint loss.
Module-3	Radio over fiber links, microwave photonics, transmission distance for single mode fibers, Power penalties.
Module-4	Optical transmitters, optical switches
Module-5	Basic applications and types of optical Amplifiers, High speed light waveguides.
Note :No questions from illustrative examples and from Self-study component	

Text Books	
1.	**"Optical Fiber Communication"**, Gerd Keiser, *4th Edition, 5th edition, Tata McGraw Hill Publishing company limited 2008.*
2.	**"Optical Fiber Communications Principles and Practice"**, John M. Senior, *Pearson Education Prentice Hall, 3rd edition, 2009.*
References	
1.	**"Optical Networks"**- Rajiv Ramaswami, Kumar N Sivarajan, 2nd edition, Morgan Kaufmann Publishers, 2008.
2.	**"Optical fiber communication and its applications",** S.C Gupta**,** *PHI Learning private limited, 2nd edition, 2012.*

Assessment Pattern :				
CIE : Continuous Internal Evaluation Theory (50 Marks)				
Bloom's Category	**Tests**	**Assignments**	**AAT1**	**AAT2**
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember				
Understand	5	2	1	1
Apply	10	2	1	1
Analyze	5	2	1	1
Evaluate	10	2	1	1
Create		2	1	1
***AAT: Alternate Assessment Tool**				

SEE –Semester End Examination Theory (50 Marks)	
Bloom's Category	**Marks Theory (50)**
Remember	5
Understand	5
Apply	10
Analyze	10
Evaluate	10
Create	10