Optical Communications

Course Code	23EC4601B	Year	III	Semester	II
Course Category	PE-I	Branch	ECE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Engineering Physics, Communication Theory
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
CO1	Illustrate the basic components of Fiber Optic Communication system and its applications	L2
CO2	Analyze the effects of different types of materials and dispersion losses in optical fibers	L4
CO3	Interpret different types of Couplers and Connectors.	L3
CO4	Analyze different types of Sources and Detectors in fiber communication link	L4
CO5	Analyze different types of Noise in optic system & System Design	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (3:High, 2:Medium, 1:Low)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2									2	1	2	
CO2	3	2								2	1	2	
CO3	2									2	1	2	
CO4	3	3								3	1	3	
CO5	3	2								2	1	2	
Avg	3	2								2	1	2	

Syllabus		
Unit No.	Contents	Mapped CO
1	**Overview of optical fiber communication –** History, The Block Diagram, advantages and applications of optical fiber communications. **Optical Fiber Waveguides**- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Step Index fibers, Graded Index fibers, Effective Refractive Index, & Related problems.	CO1
2	**Fiber Materials**: - Glass, Halide, Active glass, Plastic-clad glass fibers and plastic fibers. **Signal distortion & losses in Optical Fibers**- Attenuation, Pulse broadening, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Intermodal	CO2

	dispersion	
3	**Couplers and Connectors:** Principles, Fiber end Preparation, Splices, Connectors, Source Coupling, Distribution Networks, Directional Couplers, Star Couplers, Fiber Optical Isolator, Wavelength- Division Multiplexing.	CO3
4	**Light Sources and Detectors:** Light-Emitting Diodes-Surface Emitting LEDs, Edge Emitting LEDs, Operating Characteristics, Laser Principles, Laser Diodes, Laser-Diode Operating Characteristics, Optical Amplifiers, Principles of Photo detection, Photomultiplier, PIN Photodiode, Avalanche Photodiode	CO4
5	**Optical Receiver, Noise in optic systems & System Design:** Optic Heterodyne Receivers, Thermal and Shot Noise, Signal-to-Noise Ratio, Modal Noise, Amplifier Noise, Laser Noise**.:** Analog System Design, Digital System Design.	CO5

Learning Resources
Text Books
1. Gerd Keiser Optical Fiber Communication, McGraw Hill. 3rd Ed. , 2003 2. J.M.Senior, Optical Fiber Communication: Principles and Practice, Pearson Ed., 2nd Ed., 2006
Reference Books
1. Joseph. C. Palais, Fiber Optic Communications, Pearson Education, Asia, 2002. 2. S. C. Gupta, Text Book on Optical Fiber Communication and its Applications, PHI, 2005 3. D. K. Mynbaev, Gupta, Scheiner, Fiber Optic Communications, Pearson Education, 2005
e- Resources & other digital material
1. http://www.ocw.titech.ac.jp/index.php?module=General&action=T0300&JWC=201806903&lang=EN 2. https://www.ll.mit.edu/r-d/communication-systems/optical-communications- technology