OPTICAL COMMUNICATION SYSTEMS

(Elective Subject)

Course Code:	11B1WEC834	**Semester:**	8th Semester, B. Tech (ECE)
Credits:	3	**Contact Hours:**	L-3, T-0, P-0

Course Objectives

The objectives are to study

1. To introduce the concept of optical fiber communication system.
2. To make the students to know the constituents of the fiber optics communication system and optoelectronics.
3. To know the applications of fiber optics systems.

Course Outcomes

After studying this course the students would gain enough knowledge

1. Understand basics of optical communication systems.
2. The principles that govern optical communication systems.
3. Behavior of light as electromagnetic waves in different types of fibers.
4. The hardware components required to implement optical communication systems.
5. To efficiently design an optical communication system for practical purpose.
6. The practical techniques involved in optical communication systems.

Course Contents

Unit	**Topics**	**References (chapter number, page no. etc)**	**Lectures**
1.	Introduction to Fiber optics and Optoelectronics, Historical developments, Fiber optic communication system, Advantages, Emergence as a key technology, Role of Fiber optics technology.	Text Book 1, Chapter 1, Pages 1-16; Text Book 2, Chapter 1, Pages 1-11	3
2.	Ray Propagation in Optical Fibers - Introduction, review of fundamental laws of optics, Ray propagation in Step-index and Graded-index Fibers, Effect of material dispersion, The combined effect of multipath and material dispersion, Calculation of rms pulse width.	Text Book 1, Chapter 2, Pages 17-35 Text Book 2, Chapter 1, Pages 1-11	6
3	Wave propagation in Planar Waveguides- Introduction, Maxwell's equations, Solution in a inhomogeneous medium, Planar optical waveguide, TE modes of a symmetric step-index planar waveguide, Power distribution and	Text Book 1, Chapter 3, Pages 37-57;	5

	confinement factor.		
4	Wave propagation in Cylindrical Waveguides- Introduction, Modal analysis of an ideal SI optical fiber, fractional modal power distribution, Graded-index fibers, Limitations of multimode fibers.	Text Book 2, Chapter 4, Pages 1-61-80	4
5	Single-mode Fibers- Introduction, Single-mode fibers, Characteristics parameters of SMFs, Dispersion in SMFs, Attenuation in SMFs.	Text Book 1, Chapter 5, Pages 83-105;	4
6	Optoelectronic Sources - Introduction, Fundamental aspects of semiconductor physics, the p-n junction, Current densities and injection efficiency, Injection luminescence and the LED, the heterojunction, LED designs, Modulation response of an LED, Injection laser diodes, Source-fiber coupling	Text Book 1, Chapter 7, Pages 147-199; Text Book 2, Chapter 15	3
7	Optoelectronic Detectors - Introduction, The basic principle of optoelectronic detection. Types of photodiodes, Photoconducting detectors, Noise considerations.	Text Book 1, Chapter 8, Pages 200-218	5
8	Optoelectronic Modulators - Introduction, Review of basic principles, Electro-optic modulators, Accousto-optic modulators, Application areas of optoelectronic modulators	Text Book 1, Chapter 9, Pages 219-246;	4
9	Optical Amplifiers - Introduction, Semiconductor optical amplifiers, Erbium-doped fiber amplifiers, Fiber Raman amplifiers, Application areas of optical amplifiers	Pages 247-272; Text Book 2, Chapter, Pages	5
10	Wavelength-division Multiplexing - Introduction, The concepts of WDM and DWDM, Passive components, Active components.	Text Book 1, Chapter 11, Pages 248-23;	3
		Total Number of Lectures	42

Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks

- 10 Marks : Class performance, Tutorials & Assignments
- 10 Marks : Quizzes
- 5 marks : Attendance

Text Books

1. Fiber Optics and Optoelectronics, R.P. Khare Oxford University Press.
2. Fiber Optic Communication Systems, G. P. Agarwal, Third Edition, Wiley.

Reference Books

1. Optical Communication- principles and practice, John M Senior, Third edition, Pearson India.