

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	PHD401	OPTICAL FIBER COMMUNICATION	3	0	0	9

Course Objective

Soon optical fiber communication is going to replace microwave communication and hence this subject is of great importance for engineering and science graduates. Course for this subject is prepared in a way that it could provide all the basic information that is needed to establish end to end communication with optical fibers.

Learning Outcomes

After completing the course, students will learn

- Importance of optical communication over any other communication systems
- Basics of light guiding in an optical waveguide, wave guide structures and their properties.
- Introduction to various devices used in optical fiber communication such as light sources, detectors, optical amplifiers, multiplexers etc.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction: Light waves in a homogeneous medium, wave propagation in planar waveguide, cylindrical fiber, single and multimode waveguides, concept of TE and TM modes,	7	In this section students will learn basics of light propagation in various waveguide structures, modes formation and their consequences. to optics in isotropic and anisotropic materials.
2	Step-index fibers, numerical aperture, dispersion in single mode fibers, bit-rate, electrical and optical bandwidth, graded-index fibers, attenuation in optical fibers, decibels.	7	The students will also learn fundamentals of birefringence and optical anisotropy.
3	Optical fibers cables and components: Fiber fabrication methods, fiber-optic cables, optical fiber connections and losses, fiber splices, fiber connectors, optical amplifiers-semiconductor and erbium-doped fiber amplifiers.	8	In this section students will learn about fiber fabrication methods, optical losses and amplifiers.
4	Optical sources: Principles and characteristics of light emitting diodes (LED), heterojunction LEDs, internal and external quantum efficiency, LEDs for optical fiber communications, principle and characteristics of laser diode, heterostructure laser diodes, DBF laser, quantum-well laser.	7	This section devotes to various advanced light sources used in fiber communication, their working principles and characteristics. Students will learn it.
5	Optical detectors: Principle of p-n photodiode, quantum efficiency and responsivity, p-i-n photodiode, Avalanche photodiode, heterojunction photodiode, mid-infrared and far-infrared photodiodes.	7	In this section students will learn basics of the optical detectors and their specific uses in fiber communication.
6	Fiber Optic Communication: Fiber couplers, multiplexing strategies- optical TDM, FDM and WDM, hybrid multiplexing, coherent optical detection and communication and techniques.	6	This section introduces various devices/methods used to establish a good fiber communication. Students will learn about fiber couplers and multiplexing strategies.
Total		42	

Textbooks:

1. An Introduction to Fiber Optics; Ajoy Ghatak, K. Thyagarajan; Cambridge University Press; 1998.
2. Fiber optics and optoelectronics, R.P. Khare, Oxford University Press; 2013.
3. Optoelectronics and Photonics: Principles and Practices, S.O. Kasap, Prentice-Hall; 2001.

Reference Books:

1. Optical Fiber Communications Principles and Practice, 3rd Edition, John M. Senior, Prentice Hall; 2009.
2. Integrated optoelectronics: Waveguide optics, Photonics, Semiconductors, Karl J. Ebeling, Springer; 2011
3. Optics, Eugene Hecht, Addison-Wesley; 2001. Optical waves in layered media, Pochi Yeh, Wiley, 2005.
4. Principles of Optics, Max Born & Emil Wolf, Cambridge University Press, 1999.
5. Physics of Optoelectronic Devices, Chuang, S. L., Wiley-Interscience, 1995.