

**EC-408****OPTICAL COMMUNICATIONS****L T P C****4 - - 3****COURSE OBJECTIVES:**

1. To provide an overview of optical technologies.
2. To understanding of the design, implementation, operation and maintenance issues associated with optical network solutions.
3. To gain the knowledge on existing and future optical network technologies.
4. To acquire knowledge on Complex problems related with optical fiber links design.

**COURSE OUTCOMES:****After successful completion of the course, the students are able to**

1. to understand about theory of light, losses in fibers, fiber optic components, optical sources & detectors, optical transmitter & receiver configuration and optical networks.
2. describe the principle of optical Sources, detectors and optical amplifier.
3. discuss WDM and the optical networks like SONET/SDH.
4. analyze the characteristics of fiber optical receiver, computing probability of error and dispersions.
5. design a fiber optic link based on budgets and to assess the different losses in fibers.

**UNIT I***Text Book - 1,2 (10)*

**INTRODUCTION** : Historical development, Elements of an Optical Fiber transmission link, Advantages of Optical Fibers, Applications of Optical Fiber, Ray Theory Transmission, Total internal reflection, Acceptance angle, Critical angle, Numerical Aperture.

**FIBER TYPES** : Step Index, Graded Index, Modes of Propagation, single mode and multimode fibers, Fiber materials.

**UNIT II***Text Book - 1,2 (10)*

**TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS** : Attenuation, absorption, scattering and bending losses in fibers, Intermodal and intramodal Dispersions.

**FIBER OPTIC COMPONENTS** : Splicing, Connectors, Connection losses, Fiber Optic couplers, Fiber Optic Switches.

**UNIT III***Text Book - 1,2 (15)*

**OPTICAL SOURCES & DETECTORS:** General characteristics, Principles of Light Emission. Light Emitting Diodes types- Planar, Dome, Surface emitting, Edge emitting Super luminescent LED's, Lens coupling to fiber, LED Characteristics - Optical output power & efficiency, output spectrum, modulation bandwidth, reliability.

**LASER** : Working of DH injection laser, DFB laser and Threshold condition for lasing, Principles of photo detection. PIN Photodiode, Avalanche Photodiode and their characteristics.

**UNIT IV***Text Book - 1 (10)*

**OPTICAL FIBER SYSTEMS** : Optical Transmitter Circuits - source limitations, LED drive circuits. Optical Receiver operation-Digital system transmission, error sources, receiver configuration, Preamplifier types, Digital receiver performance-probability of error, Quantum limit.

**SYSTEM CONSIDERATIONS** : Link power budget, rise time budget, direct intensity modulation, Advanced Multiplexing Strategies - OTDM, WDM.

**UNIT V***Text Book - 1 (10)*

**OPTICAL Measurements** : Attenuation, (cut-back,OTDR), DISPERSION (EYE PATTERN , TIME DOMAIN) ,REFRACTIVE INDEX.

**OPTICAL AMPLIFIERS AND NETWORK** : Optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA Optical network: Introduction, SONET/SDH. optical interfaces, SONET/SDH rings.

**LEARNING RESOURCES:**

**TEXT BOOK(s):**

1. John M Senior - Optical Fiber Communications: Principles and Practice, 2nd Edition, PHI, 2002.
2. JC Palais - Fiber Optic Communications, 2nd Edition, PHI, 2001

**REFERENCE BOOK(s):**

Gerd Keiser, Optical Fiber Communications, 4th Edition, McGraw-Hill, 2007

**WEB RESOURCES:**

1. <http://nptel.iitm.ac.in/courses/>
2. [www.photonics.cusat.edu/links\\_optical\\_communications.html](http://www.photonics.cusat.edu/links_optical_communications.html)
3. [groups.csail.mit.edu/Miller.On-Chip-Optical-Communications.ppt](http://groups.csail.mit.edu/Miller.On-Chip-Optical-Communications.ppt)