

## EC 403 OPTICAL FIBER COMMUNICATION

L T P C  
3-0-1-4

**Objective:** This course introduces optical principles and optical fibres which are a fundamental component of networks.

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**Introduction:** Need of Fiber Optic Communications, Evolution of Light wave Systems, Optical Communication Systems, Light wave System Components; Optical Fibers as a Communication Channel, Optical Transmitters, Optical Receivers.

**Optical Fibers:** Geometrical-Optics Description; Step-Index Fibers, Graded Index Fibers, Wave Propagation; Maxwell's Equations, Fiber Modes, Single-Mode-Fibers, Dispersion in Single-Mode Fibers; Group Velocity Dispersion, Material Dispersion, Wave guide Dispersion, Higher-order Dispersion, Polarization-Mode Dispersion, Dispersion-Induced Limitations; Basic Propagation Equation, Chirped Gaussian Pulses, Limitations on the Bit Rate, Fiber Bandwidth, Fiber Losses; Attenuation Coefficient, Material Absorption, Rayleigh Scattering, wave guide Imperfections, Nonlinear Optical effects; Stimulated Light Scattering, Nonlinear Phase Modulation, Four Wave Mixing, Fiber Manufacturing; Design Issues, Fabrication Methods, Cables and Connectors

**Optical Transmitters:** Basic Concepts; Emission and Absorption Rates, p-n Junctions, Non radiative Recombination, Semi conductor Materials, Light Emitting Diodes; Power-current Characteristics, LED spectrum, Modulation Response, LED Structures, Semi Conductor Lasers; DFB Lasers, Coupled Cavity semiconductor Lasers, Tunable Semiconductor Lasers, Vertical Cavity Semiconductor Lasers, Laser Characteristics, Small & Large Signal Modulation, Spectral Line width, Source Fiber Coupling.

**Optical Receivers:** Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, MSM Photo detector, Receiver Design, Receiver Noise; Noise mechanism, Receiver sensitivity; Bit error rate, Minimum Receiver Power, Sensitivity Degradation, Receiver Performance.

**Light Wave Systems:** System Architecture, Loss limited Light wave systems, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Sources of Power Penalty; Model Noise, Dispersive Pulse Broadening, Mode Partition Noise, Frequency Chirping, Reflection Feedback Noise.

**Multi channel Systems:** WDM Light wave systems, Optical TDM Systems, Subscriber Multiplexing, Code Division Multiplexing.

### Text Books:

1. Govind P. Agrawal, Fiber Optics Communication Systems John Wiley & Sons (Asia )Pvt. Ltd.
2. Senior J. Optical Fiber Communications, Principles & Practice, PHI.
3. Keiser G., Optical Fiber Communication Mc Graw-Hill.

## EC 404 MOBILE COMMUNICATION

L T P C  
3-0-1-4

**Objective:** The demand and importance of mobile communication is fast expanding. This course introduces the basic architecture for mobile and cellular devices starting from 1G through 3G.

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**Trends of Mobile Wireless:** Evolution of mobile radio communication, first generation system, second generation system, 3G systems, 4G systems, Wireless data networks, analog & digital cellular systems, planning a cellular system.

**Introduction to Cellular Systems:** Basic cellular systems, performance criteria, Uniqueness of mobile radio environment, operation of cellular systems, concepts of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, Handoff mechanism, cell splitting, Narrow beam concept, channel assignment schemes, consideration of the components of cellular systems.

**Mobile Radio Transmission Environment:** Cell coverage, obtaining the mobile point to point model (LEE Model), propagation over water or flat open area, foliage loss, propagation in near-in distance, long distance propagation, path loss from a point to point prediction model, cell site antenna heights and signal coverage cells, propagation prediction in and through buildings, mobile-to-mobile propagation, antennas at cell site, co-channel interference, real time co-channel interference, co channel measurement -design of directional antenna system, antenna parameter and their effects, diversity receiver, adjacent channel interference, near-end-far-end interference, cross talk, effects on coverage and interference.

**Multiple Access Techniques for Wireless Communication:** Frequency division multiple access (FDMA), Time division Multiple access (TDMA), Spread spectrum multiple access-Pseudo Noise (PN) sequence, Direct sequence spread spectrum (DSSS), frequency hopped spread spectrum (FHSS).

**Digital Cellular Systems & Standards:** Global system for mobile (GSM)- standardization and service aspects, GSM radio subsystem, GSM channel types, Frame structure of GSM, typical call flow sequence, Introduction to IS-95, service aspects, network reference model & service aspects, radio aspects and tone key features of IS-95 CDMA systems, Introduction to IMT-2000, service aspects, network reference model & service aspects, radio aspects and tone key features of IMT-2000 CDMA systems, Introduction to UTP, Concept of UTP, Service aspects.

### Text Books:

1. Mobile cellular Telecommunication Analog and digital system (second edition) by William C.Y.Lee MC Graw-Hill.
2. Mobile and personal Communication system and services by Rajpandya, IEEE press (PHI).
3. Wireless digital communications by Dr. Kamilo Feher PHI.

### References Books:

1. Wireless Communications & Networks by William Stallings.
2. Wireless communications, principles and practices by Theodore s. Rappaport, Pearson Education.