

Advance Communication System  
EC802

**Credit: 4**

### **Part – I : Optical Communications**

1. Introduction to Optical Communication Systems
2. Optical Fibers
  - a. Fiber Structures and Types, Rays and Modes
  - b. Single-mode and Multimode Fibers, Refractive Index Profiles, Graded Index Fiber
  - c. Numerical Aperture, Acceptance Angle, V-Parameter
  - d. Loss mechanisms in Fibers, Loss vs. Wavelength Plot and Its Significance
  - e. Dispersion Mechanisms in Fibers: Intermodal and Intramodal (Chromatic) Dispersions, Components of Intramodal Dispersions, Dispersion vs. Wavelength Plots and Their Significance
3. Optical Sources
  - a. Desired Features of Optical Sources for Optical Communication and Material Choices
  - b. LED Structure and Operating Principle
  - c. LED Modulation Characteristics: Output Power vs. Driving Current, Speed and Bandwidth
  - d. LED Driver Circuits for Optical Transmitters
  - e. LASER Structure and Operating Principle
  - f. LASER Modulation Characteristics: Output Power vs. Driving Current, Threshold Current and Its Temperature Sensitivity, Speed and Bandwidth
  - g. LASER Driver Circuits for Optical Transmitters
4. Photodetectors
  - a. Desired Features of Photodetectors
  - b. PIN Diode as Photodetector: Structure, Operating Principle, Shot Noise
  - c. Avalanche Photodiode (APD) as Photodetector: Structure, Operating Principle, Shot Noise, Avalanche Multiplication (Excess) Noise
5. Digital Optical Communication Systems:
  - a. System Block Diagram
  - b. Optical Receiver Operation: Receiver Block Diagram, Sources of Noise, Preamplifier Configurations, Transimpedance Amplifier as Preamplifier
  - c. Bit-Error Rate (BER) Evaluation, Receiver Sensitivity
  - d. System Power Budget
  - e. System Rise-Time Budget

### **Part – II : Wireless Networks**

1. Introduction to mobile wireless communication
2. Cellular Mobile Wireless Networks: Systems and Design Fundamentals, Propagation Models:
  - a. Description of cellular system
  - b. Frequency Reuse, Co-channel and Adjacent channel interferences
  - c. Propagation Models for Wireless Networks
  - d. Multipath Effects in Mobile Communication, Models for Multipath Reception
  - e. Mobile antenna system
3. Modern Mobile Wireless Communication Systems:
  - a. 2G network Global System for Mobile Communication (GSM)
  - b. Architecture and Protocols Air Interface
  - c. GSM Multiple Access Scheme, GSM Channel Organization
  - d. Traffic Channel Multi-frame, Control (Signaling) Channel Multi-frame, Frames, Multi-frames, Super-Frames and Hyper-Frames
  - e. GSM Call Set up Procedure, GSM Protocols and Signaling

- f. Location Update Procedure, Routing of a call to a Mobile Subscriber
- g. The concept of packet data services - 2.5G GPRS networks:
- h. The 2.5 G General Packet Radio Services, GPRS Networks Architecture, GPRS Interfaces and Reference Points, GPRS Logical Channel, GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures
- i. Session Management and PDP Context, Data Transfer Through GPRS Network and Rout
- j. GPRS Location Management Procedures, GPRS Roaming, the IP Internetworking Model, GPRS Interfaces and Related Protocols, GPRS Applications

4. Overview of CDMA systems: IS-95 Networks and The Universal Mobile Telecommunication System (UMTS) (3G) architecture:

- a. CDMA based IS-95 Systems, forward link and reverse link for IS-95, handoff process in CDMA based IS-95 network.
- b. UMTS Network Architecture –Release 99, UMTS Interfaces

### **Part – III : Satellite Communication**

- 1. Basics of Satellite Communication:
  - a. Satellite frequency bands
  - b. Basic Satellite system
  - c. Orbital period and velocity
  - d. Placement of Satellite in Geo-stationery orbit
  
- 2. Antenna and Conversion:
  - a. Paraboloid and Cassegrain antennas
  - b. Up & Down conversions
  - c. Conversion Process
  - d. Transponder and Polarization Hopping
  - e. Basic Satellite Link

### **Part – IV : Software Defined Radio**

- 1. Fundamentals of Software Defined Radio:
  - a. Baseband Technology
  - b. Emergence of Software Defined Radio
  - c. Evolution of Software Defined Radio
  - d. Baseband requirements