

**DATA COMMUNICATIONS
(OPEN ELECTIVE – I)**

Course Objectives:

- To introduce the Fundamentals of data communications.
- To learn various types of Transmission media.
- To learn various Modulation techniques and Multiplexing.
- To understand the concept of error detection and correction.
- To introduce Spread Spectrum, Multiple Access techniques and 4G.

Unit-1: Introduction to Data Communications and networking

Components of communication, Transmitter, Receiver, Medium, Message, Bandwidth, Modes of communication – simplex, half duplex, full duplex, type of connections, topology – Categories – LAN, WAN, MAN, Protocols, Standards, Standard Organizations, layered approach, ISO OSI model, functions of layers.

Unit-2: Transmission Media

Metallic Cable Transmission Media: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves.

Optical Fiber Transmission Media: Advantages of Optical Fiber cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

Unit-3: Signals, Modulation Techniques and Multiplexing

Analog signals and digital signals, time and frequency domains, analog modulation techniques – AM, FM, PM, analog to digital conversion – PCM, DM, Information Capacity, Bits, Bit Rate, Baud, digital modulation techniques- ASK, FSK, PSK.

Multiplexing: Frequency Division Multiplexing, Wavelength Division Multiplexing, Time Division Multiplexing.

Unit-4: Error Detection and Correction, Data Communications Equipment

Error detection and correction – terms – types of errors, redundancy, detection versus correction, Error Detection-Repetition codes, Parity bits, Checksums, CRC, Error Correction-cyclic codes.

Data Communications Equipment: Digital Service Unit and Channel Service Unit, Voice-Band Data Communication Modems, Bell Systems-Compatible Voice- Band Modems, Voice- Band Modem Block Diagram, Voice- Band Modem Classifications, Asynchronous Voice-Band Modems, Synchronous Voice-Band Modems, Modem Synchronization, 56K Modems, Modem Control: The AT Command Set, Cable Modems.

Unit-5: Wireless Communication

Spread Spectrum: Direct Sequence Spread Spectrum, Frequency Hopping Spread Spectrum.

Multiple Access techniques: ALOHA, CSMA, CSMA/CD, FDMA, TDMA and CDMA.

Introduction to 4G and VoLTE, features of 4G and VoLTE, Next Generation mobile communication.

Course Outcomes:

A student who successfully fulfils this course requirement will be able to:

S. No	Course Outcome	BTL
1.	Know the Categories and fundamentals of various Data communication modes.	L2
2.	Familiar with different types of Transmission media.	L2
3.	Understand various modulation techniques and significance of Multiplexing.	L2
4.	Understand the concept of Error Correction and familiarize with Data Communications equipment.	L2
5.	Explain various communication methods like Spread spectrum, Multiple Access, 4G and VoLTE.	L3

Correlation of Cos with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	1	1	-	-	-	-	-	-	-	-	-	2	-
CO 2	2	1	1	-	-	-	-	-	-	-	-	-	2	-
CO 3	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO 4	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO 5	2	2	2	-	-	-	-	-	-	-	-	-	2	-

Text Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, 1e, Pearson Education.
2. Data Communications and Networking Behrouz A. Forouzan 4th Edition McGraw Hill Education.
3. Data Communication & Networks - William Stalling- Prentice Hall-Tenth Edition.

Reference Books:

1. Data communication and Networks - Bhusan Trivedi, Oxford University press, 2016.
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education.
3. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
4. Data Communications, Computer Networks and Open Systems –Fred Halsall, Addison-Wesley, 1996.