NIRMA UNIVERSITY

Institute:	Institute of Technology, School of Technology
Name of Programme:	BTech CSE, Integrated BTech (CSE)-MBA
Course Code:	2CS202CC23
Course Title:	Data Communication
Course Type:	Core
Year of Introduction:	2023-24

L	T	Practical Component				C
		LPW	PW	W	S	
2	0	2	-	-	-	3

Course Learning Outcomes (CLO):

At the end of the course, the students will be able to –

1. explain data/signal transmission over communication media (BL2)
2. apply concepts of data communication to solve various problems (BL3)
3. analyse various spread spectrums and multiplexing (BL4)
4. appraise the mechanisms of modulation techniques. (BL4)

Unit	Contents	Teaching Hours (Total 30)
Unit-I	**Introduction to Data Communication**: components of the network, its types and topology, protocol. Network models: OSI reference model, TCP/IP protocol suite, Applications of data communications Data Communications and Networking for Today's Enterprise	07
Unit-II	**Data and Signal:** types of Analog and digital signals and their characteristics, transmission of digital signal, data rate limits, signals in time and frequency domain, transmission impairment, performance measurement of network	05
Unit-III	**Digital Transmission**: digital to digital and Analog to digital conversion, transmission modes **Analog transmission:** Digital to analog and analog to analog conversion and Modulations	06
Unit-IV	**Transmission Media**: guided media and unguided media: radio frequency allocation, frequency reuse, propagation of radio waves, microwaves and infrared, satellite communication, cellular telephony. **Multiplexing and Spread Spreading Techniques**: Switching techniques, types of switching, structure of switch, types of switches. Telephone and cable network for data communication, dial-up modem, DSL lines, Cable TV	07
Unit-V	**Types of Errors:** detection versus correction, coding, block coding, cyclic codes, checksum, forward error correction.	05

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Suggested Readings/ References:

1. Behrouz Forouzan, Introduction to Data Communication and Networking, McGraw Hill
2. William Stallings, Data and Computer Communication, Prentice Hall
3. Schweber W.L, Data Communication, McGraw Hill
4. Andrew S Tanenbaum, Computer Networks, Prentice Hall
5. B.P. Lathi, Zhi Ding, Modern Digital and Analog Communication, Oxford University Press.

Suggested List of Experiments:

S. No.	Name of Experiments/Exercises	Hours
1	Understanding the basic computer network terminology and identification of various network-related components: Connectors: RJ32, RS232, BNC, RJ-45, I/O Devices Cables: Coaxial, twisted pair, UTP, NIC (network interface card) Inter-Connecting Devices: Switch, Hub	02
2	Simulation of different network topologies and comparative study of each. (Using CISCO Packet Tracer)	02
3	Hands-on practice of signals and their properties in MATLAB/Scilab: Amplitude, Phase, and Frequency of Pure and Composite signals	02
4	Implementation and Analysis of Line Coding Schemes: Implement unipolar NRZ-L, NRZ-I, and polar Manchester, Differential Manchester, and AMI/Pseudo-ternary. Compare the schemes for parameter synchronization, DC component, and bandwidth	04
5	Create Peer-to-peer networks using RS232 & RJ45 cross cable & create switch-based networks using RJ45 straight cable. Assign different groups to the different users and allocate different resources to each group	02
6	Implementation of analog modulation techniques (using MATLAB/Scilab): A. Implement amplitude, frequency, and phase modulation. B. Identify the difference between them by comparing the results in terms of bandwidth	04
7	Implementation of Pulse Code Modulation: Sampling, Quantisation, and Digitisation of various types of waveforms	04
8	Implementation of Synchronous Time Division Multiplexing technique	02
9	Implementation of Cyclic Redundancy Check (CRC) Error Detection Algorithm for Noisy channel	04
10	Implementation of Hamming Code.	04