

DATA COMMUNICATION [CT] - SYLLABUS

DATA COMMUNICATION [CT] - SYLLABUS

Lecture : 3

Year : III

Tutorial : 1 Part : I

Practical : 3/2

Course Objective:

The objective of the course is to familiarize student with the concept of data communication, communication signals and their characteristics, transmission media and their characteristics, basics of multiplexing and switching.

1. Introduction [4 hours]

1.1. Data and Signal

1.2. Analog and Digital Signal

1.3. Data Representation

1.4. Analog and Digital Data Communication System

1.5. Transmission Impairments (Attenuation, Noise, Distortion)

2. Signals and Systems [4 hours]

2.1. Signal and Classification of Signals: Periodic and Non-periodic Signals, Deterministic and Random Signals, Energy and Power Signals, Continuous Time and Discrete Time Signals

2.2. System and Basic Properties of Systems: System with and without memory, Linearity, Time Invariance, Invertibility, Casuality, Stability

3. Signal Analysis [6 hours]

3.1. Unit Impulse Function and Unit Step Function

3.2. LTI System and Impulse Response

3.3. Fourier Series Representation of Continuous Time Signal

3.4. Fourier Transform of Continuous Time Signal

3.5. Spectral Analysis of a Signal, Signal Bandwidth

4. Transmission Media [4 hours]

4.1. Electromagnetic Spectrum for Communication and Type of Propagation

4.2. Guided Transmission Media: Copper Media (Twisted pair and Co-axial) and Fiber Optics

4.3. Unguided Communication Bands and Antennas

4.4. Unguided Transmission Media: Terrestrial Microwaves, Satellite Communication and Cellular System

4.5. Data Rate Limits: Nyquist Bit Rate for Noiseless Channel, Shannon Capacity for Noisy Channel

4.6. Performance of Channel: Bandwidth, Throughput, Latency, Jitter, Bit Error Rate (BER)

5. Data Encoding and Modulation [10 hours]

5.1. Baseband Communication (Analog/Digital)

5.2. Data Encoding and Modulation

5.3. Types of Analog Modulation: Amplitude Modulation, Frequency Modulation and Phase Modulation

5.4. Pulse Modulation System: Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM)

5.5. Encoding Analog Data as Digital Signal: Pulse Code Modulation (PCM)

5.6. Encoding Digital Data as Digital Signals

5.7. Line Coding Schemes: NRZ, RZ, Manchester, AMI

5.8. Block Coding, Scrambling

5.9. Digital Modulation: Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Quadrature Amplitude Modulation (QAM)

6. Multiplexing and Spreading [6 hours]

6.1. Multiplexing and Application

6.2. Frequency Division Multiplexing (FDM), Wavelength-Division Multiplexing (WDM)

6.3. Time Division Multiplexing (TDM)

6.4. Spread Spectrum

6.5. Code-Division Multiple Access (CDMA)

7. Switching [3 hours]

7.1. Switching and Application

7.2. Circuit Switching and Packet Switching

7.3. Datagram Switching and Virtual Circuit Switching

7.4. X.25, Frame Relay, ATM

8. Information Theory and Coding [8 hours]

8.1. Introduction to Information Theory, Average Information

8.2. Source Coding – Huffman Coding

8.3. Error Detection and Correction Codes

8.4. Hamming Distance

8.5. Linear Block Coding

8.6. Cyclic Codes, CRC

8.7. Convolution Codes

Practical:

1. Signal analysis using MATLAB

2. Bandwidth analysis of different signals using spectrum analyzer

3. Analog Modulation Generation and Reconstruction

4. Pulse Modulation Generation and Reconstruction

5. Conversion of given binary sequence into different line coding

6. Digital Modulation (ASK, FSK, PSK) Generation and Reconstruction

References:

1. Data and Computer Communications, Eight Edition, William Stallings

2. Data Communications and Networking, Fourth Edition, Behrouz A Forouzan

3. Signals and Systems, A. V. Oppenheim, Latest Edition

4. Computer Networks, A. S. Tanenbaum, Latest Edition

Evaluation Scheme:

The question will cover all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below:

Unit	Hour	Marks Distribution
1	4	8
2	4	8
3	6	10
4	4	8
5	10	18
6	6	10
7	3	5
8	8	15
Total	45	80

*There may be minor variation in marks distribution.