

CSE 4025 DATA COMMUNICATIONS [3 0 0 3]

Course Objectives:

- Course is designed to understand data communications and networking.
- Learn about signaling, encoding, modulations and error detection.
- Data transfer across the Internet.

Course Outcomes:

- Ability to understand the physical network components, how different types of data can be represented.
- Ability to know how to create a data flow, Networking, Local and Wide area networks.
- Ability to design protocols and standards to implement data communications and networking

1. INTRODUCTION:

Data Communication, Components, Data Representation, Data Flow, Network Criteria, Physical Structure of Network, Network Types: LAN, WAN, Switching.

(Chapter 1 sections 1.1.1-1.1.3 of text book 1)

(1hrs)

2. INTRODUCTION TO PHYSICAL LAYER:

Analog to Digital Data, Analog to Digital Signals, Periodic and Non periodic, Periodic analog Signals: Sine wave, Phase, Wavelength, Time and Frequency Domain, Composite signal, Bandwidth, Digital Signal: Bit Rate, Bit Length, Digital signal as a composite Analog Signal, Transmission Impairment: Attenuation, Distortion, Noise, Data Rate Limits: Nyquist Bit Rate, Shannon Capacity, Performance: Bandwidth, Throughput, Latency, Bandwidth Delay product, Jitter

(Chapter 3 sections 3.1.1-3.3.3, 3.4.1-3.5.2, 3.6.1-3.6.5)

(8hrs)

3. DIGITAL TRANSMISSION AND ANALOG TRANSMISSION:

Line Coding, Line Coding Scheme, Block Coding, Scrambling, PCM, DM, Parallel Transmission, Serial Transmission, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, QAM, AM, FM, PM

(Chapter 4 sections 4.1.1-4.3.2, 5.1.2-5.2.3)

(8hrs)

4. BANDWIDTH UTILIZATION:

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

(Chapter 6 sections 6.1.1-6.1.3)

(2hrs)

5. TRANSMISSION MEDIA:

Introduction, Twisted Pair Cable, Coaxial Cable, Fiber Optic Cable, Radio Waves, Microwaves, Infrared

(Chapter 7 sections 7.1, 7.2, 7.3)

(2hrs)

6. SWITCHING:

Circuit Switched Networks: Three Phases, Efficiency, Delay, Datagram Networks, Virtual Circuit Networks, Structure of Circuit Switches, Structure of Packet Switches. (Chapter 8 sections 8.2, 8.3, 8.4)

(2hrs)

7. ERROR DETECTION AND CORRECTION:

Introduction, Types of Errors, Redundancy, Detection versus correction, Coding, Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder Using polynomials, Cyclic code analysis, Advantages of Cyclic Codes

(Chapter 10 sections 10.1, 10.3.1-10.3.5)

(2hrs)

8. DATA LINK CONTROL:

DLC Framing, Flow and Error Control, Connectionless and Connection Oriented, Data Link Simple Protocol, Stop-and-Wait Protocol, Piggybacking, HDLC, Configurations and Transfer Modes, Framing, PPP Services, PPP Framing, Transition Phases, Multiplexing. (Chapter 11 sections 11.1, 11.2, 11.3, 11.4)

(3hrs)

9. MEDIA ACCESS CONTROL:

ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled Access: Reservation, POLLING, Token passing, FDMA, TDMA, CDMA

(Chapter 12 sections 12.1, 12.2 12.3)

(3hrs)

10. WIRED LAN:

Standard Ethernet Characteristics, Addressing, Access method, Efficiency of standard Ethernet, Implementation, Fast Ethernet Access method, Physical Layer, GIGABIT Ethernet MAC sublayer Physical layer, SONET Architecture, Layers, Frames, STS Multiplexing, SONET Networks, ATM Design goals, Architecture.

(Chapter 13 sections 13.2.1-13.2.5, 13.3, 13.4)

(3hrs)

11. WIRELESS LAN:

Introduction, IEEE 802.11 architecture, MAC sublayer, Addressing mechanism, Physical Layer

(Chapter 15 sections 15.1, 15.2)

(2hrs)

Text Books:

1. Behrouz A. Fourouzan, "*Data Communication and Networking*", Tata McGrawHill, 5th Edition, 2013

References:

1. William Stallings, "*Data and Computer Communications*", Prentice-Hall, 10th Edition 2014.
2. A. S. Tanenbaum, "*Computer Networks*", 4th Ed, Prentice Hall PTR, 2003