1/3 MCA Second Semester

CA2T1 **DATA COMMUNICATIONS** **Credits : 4**

Lecture Hours : 4 periods / week Internal assessment : 30 Marks
Semester and Examination: 70 Marks

Course Description:

Data Communications will build up prior knowledge in operating systems, basic idea on networking models, protocols & signals. We will study the fundamental principles, Networking models, elements of models, signals and protocols of computer networks. We will investigate how the different protocols work, why they work that way, and their performance trade-offs. Using this knowledge, we will try to examine the way applications are deployed on the Internet and their performance trade-offs.

Course Objectives:

- Understand the structure and organization of Data Communications; including the division into layers, role of each layer, and relationships between the layers.
- Understand the basic concepts of Signals;
- In depth understanding of Multiplexing and Transmission Media.
- In depth understanding of Switching and Data Gram Protocols.
- Understand the In depth concepts of error-detection and correction techniques, and their methods.
- Understand the basic concepts of Ethernet and Wireless LAN.

Unit I:

Data Communication- Components, Data Representation, Direction of Data Flow, NETWORKS - Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks, Interconnection of Networks: Internetwork, THE INTERNET- History, The Internet Today, PROTOCOLS AND STANDARDS – Protocols, Standards, Standards Organizations, Internet Standards.

Unit II:

Network Models - LAYERED TASKS - Sender, Receiver, and Carrier, Hierarchy, THE OSI MODEL - Layered Architecture, Peer-to-Peer Processes, Encapsulation, LAYERS IN THE OSI MODEL - TCP/IP PROTOCOL- ADDRESSING - Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.

Unit III:

Signals - ANALOG AND DIGITAL- Analog and Digital Data, Analog and Digital Signals, Periodic and Nonperiodic Signals, PERIODIC ANALOG SIGNALS - Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth.

Unit IV:

Digital Signals - Bit Rate, Bit Length, Digital Signal as a Composite Analog Signal, Transmission of Digital Signals. TRANSMISSION IMPAIRMENT – Attenuation, Distortion, Noise, DATA RATE LIMITS - Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Using Both Limits, PERFORMANCE – Bandwidth, Throughput, Latency (Delay), Bandwidth-Delay Product, Jitter.

Unit V:

Multiplexing and Transmission Media: Frequency- Division Multiplexing, Wavelength-Division Multiplexing, Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing. GUIDED MEDIA- Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable, UNGUIDED MEDIA: WIRELESS - Radio

Waves, Microwaves, Infrared.

Unit VI:

Switching - CIRCUIT-SWITCHED NETWORKS - Three Phases, Efficiency, Delay. DATAGRAM NETWORKS - Routing Table, Efficiency, Delay, Datagram Networks in the Internet, STRUCTURE OF A SWITCH - Structure of Circuit Switches, Structure of Packet Switches.

Unit VII:

Error Detection and Correction - INTRODUCTION - Types of Errors, Redundancy, Detection Versus Correction, Forward Error Correction Versus Retransmission, Coding, Modular Arithmetic, BLOCK CODING - Error Detection, Error Correction, Hamming Distance, Minimum Hamming Distance, CYCLIC CODES- Cyclic Redundancy Check, Hardware Implementation, Polynomials, Cyclic Code Analysis, Advantages of Cyclic Codes, CHECKSUM - One's Complement, Internet Checksum.

Unit VIII:

Ethernet - Wired LANs: IEEE STANDARDS, Data Link Layer, Physical Layer, STANDARD ETHERNET-MAC Sublayer, Physical Layer, CHANGES IN THE STANDARD - Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet, FAST ETHERNET, GIGABIT ETHERNET, Wireless LANs 14.1 IEEE 802.11,Architecture, Addressing Mechanism, BLUETOOTH -Architecture , Bluetooth Layers.

Learning Resources

Text Books

1. Behrouz Forouzan and S.C. Fegan, **Data Communications and Networking**, McGraw Hill, 4/e, 2006.
2. William Stallings, **Data and Computer Communications** (8th ed.), Pearson Education, 8/e, 2007.

References:

1. W. Tomasi, **Introduction to Data Communications and Networking**, Pearson Education, 1/e, 2007.
2. S. Haykin, **Digital Communications**, John Wiley & Sons, Inc., 3/e, 2011.
3. P.C. Gupta, **Data Communications and Computer Networks**, Prentice-Hall of India, 3/e, 2006.
4. L. L. Peterson and B. S. Davie, **Computer Networks: A Systems Approach** , Morgan Kaufmann, 3/e,2003.
5. A.Tenenbaum, **Computer Networks**, 3/e, 2004