

DATA COMMUNICATIONS

UNIT-I

Data communication Fundamentals: Introduction, components, Data Representation, Data Flow; Networks – Network criteria, Physical Structures, Network Models, Categories of networks; Protocols, Standards, Standards organization; The Internet – Brief history, Internet today; **Network Models** -Layered tasks; The OSI model – Layered architecture, Peer-to-Peer Process, Encapsulation; Layers in the OSI model; TCP/IP Protocol suite; Addressing.

UNIT-II

Digital Transmission Fundamentals (with problems to solve): Analog & Digital data, Analog & Digital signals (basics); Transmission Impairment – Attenuation, Distortion and Noise; Data rate limits – Nyquist Bit Rate, Shannon Capacity; Performance, **Digital Transmission (with problems to solve):** Digital-to-Digital conversion - Line coding, Line coding schemes (unipolar, polar, bipolar); Analog-to-Digital conversion - PCM.

UNIT-III

Error detection & correction(with problems to solve): Introduction, Block coding, Linear Block codes, Cyclic codes – CRC, Polynomials, Checksum, **Datalink control:** Framing, Flow& error control, Protocols, Noiseless channels (Simplest Protocol, Stop-and-wait protocol); Noisy channels (Stop-and-wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Piggybacking).

UNIT-IV

HDLC – Transfer modes, frames: **Point-to-Point Protocol** – Framing, transition phases; **Multiple Access:** Random Access (Aloha, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Reservation, Polling, Token Passing), Channelization (FDMA, TDMA, CDMA)

UNIT-V

Wired LANs: IEEE standards; Standard Ethernet; **Wireless LANs:** IEEE802.11 Architecture, MAC sublayer, addressing mechanism, Bluetooth and its architecture; Connecting devices, Backbone networks, Virtual LANs

Text Book:

1. Behrouz A. Forouzan, Data Communications and Networking, Fourth Edition, Tata McGraw-Hill, 2006.

References:

1. Alberto Leon-Garcia and Indra Widjaja, Communication Networks –Fundamental Concepts and Key architectures, Second Edition, Tata McGraw-Hill, 2004.
2. Wayne Tomasi, Introduction to Data Communications and Networking, Pearson Education, 2005.

Course Outcomes (COs):

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

1. Distinguish different communication models / protocol stacks (OSI & TCP/IP) and analyze the usage of appropriate network topology for a given scenario. (PO-1, 2, 3) (PSO-1,2)
2. Handle the issues associated with digital data signals and solve the problems on data transmission by measuring the performance parameters. (PO-1, 2, 3) (PSO-1, 2)
3. Apply different error detection, error correction as well as flow control strategies to solve error and flow control issues induced during data communication. (PO-1, 2, 3) (PSO-2)
4. Use the different strategies of multiple access to achieve better network efficiency and analyze the network performance. (PO-1, 2, 3) (PSO-1, 2)
5. Illustrate the IEEE standards for wired, wireless LANs and their connecting devices. (PO-3, 10) (PSO-2)

UNIT-I

Network layer: Logical addressing - IPv4 addresses, Address space, notations, classful and classless addressing with problem solving, NAT, IPv6 addresses; **Network layer: Internet protocol** - IPv4 datagram, fragmentation, checksum and options; IPv6 packet format, advantages and extension headers; Transition from IPv4 to IPv6.

UNIT-II

Address mapping, Error reporting, & Multicasting - Address mapping, ARP, RARP, BOOTP and DHCP; ICMP, IGMP, **Network layer: Delivery, Forwarding, & Routing** – Direct Vs Indirect delivery, Forwarding Techniques, Forwarding Process, Routing Table,; **Unicast routing protocols with problem solving** – Optimization, Intra and Inter domain routing, distance vector routing, link state routing, path vector routing.

UNIT-III

Multicast routing protocols – Introduction, applications, unicast routing vs multicast routing, source based tree routing, group shared tree routing, multicast distance vector.

Transport Layer - Process-to-Process delivery, User Datagram Protocol, Transmission Control Protocol, SCTP-services, features.

UNIT-IV

Congestion control & QOS - Data traffic, Congestion, Congestion control, Two examples – congestion control in TCP and Frame Relay, Quality of Service, Techniques to improve QOS,

Application Layer: Domain Name System - Namespace, Domain name space, Distribution of Name space, DNS in internet, Resolution; **Remote logging** – TELNET; **Electronic mail** – Architecture, User Agent, Message Transfer Agent: SMTP; **File transfer** - File transfer protocol (FTP);.

UNIT-V

Network Management: SNMP - Network management system; Simple Network Management Protocol – concept, management components. **Network Security** - Security Services, Message confidentiality, Message integrity, Message Authentication, Digital Signature, Entity Authentication

Text Books:

1. Behrouz A. Forouzan, Data Communications and Networking, Fourth Edition, Tata McGraw-Hill, 2006.

Reference:

1. Alberto Leon-Garcia and Indra Widjaja, Communication Networks –Fundamental Concepts and Key architectures, Second Edition, Tata McGraw-Hill, 2004.
2. Wayne Tomasi, Introduction to Data Communications and Networking, Pearson Education, 2005.

Course Outcomes (COs):

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

1. Identify and solve the problems associated with transition from IPv4 to IPv6. (PO-1, 2, 3) (PSO-1, 2)
2. Use different protocols to achieve Address mapping, Error reporting & routing. (PO-1, 2, 3, 5) (PSO-2)
3. Paraphrase different transport layer protocols and analyze different techniques to improve QOS (PO-1, 2, 3) (PSO-2, 3)
4. Describe the working of various application layer services. (PO-2, 3) (PSO-2)
5. Analyze different cryptographic techniques for securing the data and network. (PO-1, 2, 3) (PSO-1, 2)