

**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

**New Scheme Based On AICTE Flexible Curricula**

**Artificial Intelligence and Data Science, VI-Semester**

**AD-602 Computer Networks**

Course Outcomes: After completion of the course students will be able to

1. Characterize and appreciate computer networks from the view point of components and from the view point of services (Knowledge & design of networks)
2. Understand the Concepts of Data link layer and its protocols and also about the working of MAC sublayer.

CO-3: Describe the essential principles of Network Layers and use IP addressing to create subnets for any specific requirements.

CO-4. Design a Reliable Data Transfer Protocol and incrementally develop solutions for the requirements of Transport Layer.

CO-5: Select the most suitable Application Layer protocol (such as HTTP, FTP, SMTP, DNS, Bit torrent) as per the requirements of the network application and work with available tools to demonstrate the working of these protocols.

**Unit –I:**

Computer Network: Definitions, goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISO/OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Principles of physical layer: Media, Bandwidth, Data rate and Modulations.

**Unit-II**

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat,

Hybrid ARQ.

MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA). IEEE Standards 802 series & their variant.

**Unit-III**

Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost-Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding, Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6.

**Unit-IV**

Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management.

#### Unit-V

Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

Network Security: Introduction to security, Traditional Ciphers, Modern Ciphers, Message Integrity and Authentication.

#### References:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks" Pearson Education.
2. Douglas E Comer, "Internetworking With Tcp/Ip Principles, Protocols, And Architecture - Volume I" 6th Edition, Pearson Education
3. Dimitri Bertsekas, Robert Gallager, "Data Networks", PHI Publication, Second Edition.
4. Behrouz A. Forouzan, "TCP/IP protocol Suite" Fourth Edition, Tata Mc Graw Hill
5. Uyles Black, "Computer Networks", PHI Publication, Second Edition.

#### List of Experiments:

1. Study of Different Type of LAN & Network Equipment.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of framing methods.
6. Study of Tool Command Language (TCL).
7. Study and Installation of Standard Network Simulator: N.S-2, N.S3, OpNet, QualNet etc .
8. Study & Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
9. Configure 802.11 WLAN.
10. Implement & Simulate various types of routing algorithm.
11. Study & Simulation of MAC Protocols like Aloha, CSMA, CSMA/CD and CSMA/CA using Standard Network Simulators.
12. Study of Application layer protocols-DNS, HTTP, HTTPS, FTP and TelNet.