

**IV Semester**  
**Course 11: Data Communication and Computer Networks**  
Credits -3

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**Course Objectives**

To provide students with a comprehensive understanding of networking principles, protocols, and technologies, enabling them to design, analyze, and evaluate efficient and reliable network solutions.

**Course Outcomes**

Upon successful completion of the course, a student will be able to:

1. Understand and apply network applications, hardware, software, and reference models for network communication.
2. Design and analyze data link layer protocols, multiple access protocols, and wireless LAN technologies.
3. Design routing algorithms, congestion control algorithms, and evaluate network layer protocols for internetworking.
4. Analyze transport service, transport protocols, and evaluate UDP and TCP in the internet.
5. Understand and evaluate application layer protocols, including DNS, email, WWW, and network management protocols.

**UNIT-I**

**INTRODUCTION:** Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, Connection oriented network - X.25, frame relay.

**THE PHYSICAL LAYER:** Theoretical basis for communication, guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.

**UNIT-II**

**THE DATA LINK LAYER:** Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer on the internet.

**THE MEDIUM ACCESS SUBLAYER:** Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth.

**UNIT-III**

**THE NETWORK LAYER:** Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

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#### **UNIT-IV**

**THE TRANSPORT LAYER:** Transport service, elements of transport protocol, SimpleTransport Protocol, Internet transport layer protocols: UDP and TCP.

#### **UNIT-V**

**THE APPLICATION LAYER:** Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http.

**APPLICATION LAYER PROTOCOLS:** Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.

#### **Text Book(s)**

1. S. Tanenbaum (2003), Computer Networks, 4th edition, Pearson Education/ PHI, New Delhi, India

#### **Reference Books**

2. Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc Graw-Hill, India.
3. Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India.

#### **SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:**

**Unit 1: Activity:** Hands-on exercises to configure network applications

**Evaluation Method:** Practical skills in configuring network applications, hardware, and software.

**Unit 2: Activity:** Protocol Design and Simulation using simulation tools like NS-3 or Cisco Packet Tracer.

**Evaluation Method:** Students' ability to design and simulate data link layer protocols and multiple access protocols

**Unit 3: Activity:** Guest Lectures and Workshops on routing algorithms, congestion control, and network layer protocols.

**Evaluation Method:** Students' participation and understanding demonstrated in guest lectures and workshop

**Unit 4: Activity:** Network Monitoring and Traffic Analysis using tools like Wireshark

**Evaluation Method:** Understanding of transport protocols through their analysis of network traffic and identification of UDP and TCP behavior

**Unit 5: Activity:** Group Projects on Network Application Development

**Evaluation Method:** Group Project Presentations

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**List of Experiments:**

1. Understanding various network tools in Windows and Linux
2. Study different types of Network devices and Cables
3. Building a Local Area Network
4. Concept of Network IP Address
5. Introduction to Network Simulator – Packet Tracer (PT)
6. Configuration of a Router using Packet Tracer
7. Implementation of a Network using Packet Tracer
8. Implementation of Static Routing using Packet Tracer
9. Implementation of RIP using Packet Tracer
10. Implementation of OSPF using Packet Tracer
11. Implement DNS using packet tracer
12. Implementation of a VLAN using Packet Tracer