

# **Government PG College, Ambala Cantt**

**Course File(Session 2023-24)**

**Name of Professor: Shalin Bhola**

**Class: B. Sc. C.S./6<sup>th</sup> Semester**

---

**Subject code and Name: Paper II Computer Networks  
SYLLABUS**

**Maximum Marks: 50**

**External: 40**

**Minimum Pass Marks: 18**

**Internal: 10**

**Time: 3 hours**

**Note:** Examiner will be required to set Nine Questions in all. First Question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit. All questions will carry equal marks.

## **UNIT – I**

Introduction to Data Communication and Computer Networks; Uses of Computer Networks; Types of Computer Networks and their Topologies; Network Hardware Components: Connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, Switches, Routers, Gateways; Network Software: Network Design issues and Protocols; Connection-Oriented and Connectionless Services; OSI Reference Model; TCP/IP Model;

## **UNIT – II**

Analog and Digital Communications Concepts: Analog and Digital data and signals; Bandwidth and Data Rate, Capacity, Baud Rate; Guided and Wireless Transmission Media; Communication Satellites; Switching and Multiplexing; Modems and modulation techniques;

## **UNIT – III**

Data Link Layer Design issues; Error Detection and Correction methods; Sliding Window Protocols: One-bit, Go Back N and Selective Repeat; Media Access Control: ALOHA, Slotted ALOHA, CSMA, Collision free protocols; Introduction to LAN technologies: Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet; Token Ring; Introduction to Wireless LANs and Bluetooth;

## **UNIT – IV**

Routing Algorithms: Flooding, Shortest Path Routing, Distance Vector Routing; Link State Routing, Hierarchical Routing; Congestion Control; Traffic shaping; Choke packets; Load shedding; Application Layer: Introduction to DNS, E-Mail and WWW services; Network Security Issues: Security attacks; Encryption methods; Firewalls; Digital Signatures;

**TEXT BOOKS:** Andrew S. Tanenbaum, “Computer Networks”, Pearson Education. Michael A. Gallo, William M. Hancock, “Computer Communications and Networking Technologies”, CENGAGE Learning.

**REFERENCE BOOKS:** Behrouz A Forouzan, “Data Communications and Networking”, McGraw Hill. Bhushan Trivedi, “Computer Networks”, Oxford

## COURSE OBJECTIVES

The course objectives outlined are as follows:

1. **Understanding Network Fundamentals:** To grasp the fundamental concepts of computer networks including protocols, architectures, topologies, and models like OSI (Open Systems Interconnection) and TCP/IP (Transmission Control Protocol/Internet Protocol).
2. **Protocols and Technologies:** To familiarize students with various network protocols and technologies such as Ethernet, Wi-Fi, TCP/IP, DNS (Domain Name System), HTTP (Hypertext Transfer Protocol), and others.
3. **Network Design and Implementation:** To teach students how to design and implement computer networks, considering factors like scalability, reliability, and performance.
4. **Network Security:** To introduce students to the basics of network security, including authentication, encryption, firewalls, intrusion detection systems, and best practices for securing network infrastructure.
5. **Network Management:** To cover principles and tools for network management, including monitoring, troubleshooting, and performance optimization.
6. **Application Layer Protocols:** To explore various application layer protocols such as HTTP, SMTP (Simple Mail Transfer Protocol), FTP (File Transfer Protocol), and DNS, and understand their functions and interactions.
7. **Transport Layer Protocols:** To understand the role of transport layer protocols like TCP and UDP (User Datagram Protocol) in reliable data transfer and flow control.
8. **Network Layer Protocols:** To study network layer protocols such as IPv4 and IPv6, routing algorithms, and packet forwarding mechanisms.
9. **Data Link Layer and Physical Layer:** To delve into the data link layer protocols like Ethernet and Wi-Fi, and physical layer concepts such as modulation, transmission media, and signal encoding.
10. **Emerging Technologies:** To discuss emerging trends and technologies in computer networks, such as Internet of Things (IoT), software-defined networking (SDN), and cloud computing, and their impact on network design and management.

## COURSE OUTCOMES

After the successful completion of the course, students will be able to:

1. **Demonstrate Understanding of Network Fundamentals:** Students should be able to explain fundamental concepts such as network protocols, architectures, topologies, and models like OSI and TCP/IP.
2. **Design and Implement Computer Networks:** Students should be able to design and implement small to medium-sized computer networks considering factors like scalability, reliability, and performance.
3. **Analyze and Troubleshoot Network Issues:** Students should be able to analyze network problems, identify their root causes, and apply appropriate troubleshooting techniques to resolve them effectively.
4. **Configure Network Devices:** Students should be able to configure network devices such as routers, switches, and firewalls to implement specific network functionalities and security policies.
5. **Evaluate Network Performance:** Students should be able to evaluate network performance metrics using appropriate tools and techniques and suggest improvements to enhance performance.
6. **Implement Network Security Measures:** Students should be able to implement basic network security measures such as access control, encryption, and intrusion detection to protect network assets from unauthorized access and attacks.
7. **Demonstrate Proficiency in Network Protocols:** Students should be able to explain the functions and interactions of various network protocols at different layers of the OSI model, including application layer protocols like HTTP and FTP, transport layer protocols like TCP and UDP, and network layer protocols like IPv4 and IPv6.
8. **Apply Network Management Principles:** Students should be able to apply network management principles and tools to monitor network performance, configure network devices, and troubleshoot network issues efficiently.

## Lesson Plan

Week No	Scheduled Dates	Topics to be covered
1	5-6 January	Introduction to Data Communication and Computer Networks; Uses of Computer Networks; Types of Computer Networks and their Topologies
2	12-13 January	Network Hardware Components: Connectors, Transceivers, Repeaters, Hubs, Network Interface Cards and PC Cards, Bridges, Switches, Routers, Gateways
3	19-20 January	Network Software: Network Design issues and Protocols; Connection-Oriented and Connectionless Services; OSI Reference Model; TCP/IP Model; test
4	22-25 January	Analog and Digital Communications Concepts: Analog and Digital data and signals; Bandwidth and Data Rate, Capacity, Baud Rate;
5	26 January-27 January	Guided and Wireless Transmission Media
6	2-3 February	Communication Satellites; Switching and Multiplexing
7	9-10 February	Modems and modulation techniques; test
8	16-17 February	Data Link Layer Design issues; Error Detection and Correction methods
9	23-24 February	Sliding Window Protocols: One-bit, Go Back N and Selective Repeat;
10	1-2 March	Media Access Control: ALOHA, Slotted ALOHA, CSMA, Collision free protocols
11	8-9 March	Introduction to LAN technologies: Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet; Token Ring; Introduction to Wireless LANs and Bluetooth; Test
12	15-16 March	Routing Algorithms: Flooding, Shortest Path Routing, Distance Vector Routing; Link State Routing, Hierarchical Routing;
13	22 March	Congestion Control; Traffic shaping; Choke packets; Load shedding;
14	5-6 April	Application Layer: Introduction to DNS, E-Mail and WWW services;
15	12-13 April	Network Security Issues: Security attacks; Encryption methods; Firewalls; Digital Signatures;
16	19-20 April	Final Test, Assignments and REVISION of Contents
17	26-27 April	Previous Year Question Papers Discussion