

Course Title: Computer Networks
Course No: CSC258
Nature of the Course: Theory + Lab
Year: Second, Semester: Fourth

Full Marks: 60+20+20
Pass Marks: 24+8+8
Credit Hours: 3

Course Description: This course introduces concept of computer networking and discuss the different layers of networking model.

Course Objective: The main objective of this course is to introduce the understanding of the concept of computer networking with its layers, topologies, protocols & standards, IPv4/IPv6 addressing, Routing and Latest Networking Standards.

Unit	Contents	Hour
1. Introduction to Computer Network [6 Hour]	1.1. Definitions, Uses, Benefits 1.2. Overview of Network Topologies <i>Mesh, Star, Tree, Bus</i> 1.3. Overview of Network Types <i>LAN, PAN, CAN, MAN, WAN</i>	1
	1.4. Networking Types P2P, Multipoint, Client/Server 1.5. Overview of Protocols and Standards <i>Protocols: Syntax, semantics, timing; Standards: De facto, De jure; Standards Organizations</i>	1.5
	1.6. OSI Reference Model 1.7. TCP/IP Model and its comparison with OSI	2.5
	1.8. Connectionless and Connection-Oriented Network Services <i>Basic working Mechanism</i> 1.9. Internet, ISPs, Backbone Network Overview Basic concept of Internet and ISPs, Bus backbone, Star backbone, connecting remote LANs	1
	2. Physical Layer and Network Media [4 Hour]	2.1. Network Devices <i>Repeater, Hub, Switch, Bridge, Router</i> 2.2. Different types of transmission medias <i>Wired: twisted pair, coaxial, fiber optic, Wireless: Radio waves, micro waves, infrared</i> 2.3. Ethernet Cable Standards <i>UTP, Fiber cable standards</i>
	2.4. Circuit, Message & Packet Switching	2
	2.5. ISDN <i>Interface and Standards</i>	0.5
3. Data Link Layer [8 Hour]	3.1. Function of Data Link Layer (DLL) 3.2. Overview of Logical Link Control (LLC) and Media Access Control (MAC) 3.3. Framing and Flow Control Mechanisms <i>Stop-and-wait ARQ, Piggybacking, Go-Back-N ARQ, Selective Repeat ARQ</i>	3

	<p>3.4. Error Detection and Correction techniques <i>Parity checks, Cheksumming Methods, CRC, Hamming code</i></p> <p>3.5. Channel Allocation Techniques <i>ALOHA, Slotted ALOHA, CSMA, CSMACD, CSMA/CA</i></p> <p>3.6. Ethernet Standards <i>802.3 CSMA/CD, 802.4 Token Bus, 802.5 Token Ring</i></p>	3
	<p>3.7. Wireless LAN <i>Spread Spectrum, Bluetooth, Wi-Fi</i></p> <p>3.8. Overview Virtual Circuit Switching, Frame Relay & ATM</p> <p>3.9. DLL Protocol <i>HDLC, PPP</i></p>	2
4. Network Layer [10 Hour]	<p>4.1. Introduction and Functions</p> <p>4.2. IPv4 Addressing</p> <p>4.3. Class-full and Classless Addressing</p> <p>4.4. IPv4 Sub-netting/ Super-netting</p> <p>4.5. IPv6 Addressing and its Features</p> <p>4.6. IPv4 and IPv6 Datagram Formats</p> <p>4.7. Comparison of IPv4 and IPv6 Addressing</p> <p>4.8. NATing</p> <p>4.9. Example Addresses <i>Unicast, Multicast and Broadcast</i></p>	4
	<p>4.10. Routing</p> <p>4.10.1. Introduction and Definition</p> <p>4.10.2. Types of Routing <i>Static vs Dynamic, Unicast vs Multicast, Link State vs Distance Vector, Interior vs Exterior</i></p> <p>4.10.3. Path Computation Algorithms <i>Bellman Ford, Dijkstra's</i></p> <p>4.10.4. Routing Protocols <i>RIP, OSPF & BGP</i></p>	4
	<p>4.11. Overview of IPv4 to IPv6 Transition Mechanisms</p> <p>4.12. Overview of ICMP/ICMPv6</p> <p>4.13. Overview of Network Traffic Analysis</p> <p>4.14. Security Concepts <i>Firewall & Router Access Control</i></p>	2
5. Transport Layer [6 Hour]	<p>5.1. Introduction, Functions and Services</p> <p>5.2. Transport Protocols <i>TCP, UDP and Their Comparisons</i></p> <p>5.3. Connection Oriented and Connectionless Services</p>	1
	<p>5.4. Congestion Control <i>Open Loop & Closed Loop, TCP Congestion Control</i></p> <p>5.5. Traffic Shaping Algorithms</p> <p>5.6. <i>Techniques to improve QOS</i> <i>Scheduling, traffic shaping, resource reservation, admission control</i></p>	2.5

	5.7. Queuing Techniques for Scheduling 5.8. Introduction to Ports and Sockets, Socket Programming <i>Socket programming with UDP and TCP (e.g. client Server Application)</i>	2.5
6. Application Layer [7 Hour]	6.1. Introduction and Functions 6.2. Web & HTTP <i>Overview of HTTP, Non-Persistent and Persistent Connections, HTTP Message Format</i>	2
	6.3. DNS and the Query Types <i>Services provided by DNS, Overview of how DNS works, DNS records and messages</i> 6.4. File Transfer and Email Protocols <i>FTP, SFTP, SMTP, IMAP, POP3</i>	3
	6.5. Overview of Application Server Concepts <i>Proxy, Web, Mail</i> 6.6. Network Management <i>SNMP and Transport mapping</i>	2
7. Multimedia & Future Networking [4 Hour]	7.1. Overview Multimedia Streaming Protocols <i>SCTP</i>	1
	7.2. Overview of SDN and its Features, Data and Control Plane	1
	7.3. Overview of NFV	1
	7.4. Overview of NGN	1

Text Books:

1. Data Communications and Networking, 4th Edition, Behrouz A. Forouzan. McGraw-Hill
2. Computer Networking; A Top Down Approach Featuring The Internet, 2nd Edition, Kurose James F., Ross W. Keith PEARSON EDUCATION ASIA

Laboratory works:

The lab activities under this subject should accommodate at least the following

S.N.	Contents
1.	Understanding of Network equipment, wiring in details
2.	Practice on basic Networking commands (ifconfig/ipconfig, tcpdump, netstat, dnsip, hostname, route)
3.	Overview of IP Addressing and sub-netting, static ip setting on Linux/windows machine, testing
4.	Introduction to Packet Tracer, creating of a LAN and connectivity test in the LAN, creation of VLAN and VLAN trunking.
5.	Basic Router Configuration, Static Routing Implementation
6.	Implementation of Dynamic/interior/exterior routing (RIP, OSPF, BGP)
7.	Firewall Implementation, Router Access Control List (ACL)
8.	Packet capture and header analysis by wire-shark (TCP,UDP,IP)
9.	Basic concept of DNS, Web, FTP (shall use packet tracer, GNS3)

Model Question

Bachelor Level/ Second Year/ Fourth Semester/ Science
Computer Networks (CSC 258)

Full Marks: 60
Pass Marks: 24
Time: 3 hours.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group A (Long Answer Question Section)

Attempt any TWO questions.

(2x10=20)

1. Suppose you are assigned to design a LAN for an office having 3 departments. Each department will have 50 computers locating in 10 rooms each equipped with 5 computers. Make your own justification while selecting connecting devices and accessories.
2. Highlight on the importance of routing algorithm. Explain Distance Vector Routing algorithm and compare it with link state routing.
3. Explain various congestion control approaches.

Group B (Short Answer Question Section)

Attempt any EIGHT questions.

(8x5=40)

4. Is 192.16.144.64/27 a host, network or broadcast address? In which layer of OSI model do HUB, Switch and Router operate on.
5. Describe the working procedure of Token bus and Token ring.
6. Why do you think network traffic analysis is carried out? How does IPv6 overcome the disadvantages of IPv4?
7. Find Hamming Code for data 01100111.
8. Differentiate between frame relay and ATM.
9. What is the function of proxy server? Explain about electronic mail.
10. Demonstrate the use of socket programming for creating network application using UDP and TCP with necessary diagrams.
11. Explain DNS with reference to its hierarchy and records.
12. Write Short Notes (Any Two):
 - a) Firewall
 - b) Packet Switching
 - c) NGN