Program: Computer Engineering	T.Y B. Tech.	Semester: V
Course: Computer Network (DJS22CEC502)		
Course: Computer Network Laboratory (DJS22CEL502)		

Pre-requisite: None

Course Objectives:

1. To get familiar with contemporary issues and challenges of various protocol designs in layered architecture.
2. To assess the strengths and weaknesses of various routing algorithms.
3. To explore the issues and challenges of protocols design while delving into TCP/IP protocol suite.

Outcomes: On successful completion of course, learner will be able to:

1. Demonstrate the concepts of data communication at physical layer and compare ISO - OSI model & TCP/IP model.
2. Understand the fundamental concepts of the Data Link Layer and analyze different MAC protocols.
3. Design the network using IP addressing and subnetting / supernetting schemes.
4. Analyze various transport layer, application layer protocols.

Computer Network (DJS22CEC502)		
Unit	**Description**	**Duration**
1	**Introduction to Networking** Introduction to computer network, network applications, network software and hardware components (Interconnection networking devices), Network topology, protocol hierarchies, design issues for the layers, connection-oriented and connectionless services, **Reference models**: Layer details of OSI, TCP/IP models. **Introduction to 5G Networks**: Overview of 5G technology and its evolution from previous generations (3G, 4G), Core network architecture in 5G.	**05**
2	**Physical Layer** Introduction to the Digital Communication System, Guided Transmission Media: Twisted pair, Coaxial, Fiber optics, Unguided Media (Wireless Transmission): Radio Waves, Microwave, Bluetooth.	**04**
3	**Data Link Layer** DLL Design Issues (Services, Framing, Error Control, Flow Control), Error Detection and Correction (Hamming Code, Parity, CRC, Checksum), Elementary Data Link protocols: Stop and Wait, Sliding Window (Go Back N, Selective Repeat), HDLC	**08**

	Medium Access Control Sublayer: Channel Allocation problem, Multiple Access Protocol (Aloha, Carrier Sense Multiple Access (CSMA/CA, CSMA/CD)	
4	**Network layer** Network Layer design issues, Communication Primitives: Unicast, Multicast, Broadcast. IPv4 Addressing (classful and classless), Subnetting, Supernetting design problems, IPv4 Protocol, Network Address Translation (NAT), IPv6 **Routing algorithms**: Shortest Path (Dijkstra's), Link state routing, Distance Vector Routing **Routing Protocols:** ARP, RARP, ICMP, IGMP, RIP, OSPF **Congestion control algorithms**: Open loop congestion control, Closed loop congestion control, QoS parameters, Token & Leaky bucket algorithms.	**12**
5	**Transport Layer** The Transport Service: Transport service primitives, Berkeley Sockets, Connection management (Handshake), UDP, TCP, TCP state transition, TCP timers TCP Flow control (sliding Window), TCP Congestion Control: Slow Start	**06**
6	**Application Layer** DNS: Name Space, Resource Record and Types of Name Server. HTTP, SMTP, Telnet, FTP, DHCP	**04**
	Total	**39**

List of Laboratory Experiments: (At Least Ten)

Computer Network Laboratory (DJS22CEL502)	
Sr. No.	**Suggested Practical**
1	Execute and evaluate network administration commands and demonstrate their use in different network scenarios.
2	Installation & Configuration of Network Simulator (NS2) in Linux/Windows Environment.
3	Building of wired & wireless topology using NS2.
4	Write a program to implement A) Error Detection and Correction B) Framing
5	Implement Stop and Wait protocol in NS2.
6	Write a program to implement Sliding Window Protocols- Selective Repeat, Go Back N.
7	Write a program to find out class of a given IP address, subnet mask & first & last IP address of that block.
8	Write a program to implement any one Routing Protocol.
9	Write a program to implement Congestion Control algorithms.
10	Implement the socket programming for client server architecture.
11	Install and configure Network Management/ Monitoring Tools like Wireshark, Packet Tracer.
12	Analyze the traffic flow of different protocols using Network Management/ Monitoring Tools.

13	Perform File Transfer and Access using FTP.
14	Perform Remote login using Telnet server.
15	Perform network discovery using discovery tools (e.g. Nmap, mrtg)

Textbooks:

1. A.S. Tanenbaum, Computer Networks, 6th edition Pearson Education, 2020
2. B.A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, 6th edition, TMH, 2022
3. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, 6th edition, Pearson, 2017

References:

1. Behrouz A. Forouzan, Firouz Mosharraf, Computer Networks: A Top-Down Approach, Mc Graw Hill, 2023
2. Dhanashree K. Toradmalle, Computer Networks and Network Design, Wiley, 2020

Online Resources:

1. https://www.netacad.com/courses/networking/networking-essentials
2. https://www.coursera.org/learn/computer-networking
3. https://nptel.ac.in/courses/106/105/106105081
4. https://www.edx.org/course/introduction-to-networking

Prepared by Checked by Head of the Department Principal