Computer Networks			
Course Code	**22CSE52**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE	3 Hours
Total Hours	40 hours Theory + 10 Lab slots	Credits	04

Course Learning Objectives: The objective of the course is to
- Develop knowledge of network elements and associated network layer protocols and uses of computer networks.
- Analyze various network layers' design issues and its quality-of-service requirements.
- Apply the knowledge of computer networking to develop network applications.
- Develop the knowledge of computer networking modern tools and technological advancements..

Module-1 Introduction   (08 hours)

Uses of computer networks: Business Applications, Home Application, Mobile Users, Social Issues; Network hardware: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks, Home Networks, Internet works; Network software: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Services, Service Primitives. Reference Models: OSI Reference Model and TCP/IP Reference Model.
Chapter 1: 1.1-1.3, 1.4.1, 1.4.2

Module-2 Network Layer - Routing and Congestion Control (8 hours)

Routing algorithms: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link state Routing, Hierarchical Routing.
Congestion Control Algorithms: General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets, Load Shedding, Jitter Control.
Chapter 5: 5.2, 5.3

Module-3 Quality of Service in Networks and Internetworking (8 hours)

Quality of Service: Application Requirements, Traffic Shaping, Packet Scheduling, Admission Control.
Internetworking: How networks differ, How Networks Can Be Connected, Tunneling, Internetwork Routing, Fragmentation**;** The Network Layer in the Internet: The IPv4 Protocol, IP Addresses, IPv6, Internet Control Protocols.
Chapter 5: 5.4, 5.5, 5.6: 5.6.1-5.6.4, 5.6.6-5.6.8

Module-4 The Transport Layer (8 hours)

The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, An Example of Socket Programming. **Elements of Transport Protocols:** Addressing, Connection Establishment, Connection Release.

The Internet Transport Protocols (UDP and TCP): Introduction to UDP, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, and Sliding Window protocols.

Chapter 6: 6.1,6.2,6.4,6.5

Module-5 The Application Layer (8 hours)

The Domain Name System DNS: The DNS Name Space, Domain Resource Records, Name Servers, **Electronic Mail:** Architecture and Services, The User Agent, Message Formats
WWW: Architectural overview, Static Web Pages, Dynamic Web Pages and
. HTTP (Hypertext Transfer Protocol), Web Search.
Chapter 7: 7.1, 7.2, 7.3

A–Demonstration (Compulsorily to be conducted):

A1. Implement three nodes point–to–point networks with duplex links between them using NS2. Set the queue size, vary the bandwidth, and find the number of packets dropped.

A2. Implement transmission of ping messages/traceroute over a network topology consisting of 6 nodes using NS2 and find the number of packets dropped due to congestion.

B–Exercise (compulsorily to be conducted):

B1. Write a program to find the shortest path between vertices using the bellman-ford algorithm

B2. Write a program for congestion control using a leaky bucket algorithm.

B3. Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

C–Structured Enquiry (compulsorily any 4 to be conducted):

C1. Analyze network packets using Wireshark (IPv6, Ipv4, ICMP, and ICMP6).

C2. Implement an Ethernet LAN using n nodes and set multiple traffic nodes using NS2 and plot conges the window for different source/destination.

C3. Develop a program such that client will send a simple ping message to a server and receive a corresponding pong message back from the server using any programming message.

C4. Implement IPv4 address classifier (A, B, C, D, and E) using any programming language.

C5. Implement simple FTP protocol using any programming language.

C6. Create IPv4 or IPv6 packets using any programming language.

D–Open Ended Experiments (any one):

D1. Implement IPv4 router using any programming language.

D2. Implement packet sniffer using any programming language.

Course Outcomes: At the end of the course the student will be able to:

22CSE52.1	Identify various uses of networks, Design issue of network layers, and summarize its quality-of-service requirements.
22CSE52.2	Illustrate various routing and congestion control algorithms.
22CSE52.3	Outline the internet protocol's structure and demonstrate the working of internet protocols.
22CSE52.4	Identify transport layer services and show the working of transport layer protocols.
22CSE52.5	Appraise application layer protocols.
22CSE52.6	Apply modern networking tools.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Computer Networks	Andrew S. Tanenbaum David J. Wetherall	Pearson	4th Edition, 2014
2	A First Course in the Finite Element Method	Daryl L. Logan	Cengage Learning India	5th Edition, 2020
Reference Books				

1	Computer Networking. A Top-Down Approach	Kurose and Ross	Tata McGraw-Hill	5th Edition, 2010
2	Computer Networks: A Systems Approach	Bruce S. Davie and Larry L. Peterso	The Morgan Kaufmann Series in Networking	5th Edition, 2011

Web links and Video Lectures (e-Resources):
- **Computer Networks and Internet Protocol, IIT Kharagpur:**
  https://www.youtube.com/playlist?list=PLbRMhDVUMngf-peFloB7kyiA40EptH1up
- **TCP/IP Tutorial and Technical Overview:**
  https://www.redbooks.ibm.com/redbooks/pdfs/gg243376.pdf
- **RFCs:** http://www.ietf.org/rfc.html
- **Computer Networks:** https://www.cse.iitk.ac.in/users/dheeraj/cs425/
- **Web Resources for Computer Networks, 5/e:** https://www.cs.vu.nl/~ast/CN5/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CSE52.1				3		3			3					
22CSE52.2	2				2									2
22CSE52.3			2						2					
22CSE52.4			2										2	
22CSE52.5			2			2								2
22CSE52.6					3				1					2

1: Low   2: Medium 3: High