CSA07 COMPUTER NETWORKS L T P C 3 0 2 4

Prerequisite: NIL

Course Objectives

The course on Computer Networks aims to provide the students with the following:

1. Knowledge on different network topology, mode of network communication and various types of network devices deployed between source and destination systems
2. Understand how seamless communication happens in a MPLS and ATM networks.
3. Create systems under various subnets and route packets between them using appropriate protocols.
4. Efficient management of congestion in a network based on various transport layer protocols, using different service mechanisms and QoS Parameters.
5. Understand and configure application layer protocols such as RTP, RTCP, RSVP, DHCP and DNS for ease of operation of networks.
6. Explore emerging trends in networking, including Software-Defined Networking (SDN), Network Function Virtualization (NFV), 5G, and Edge Computing.

Course Outcomes

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

1. Interpret different types of network topology using network devices with appropriate cables in Physical Layer.
2. Classify and distinguish the various Data Link Control Protocols based on its working mechanism
3. Demonstrate IP addressing and Routing schemes for a Global Network.
4. Articulate the Transport Layer Functionalities using TCP, UDP for improving Quality of Service
5. Identify Protocols necessary for developing network-based applications.
6. Examine the technical networking concepts proficiently through models, laboratory experiments, and university assessments
7. Analyze the performance of different network devices and routing mechanisms using Simulation Tools.
8. Evaluate modern networking paradigms such as IoT networking, cloud-based networking, and AI-driven network management.

Topics

Physical Layer And Media

Introduction to Networks and Communication Media: Uses - Network Hardware - Network Software - Components and Categories – types of Connections – Topologies – Protocols and Standards – ISO / OSI mode - Reference Models. Basis for data communication- Transmission Media-

Wireless Transmission- Ethernet Interface and Configuration. **Introduction to 5G Networks and its impact on communication protocols.**

Data Link Layer

Error Detection and Correction, Data Link Control, Multiple Access, Wired/Wireless LAN, Connecting LANs, Backbone Networks, Wireless LANs – 802.11 – Bluetooth and Wireless WANs-Virtual-Circuit Networks, Frame Relay ATM and MPLS, **Introduction to Wi-Fi 6 (802.11ax) and its advantages**

Network Layer

Internetworks – Packet Switching and Datagram approach – IPv4 addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Multicast, ICMP, IPv6 addresses, Internetworking. **Software-Defined Networking (SDN) - Network Virtualization - OpenFlow Protocol.**

Transport Layer

Duties of transport layer – Multiplexing – Demultiplexing – TCP Sockets – User Datagram Protocol (UDP), Multicast– Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Queuing Analysis- models, single server, multi-server, Priority Queues, Network of Queues, Congestion and Traffic Management. **Introduction to QUIC Protocol and Transport Layer Security (TLS) 1.3.**

Application Layer

Domain Name Space (DNS) – SMTP – FTP – HTTP - Electronic Mail, POP - SNMP – P2P Communication, VOIP, Overlay Network- SSL Security - firewalls, DoS, etc.

Text Books

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, 2006.
2. Andrew S. Tanenbaum, “Computer Networks”, Fourth Edition, Prentice Hall, 2002

References

1. Prakash C. Gupta - Data Communications and Computer Networks – PHI Learning Fourth Edition – 2006
2. Larry L.Peterson and Bruce S. Davie - Computer Networks –Elsevier Fourth Edition
3. -2008
4. James F.Kurose and Keith W. Ross - Computer Networks –Pearson Education – 2005
5. Stallings, “Data and Computer Communications”, Prentice Hall, 1996.

6. Olivier Bonaventure, “Computer Networking: Principles, Protocols and Practice", 2011.
7. Fred Halsall, “Computer Networking and the Internet”, (5th Edition), Addison Wesley, 2005.
8. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, 3rd edition, Morgan Kaufmann, 2003.