19ECS232: COMPUTER NETWORKS

L	T	P	C
3	0	2	4

The course is designed to impart a basic understanding of the working of computer networks, with the Internet as the case in point. Starting with the application layer with which the user interacts directly, it covers the important principles and protocols in the application, transport, network and link layers. Brief introductions to socket programming and wireless networks are introduced.

Course Objectives:

- Familiarize the student with the components of the Internet and the concept of layered protocol architecture.
- Expose the student to the important principles behind the working of various layers of a network.
- Enable the student to write simple network applications using socket programming.
- Demonstrate the working of the most important protocols used in the Internet.
- Acquaint the student with the basics of wireless networking.

UNIT I **6 L**

Computer networks and the Internet: Internet, The Network Edge, The Network Core: Delay, Loss and Throughput in Packet-Switched Networks, Protocol Layers and Their Service Models, History of Computer Networking and the Internet.

Learning Outcomes:

After completion of this unit, the student will be able to

- identify the roles of the various components of the Internet(L3)
- explain network parameters such as delay, loss and throughput(L2)
- model the network using a layered architecture(L3)

UNIT II **8 L**

Application Layer: Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS- The Internet's Directory Service, Socket Programming: Creating Network Applications

Learning Outcomes:

After completion of this unit, the student will be able to

- summarize the principles governing the working of network applications(L2)
- outline the working of popular applications in the Internet(L2)
- develop simple network applications using socket programming(L6)

UNIT III **10 L**

Transport Layer: Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-oriented Transport: TCP, Principles of Congestion Control: TCP Congestion Control

Learning Outcomes:

After completion of this unit, the student will be able to

- explain the need for multiplexing and demultiplexing at the transport layer(L2)
- compare connectionless service with connection-oriented service(L4)
- outline the working of TCP and UDP(L2)
- analyze the principles of congestion control(L4)

UNIT IV **10 L**

The Network Layer: Introduction, Virtual Circuit and Datagram Networks, Inside Router, The Internet Protocol (IP), Routing Algorithms

Learning Outcomes:

After completion of this unit, the student will be able to

- distinguish between virtual circuit and datagram networks(L4)
- outline the working of the Internet Protocol(L2)
- explain and analyze the working of routing algorithms(L2)

UNIT V **10 L**

The Link Layer: Introduction to the Link Layer, Multiple Access Links and Protocols, Switched Local Area Networks

Wireless and Mobile Networks: Introduction, Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LANs (Architecture and MAC Protocol), Mobile IP

Learning Outcomes:

After completion of this unit, the student will be able to

- summarize the protocols used for multiple access links(L2)
- compare the characteristics of wireless networks with those of wired networks(L4)
- outline the working of IEEE 802.11 standard and Mobile IP(L2)

COMPUTER NETWORKS LABORATORY

List of Practical Experiments:

1. Write a report that includes a diagram showing the topology, type of connection devices, and speed of the wired and wireless LAN in your organization. Also find out the MAC and IP addresses and the subnet mask of your computer.
2. Install and run a network diagnosis tool such as Tcp dump or Wireshark. Start capturing packets on an active interface, open a browser and type the address of your favorite search engine. Wait till the page loads and stop capture. List out the type and number of each type of packets captured.
3. Write a program to create a server that listens to port 5003 using stream sockets. Write a simple client program to connect to the server. Send a simple text message "Hello" from the client to the server and the server to the client and close the connection.
4. Write a program to create a chat server that listens to port 5004 using stream sockets. Write a simple client program to connect to the server. Send multiple text messages from the client to the server and vice versa. When either party types "Bye", close the connection.
5. Write a program to create a server that listens to port 5005 using stream sockets. Write a simple client program to connect to the server. The client should request for a text file and the server should return the file before terminating the connection.
6. Write a program to create a server that listens to port 5006 using stream sockets. Write a simple client program to connect to the server. Run multiple clients that request the server for binary files. The server should service each client one after the other before terminating the connection.
7. Write a program to create a server that listens to port 5007 using stream sockets. Write a simple client program to connect to the server. Run multiple clients that request the server for text files. The server should service all clients concurrently.
8. Write a program to create a server that listens to port 5009 using datagram sockets. Write a simple client program that requests the server for a binary file. The server should service multiple clients concurrently and send the requested files in response.

Text Book(s):

1. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, 6/e, Pearson, 2012.

References

1. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5/e, Prentice Hall, 2011.

2. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, 3/e, Morgan Kaufmann, 2011.

3. Richard Stevens, UNIX Network Programming – Volume 1, 3/e, Prentice Hall of India, 1997.

Course Outcomes:

At the end of the course, students will be able to

- interpret the concept of modular network design using layered protocol architecture(L5)
- list the various components in the Internet and their functions(L1)
- analyze various types of services provided by each layer in the network architecture(L4)
- discuss the working of the important protocols used in the Internet(L6)
- develop simple network applications and test them(L6)