Course Code: CSE3003

Course Title: Computer Networks

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Objectives:

- To introduce basic concepts in Computer Networks
- To expose state-of-the-art technologies in computer network protocols, architectures, and applications.

Expected Outcome:

- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- Identify the different types of network devices and their functions within a network
- Understand and building the skills of subnetting and routing mechanisms.
- Familiarity with the basic protocols of computer networks, and how they can be used
- To assist in network design and implementation.

Syllabus

Module No. 1	**Introduction**	**6 Hours**
Computer network and its history, progress and application, Internet, Network architecture, Networking devices. OSI Model, TCP/IP Protocol stack, Networking in different OS.		
Module No. 2	**Physical Layer**	**8 Hours**
Data communication technologies, Analog and digital communication. Encoding mechanisms, Packet Switching, Circuit Switching.		
Module No. 3	**Data Link Layer**	**8 Hours**
Framing, HDLC, PPP, Error detection, Error Correction, MAC Protocols, Reliable Transmission, Ethernet, 802.3, 802.5, 802.11, PPP,ATM.		
Module No. 4	**Network Layer**	**7 Hours**
IP addressing schemes, IPV4, Subnetting, IPV6, shift from IPV4 to IPV6, ICMP, DHCP, ARP. Routing Protocols: Distance-vector and link-state routing. RIP, OSPF, BGP Multicasting.		
Module No. 5	**Transport Layer**	**8 Hours**
Connection Oriented and connection less service, TCP and UDP, Port Addressing, Remote Proced Call, Flow Control vs Congestion Control, Quality of Service.		
Module No. 6	**Application Layer Protocols**	**8 Hours**
Application Layer Protocols: World wide web and HTTP, HTTPS, Domain names: DNS, File Transfer: FTP, Electronic mail: SMTP, Peer to peer networking, Torrent, VPN, Session managemen Data compression techniques.		

Books

- **Text Books**
- James F. Kurose, Keith W. Ross, "**Computer Networking – A Top-Down Approach Featuring the Internet**", Pearson Education, Seventh Edition, 2017.
- **References**
- Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, Second Edition, 2015.
- Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.
- Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers, Fifth Edition, 2011.
- Narasimha Karumanchi "Elements of Computer Networking: An Integrated Approach (Concepts, Problems and Interview Questions)", Career Monk Publisher, 2014.

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Introduction

Computer network and its history progress and application
Internet
Network architecture
Networking devices
OSI Model
TCP/IP Protocol stack
Networking in different OS.

Physical Layer

Data communication technologies
Analog and digital communication
Encoding mechanisms
Packet Switching
Circuit Switching

Data Link Layer

Framing
HDLC
PPP
Error detection
Error Correction

Computer networking history

Year	Event
1961	The idea of **ARPANET**, one of the earliest computer networks, was proposed by Leonard Kleinrock in 1961, in his paper titled **"Information Flow in Large Communication Nets."**
1965	The term "**packet**" was coined by Donald Davies in 1965, to describe data sent between computers over a network.

Computer networking history

1969	ARPANET was one of the first computer networks to use packet switching. Development of ARPANET started in 1966, and The first two nodes, UCLA and SRI (Standford Research Institute), were connected, Officially starting ARPANET in 1969.
1969	The first RFC surfaced in April 1969, as a document To define and provide information about • Computer communications, • Network protocols, and • Procedures.
1969	The first network switch and IMP (Interface Message Processor) was sent to UCLA on August 29, 1969. It was used to send the **first data transmission on ARPANET**.
1969	The **Internet** **was officially born**, with the first data transmission being sent between UCLA and SRI on October 29, 1969, at 10:30 p.m.

Computer networking history

1970	• Steve Crocker and a team at UCLA released NCP (NetWare Core Protocol) in 1970. • NCP is a file sharing protocol for use with NetWare.
1971	Ray Tomlinson sent the first e-mail in 1971.
1971	ALOHAnet, a UHF wireless packet network, is used in Hawaii to connect the islands together. Although it is not Wi-Fi, it helps lay the foundation for Wi-Fi.
1973	Ethernet is developed by Robert Metcalfe in 1973 while working at Xerox PARC.
1973	The first international network connection, called SATNET, is deployed in 1973 by ARPA.

Computer networking history

1973	An experimental VoIP call was made in 1973, officially introducing VoIP technology and capabilities. The first software allowing users to make VoIP calls was not available until 1995.
1974	The first routers were used at Xerox in 1974. These first routers were not considered true IP routers.
1976	Ginny Strazisar developed the first true IP router, originally called a gateway, in 1976.
1978	Bob Kahn invented the TCP/IP protocol for networks and developed it, with help from Vint Cerf, in 1978.

Computer networking history

1981	Internet protocol version 4, or IPv4, was officially defined in RFC 791 in 1981. IPv4 was the first major version of the Internet protocol.
1981	BITNET was created in 1981 as a network between IBM mainframe systems in the United States.
1981	CSNET (Computer Science Network) was developed by the U.S. National Science Foundation in 1981.
1983	ARPANET finished the transition to using TCP/IP in 1983.
1983	Paul Mockapetris and Jon Postel implement the first DNS in 1983.

Computer networking history

1986	The NSFNET (National Science Foundation Network) came online in 1986. It was a backbone for ARPANET, before eventually replacing ARPANET in the early 1990s.
1986	BITNET II was created in 1986 to address bandwidth issues with the original BITNET.
1988	The first T1 backbone was added to ARPANET in 1988.
1988	WaveLAN network technology, the official precursor to Wi-Fi, was introduced to the market by AT&T, Lucent, and NCR in 1988.
1988	Details about network firewall technology was first published in 1988. The published paper discussed the first firewall, called a packet filter firewall, that was developed by Digital Equipment Corporation the same year.

Computer networking history

1990	Kalpana, a U.S. network hardware company, developed and introduced the first network switch in 1990.
1996	IPv6 was introduced in 1996 as an improvement over IPv4, including a wider range of IP addresses, improved routing, and embedded encryption.
1997	The first version of the 802.11 standard for Wi-Fi is introduced in June 1997, providing transmission speeds up to 2 Mbps.
1999	The 802.11a standard for Wi-Fi was made official in 1999, designed to use the 5 GHz band and provide transmission speeds up to 25 Mbps.
1999	802.11b devices were available to the public starting mid-1999, providing transmission speeds up to 11 Mbps.

Computer networking history

1999	The WEP encryption protocol for Wi-Fi is introduced in September 1999, for use with 802.11b.
2003	802.11g devices were available to the public starting in January 2003, providing transmission speeds up to 20 Mbps.
2003	The WPA encryption protocol for Wi-Fi is introduced in 2003, for use with 802.11g.
2003	The WPA2 encryption protocol is introduced in 2004, as an improvement over and replacement for WPA. All Wi-Fi devices are required to be WPA2 certified by 2006.
2009	The 802.11n standard for Wi-Fi was made official in 2009. It provides higher transfer speeds over 802.11a and 802.11g, and it can operate on the 2.4 GHz and 5 GHz bandwidths.
2018	The Wi-Fi Alliance introduced WPA3 encryption for Wi-Fi in January 2018, which includes security enhancements over WPA2.