

University of Mumbai			
<b>Class:</b> T.E.	<b>Branch:</b> Computer Engineering	<b>Semester:</b> V	
<b>Subject:</b> Computer Network (Abbreviated as <b>CN</b> )			
Periods per Week (each 60 min)	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	--	50
	Oral	---	--
	Term Work	---	25
	Total	03	175

<b>Objectives of the course:</b> This is first course in Computer Networks. Need of Communication is the fundamental expectation along with the Layered approach of Computer Network. It is expected to know the details of layers along with the functionalities like: How each layer works? and how each layer communicates with other layers?		
<b>Pre-requisites:</b> Course in Data Structures and computer organization, C/C++.		
Module	Contents	Hours
1	<b>Introduction:</b> Network Applications; Network Hardware: Topologies, LAN, MAN, WAN, Wireless network, Home Network, Internetworks; Network Software: Protocol Hierarchies, Design Issues for the layers, Connection oriented and connectionless Services; Reference Models: Layers details of OSI, TCP/IP Models.	04
2	<b>The Physical Layer</b> <b>Transmission Media:</b> Guided Transmission Media: Twisted pair, Coaxial, Fiber optics; Unguided media (Wireless Transmission):Radio waves, Microwaves, Infrared <b>Network Hardware Components:</b> Connectors, Transceivers and Media converters, Network interface cards & PC cards, Repeaters, Hubs, Bridges, Routers & Gateways etc. <b>Telephone network:</b> Major componets, Local acess transport areas, Signaling, Services provided by telephone networks; Dial up Modems; Digital Subscriber line: ADSL, HDSL, SDSL, VDSL; <b>Cable Television network:</b> Cable TV for data transfer, BW, sharing, CM and CMTS, Data transmission schemes: DOCSIS	08
3	<b>The Data Dink Layer:</b>	07

	<p><b>Error detection and correction:</b> Types of errors, redundancy, detection versus correction, forward error correction versus retransmission, coding; Block Coding: Error detection, Error correction, Hamming distance, minimum hamming distance; , Linear block codes; Cyclic codes: CRC, hardware implementation, Polynomials, Cyclic code analysis, Advantages, Other cyclic codes; Checksum;</p> <p><b>Data Link Control:</b> Framing: Fixed size and variable size framing; Flow and Error control, Protocols for Noisy Channels: simplex protocol, Stop and wait protocol; Protocols for Noisy Channels: Concept of Sliding Window Protocol, Stop and wait ARQ, Go-back-N ARQ, Selective repeat ARQ; Example of Data Link Protocols: HDLC; The Data Link Layer in the Internet: PPP.</p>	
3	<p><b>The Medium Access Sub-layer:</b> The channel Allocation Problem: Static and Dynamic Channel Allocation; Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA; Controlled Access: Reservation, Polling, Token passing; Channelization: FDMA, TDMA, CDMA; Ethernet: IEEE standards; Standard Ethernet: MAC Sublayer, Physical Layer; Bridged Ethernet, Switched Internet, Full-Duplex Ethernet; Fast Ethernet: MAC Sublayer, Physical Layer; Gigabit Ethernet: MAC Sublayer, Physical Layer, Ten Gigabit Ethernet</p>	06
4	<p><b>The Network Layer:</b> Network Layer Design Issues: Store and Forward Packet switching, Service provided to the transport layer, Implementation of connectionless and connection oriented services, comparison of Virtual-Circuit and Datagram Subnets; Routing Algorithms: Shortest path routing, Flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast Routing; Congestion Control Algorithms: General Principles, Congestion prevention policies, Congestion control in virtual circuit &amp; Datagram subnets; Quality Of Service: Requirements, Techniques for achieving good QoS; Internetworking; Introduction to IP Protocol and IP Addresses,</p>	07
5	<p><b>The Transport Layer:</b> The Transport Service: Transport service primitives, Berkeley Sockets, Socket programming examples; Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release, Flow control and buffering, Multiplexing; Introduction to the Internet Transport Protocols: UDP and TCP</p>	03
6	<p><b>Network Hardware Components:</b> Connectors, Transceivers and Media converters, Network</p>	04

	interface cards and PC cards, Repeaters, Hubs, Bridges, Switches, Routers and Gateways etc	
7	<b>Wireless LANs/WANs:</b> Introduction to Architecture and Layers of IEEE 802.11, Bluetooth, SONET; Introduction to Satellite Networks.	03

### TOPICS FOR EXPERIMENT and TERM WORK

1. Programs on Error detection and correction: CRC, Hamming Code, Checksum, etc
2. Use network simulators like NS2 to implement:
  - a. Monitoring traffic for the given topology
  - b. Analysis of CSMA and Ethernet protocols
  - c. Network Routing: Shortest path routing, DVR, LSR.
  - d. Analysis of congestion control (TCP and UDP).
3. Network Socket programming:
  - a. TCP/UDP Client-Server program.
  - b. Stop and Wait using sockets.
  - c. Sliding Window Program using sockets.
4. Assignment: Case study with Windows / Linux, Prepare short note on any one advanced topic.

### BOOKS

#### Text Books:

1. A. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition.
2. B. A. Forouzan, "Data Communications and Networking", TMH, Fourth Edition.

#### References:

1. M. A. Gallo and W. M. Hancock, "Computer Communications and Networking Technologies", CENGAGE Learning (Indian Edition), First Edition.
2. Peterson, and Davie, "Computer Networks", Morgan Kaufmann, Second Edition.
3. Kurose, Ross, "Computer Networking", Pearson Education, Third Edition.
4. S. Keshay, "An Engineering Approach to Computer Networking", Addison Wesley.
5. W.R. Stevens, "Unix Network Programming", Vol.1, Pearson Education.

### TERM WORK

Term work should be based on the Lab experiments (10 Marks) and attendance (5 Marks). A term test or oral must be conducted with a weightage of (10 Marks)

### PRACTICAL/ORAL EXAMINATION

A Practical/Oral examination is to be conducted based on the above syllabus.