

Savitribai Phule Pune University Third Year of Computer Engineering (2015 Course) 310245: Computer Networks		
Teaching Scheme: TH: 04 Hours/Week	Credit 04	Examination Scheme: In-Sem (Paper): 30 Marks End-Sem (Paper): 70 Marks
Prerequisite Courses: Computer Organization and Architecture (210244)		
Companion Course: Computer Network Lab (310248)		
Course Objectives: <ul style="list-style-type: none"> To understand the fundamental concepts of networking standards, protocols and technologies. To learn different techniques for framing, error control, flow control and routing. To learn role of protocols at various layers in the protocol stacks. To learn network programming. To develop an understanding of modern network architectures from a design and performance perspective 		
Course Outcomes: On completion of the course, student will be able to– <ul style="list-style-type: none"> Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies Demonstrate design issues, flow control and error control Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols. Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community. Illustrate Client-Server architectures and prototypes by the means of correct standards and technology. Demonstrate different routing and switching algorithms 		
Course Contents		
Unit I	Physical Layer	09 Hours
Introduction of LAN; MAN; WAN; PAN, Ad-hoc Network, Network Architectures: Client-Server; Peer To Peer; Distributed and SDN, OSI Model, TCP/IP Model, Topologies: Star and Hierarchical; Design issues for Layers, Transmission Mediums: CAT5, 5e, 6, OFC and Radio Spectrum, Network Devices: Bridge, Switch, Router, Brouter and Access Point, Manchester and Differential Manchester Encodings; IEEE802.11: Frequency Hopping (FHSS) and Direct Sequence (DSSS)		
Unit II	Logical Link Control	09 Hours
Design Issues: Services to Network Layer, Framing, Error Control and Flow Control. Error Control: Parity Bits, Hamming Codes (11/12-bits) and CRC. Flow Control Protocols: Unrestricted Simplex, Stop and Wait, Sliding Window Protocol, WAN Connectivity : PPP and HDLC		
Unit III	Medium Access Control	09 Hours

Channel allocation: Static and Dynamic, Multiple Access Protocols: Pure and Slotted ALOHA, CSMA, WDMA, IEEE 802.3 Standards and Frame Formats, CSMA/CD, Binary Exponential Back-off algorithm, Fast Ethernet, Gigabit Ethernet, IEEE 802.11a/b/g/n and IEEE 802.15 and IEEE 802.16 Standards, Frame formats, CSMA/CA.

Unit IV	Network Layer	09 Hours
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Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, NAT, CIDR, ICMP, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet: RIP, OSPF, BGP, Congestion control and QoS, MPLS, Mobile IP, Routing in MANET : AODV, DSR

Unit V	Transport Layer	09 Hours
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Services, Berkley Sockets, Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, TCP, TCP Timer management, TCP Congestion Control, Real Time Transport protocol(RTP), Stream Control Transmission Protocol (SCTP), Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless.

Unit VI	Application Layer	09 Hours
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Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).

Books:

Text:

1. Andrew S. Tenenbaum, –Computer Networks”, PHI, ISBN 81-203-2175-8.
2. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408 – 7

References:

1. Kurose, Ross –Computer Networking a Top Down Approach Featuring the Internet”, Pearson, ISBN-10: 0132856204
2. Matthew S. G, –802.11 Wireless Networks”, O’Reilly publications, ISBN: 81-7656-992-5
3. C. Siva Ram Murthy and B. S. Manoj, –Ad Hoc Wireless Networks: Architectures and Protocols” Prentice Hall, ISBN-10: 8131706885; ISBN-13: 978-8131706886
4. Holger Karl and Andreas Willing, –Protocols and Architectures for Wireless Sensor Networks”, Wiley India , ISBN: 9788126533695
5. Eldad Perahia, Robert Stacey, –Next Generation Wireless LANs”, Cambridge, ISBN-10: 1107016762; ISBN-13: 978-1107016767
6. Efraim Turban, Linda Volonino, Gregory R. Wood –Computer Networking a Top Down Approach Featuring the Internet”, 10th Edition, Wiley; ISBN13: 978-1-118-96126-1