

Savitribai Phule Pune University Third Year of Artificial Intelligence and Data Science (2019 Course) 317521: Computer Networks		
Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	Mid_Semester(TH): 30 Marks End_Semester(TH): 70 Marks
Prerequisite Courses, if any:		
Companion Course, if any: CN Laboratory(317527)		
Course Objectives: <ul style="list-style-type: none"> To understand the Basics concepts of networking standards, protocols and technologies. To learn the different signal transmission, multiplexing techniques. To learn the role of protocols at various layers in the protocol stacks. To learn the different IEEE standards. 		
Course Outcomes: On completion of the course, learner will be able to– CO1: Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies CO2: Analyze the working of physical layer protocols. CO3: Analyze the working of different routing protocols and mechanisms CO4: Implement client-server applications using sockets CO5: Illustrate role of application layer with its protocols, client-server architectures CO6: Summarize concepts of MAC and ethernet.		
Course Contents		
Unit I	Fundamentals of Computer Network	(06 Hours)
Definition, uses of computer network, Network Devices: Bridge, Switch, Router, Gateway, Access Point, Network Topologies: Bus, Star, Ring, Tree, Mesh, Hybrid, Types of Network: LAN, MAN, WAN, PAN, Ad-Hoc Network, Networks Software, Protocol, Design issues for the Network layers. Types of Transmission Media: Guided Media, Unguided Media. Network Architecture: Client-Server, Peer To Peer, Hybrid. Network Models: OSI and TCP/IP Model, Types of Addressing: Physical addressing, Logical addressing, Port addressing and other addressing.		
#Exemplar/Case Studies	Demonstrate the LAN Network	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	Physical Layer	(7 Hours)
Functions of Physical Layer, Data And Signals, Digital Transmission, Analog Transmission, Transmission Impairment: Attenuation, Distortion, Noise, Bandwidth utilization: Multiplexing : Frequency-Division Multiplexing , Wavelength Division, synchronous time-division multiplexing, statistical time-division multiplexing. Spread Spectrum: Frequency Hopping (FHSS) and Direct Sequence Spread Spectrum (DSSS), Switching: circuit switching, packet switching, message switching, Types of cable connection: Straight through connection, Cross over Connection. Line Coding Schemes: Manchester and Differential Manchester Encodings.		

#Exemplar/Case Studies	Study of college campus network	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	Network Layer	(7 Hours)
Introduction: Functions of Network layer. Switching Techniques: Circuit switching, Message Switching, Packet Switching. IP Protocol: Classes of IP (Network addressing), IPv4, IPv6, Network Address Translation, Sub-netting, CIDR. Network layer Protocols: ARP, RARP, ICMP, IGMP. Network Routing and Algorithms: Static Routing, Dynamic Routing, Distance Vector Routing, Link State Routing, Path Vector. Routing Protocols: RIP, OSPF, BGP, MPLS. Routing in MANET: AODV, DSR, Mobile IP.		
#Exemplar/Case Studies	Simulation of Network Layer Protocol	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	Transport Layer	(7 Hours)
Process to Process Delivery, Services, Socket Programming. Elements of Transport Layer Protocols: Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, Congestion Control. Transport Layer Protocols: TCP and UDP, SCTP, RTP, Congestion control and Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless networks.		
#Exemplar/Case Studies	Simulation of Demonstration of Transport layer protocols.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	Application Layer	(6 Hours)
Client Server Paradigm, Peer to Peer Paradigm, Communication using TCP and UDP services, Domain Name System (DNS), HyperText Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).		
#Exemplar/Case Studies	Study of Application Layer protocols using network protocol analyzer. e.g. Wireshark	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	Medium Access Control	(6 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.		
#Exemplar/Case Studies	Study of Medium Access Control protocols	
Mapping of Course Outcomes for Unit VI	CO6	

Learning Resources

Text Books:

1. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw-Hill, Publications, ISBN: 0-07-058408-7
2. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson India, 2012.
3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on Approach", Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515
4. Behrouz A. Forouzan, TCP/IP Protocol Suite, McGraw Hill Education, ISBN: 978-0-07-070652-1, 4th Edition.

Reference Books:

1. L. Peterson and B. Davie, "Computer Networks: A Systems Approach", 5th Edition, Morgan-Kaufmann, 2012.
2. Kurose, Ross "Computer Networking a Top Down Approach Featuring the Internet", Pearson, ISBN-10: 0132856204
3. Matthew S. G, "802.11 Wireless Networks", O'Reilly publications, ISBN: 81-7656-992-5
4. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols" Prentice Hall, ISBN-10: 8131706885; ISBN-13: 978-8131706886
5. Holger Karl and Andreas Willing, "Protocols and Architectures for Wireless Sensor Networks", Wiley India, ISBN: 9788126533695
6. Eldad Perahia, Robert Stacey, "Next Generation Wireless LANs", Cambridge, ISBN-10: 1107016762; ISBN-13: 978-1107016767
7. 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

e-Books:

MOOC Courses:

@ The CO-PO Mapping Table

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
CO1	1	1	-	2	1	1	-	-	2	2	-	1
CO2	1	1	-	1	1	1	-	-	2	2	-	1
CO3	2	3	-	2	1	1	-	-	2	2	-	1
CO4	1	1	1	-	1	-	-	-	1	-	1	1
CO5	1	3	-	-	1	-	1	1	-	-	-	-
CO6	1	1	-	2	1	1	-	-	2	2	-	1