GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3161007
Semester – VI
Subject Name: Computer Networks

Type of course: Elective

Prerequisite: Basics of Computer hardware and software

Rationale: This course imparts a unified system view of the broad field of data and computer communications. The fundamentals of data communication are thoroughly explained to an extent of implementation in various networks.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction to Data Communication and Networking Data communication, use of Networks, Internet Protocols and standards, layering of Models, OSI model, TCP/IP Internet model.	2
2	Physical Layer Transmission media (Twisted pair, Coaxial cable, Fiber optic cable), Wireless Medium as Physical Layer (Electromagnetic Spectrum, ISM Band, Lighwave Transmission), Circuit switching, DSL technology, Cable modem.	4
3	Data Link Layer Services to N/W layer, Framing, Bit Stuffing, Character Stuffing, Error control, Flow control mechanism stop & wait, Go-back-, Selective repeat. Example data link protocol HDLC, PPP.	7
4	Medium Access Layer Channel allocation problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA	5
5	Local Area Network Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, Blue tooth, Zigbee, Connecting devices- Repeaters, Hub, Bridges, Switch, Router, Gateways, Broadband Wireless Networks	7
6	Network Layer Packet Switching, Virtual circuits and datagram, Static and Dynamic Routing Algorithms (Optimality principle, Static Routing Algorithms: Shortest Path, Flooding, Dynamic routing Algorithms: Distance Vector, Link state routing.), Congestion Control, IP	8

	Addressing, CIDR & NAT, IP layer protocols (ICMP, ARP, RARP, DHCP, BOOTP), IPv4 and IPv6.	
7	Transport layer Elements of Transport protocols - TCP & UDP	4
8	Application Layer DNS- Domain Name System, E-mail, FTP, HTTP, WWW, Firewall, Network Security	5

Reference Books:

1. Computer Networks by Andrew S. Tanenbaum, 4th Edition, Prentice Hall Publication
2. Data Communication and Networking by Behrouz Forouzan, 4th Edition, Tata McGraw-Hill Publication
3. Data and Computer Communication by William Stallings, Prentice Hall Publication
4. Computer Networks by Bhushan Trivedi, Oxford Publication
5. Computer networking: A top-down approach featuring the internet by Kurose, F James, 3rd Edition, Pearson Education India.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Differentiate unique responsibilities and tasks performed by various layers in top-down and bottom-up approach of data flow	10%
CO-2	Design and troubleshoot customized small scale – short distance to large scale long distance networks to mitigate network hardware aspect	30%
CO-3	Simulate, modify, develop and implement algorithms and protocols at different layers to mitigate implementation aspects of the networks	45%
CO-4	Identify various network threats and implement standard security algorithms for safe and effective utilization of the Internet	15%

Tentative / Proposed List of Experiments:

1. Implementation of bit stuffing and de-stuffing

2. Implementation of character stuffing and de-stuffing

3. Implementation of parity checker

4. Implementation of CRC

5. Implementation of checksum

6. Implementation of pure and slotted ALOHA

7. Implementation of shortest path algorithm

10. Implementation of encryption and decryption algorithms

Design based Problems (DP)/Open Ended Problems:

1. Identification of various networks components

a. Connections, BNC, RJ-45, I/O box
b. Cables, Co-axial, twisted pair, UTP
c. NIC (network interface card)
d. Switch, Hub

2. Sketch network diagram of any network

3. Interfacing with the network card (Ethernet)

4. Preparing of network cables

5. Establishment of a LAN

6. Troubleshooting of networks

7. Installation of Linux operating System and basic commands

8. Introduction to Network Simulation Tools like Cisco Packet Tracer (CPT)

List of Open Source Software/ Learning website:

1. **Virtual Lab: http://vlabs.iitkgp.ernet.in/ant/**
2. **Learning Website:** http://nptel.ac.in