SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

B. Tech. Semester IV

Subject Name: **Computer Communication and Networking** **Subject Code: BTEC13405**
Type of course: PCC
Prerequisite: Basics of Computer Hardware, C Language, Matlab, Python for Programming.
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				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. no.	Topics	Teaching Hrs.	Module % Weightage
1.	**Introduction:** Introduction to Data Communication, Types of Networks, The Internet Protocols, and standards, Design issues of Layers, OSI reference model, TCP/IP Internet model.	5	10
2.	**Physical Layer:** Transmission media (Twisted pair, Coaxial cable, Fiber optic cable), Wireless Transmission (Electromagnetic Spectrum, ISM Band, Lightwave Transmission), Circuit switching, DSL technology, Cable modem.	3	5
3.	**Data Link Layer:** Services to the network layer, Framing, Bit Stuffing, Character Stuffing, Error control, Flow control, Error detection, and correction, Simplex stop & wait for protocol, Sliding window protocol, Go back N, Selective repeat. Example data link protocol HDLC, PPP.	8	20
4.	**Medium Access Control:** Channel allocation problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA	4	10
5.	**Local Area Network:** Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN,	3	5

	Bluetooth, Zigbee, Connecting devices- Repeaters, Hub, Bridges, Switch, Router, Gateways, Broadband Wireless Networks		
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, Quality of service, Internetworking, The Internet Protocol, IP Addressing, CIDR & NAT, Network layer protocols (ICMP, ARP, RARP, DHCP, BOOTP), IPv4 and IPv6.	10	25
7.	**Transport layer:** Elements of Transport protocols - TCP & UDP.	4	10
8.	**Application Layer:** DNS- Domain Name System, E-mail, FTP, HTTP, WWW, Firewall, Streaming Audio, Internet radio, Voice over IP, Video on demand	4	5
9.	**Network Security:** Cryptography, Symmetric key algorithms, Public Key algorithms, Digital signatures, Authentication protocols	4	10

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	15	25	25	15	5

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Computer Networks	Andrew S. Tanenbaum	Prentice Hall	2017	4th
2.	Data Communication and Networking	Behrouz Forouzan	Tata McGraw-Hill	2017	4th

Course Outcome:

Sr. No.	CO Statement	Marks %

	After learning this subject students will be able to,	weightage
CO-1	Analyze and witness the use and application of network components.	10
CO-2	Recognize the importance of all the layers of the OSI model as well as the TCP/IP protocol suite.	20
CO-3	Acquire the skills to prepare computer networks with subnetting and routing mechanisms.	20
CO-4	Describe error detection and correction, flow control and congestion control mechanisms.	20
CO-5	Analyze the behavior of data packets at various layers.	20
CO-6	Explain cryptography algorithms to protect data in computer communication.	10

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	1	1	2	1	2	1	1	1	1	1	1	2	1	1	2
CO-2	1	1	1	1	2	1	1	1	1	1	1	3	1	1	2
CO-3	2	2	3	1	2	2	2	1	2	3	3	3	2	2	3
CO-4	2	2	1	2	2	1	1	1	1	1	1	2	2	2	3
CO-5	1	1	1	2	2	1	1	1	1	1	1	2	2	1	3
CO-6	2	2	2	2	2	1	2	3	2	1	3	3	2	2	3

List of practical:

1. Implement an error detecting mechanism using CRC. Generate CRC for any message. Append CRC with a message for transmission. Generate error in the transmitted message and identify whether it is detected.
2. Implement error detection and correction mechanism using Hamming code. Compute hamming code for 7-bit messages and 11-bit messages.
3. Write MATLAB program to encrypt data using Transposition Cipher method. Use any 6 letters Key. Your program should ask for a key. Use your key letters in ascending order to encrypt a message. Make general program. Check your program with key: signal after encryption decrypts the encrypted message to get the original data.
4. To study network property of LAN card on Windows and Linux machines. Study PING and IPCONFIG / IFCONFIG command and perform given exercise.
5. Use Wireshark packet capture utility to study network traffic and perform given exercise.
6. Use ARP, HOSTNAME, ROUTE PRINT, NETSTAT, NBTSTAT, TRACERT, PATHPING, NSLOOKUP commands on WINDOWS. Use TRACEROUTE, ROUTE PRINT, TELNET, SSH commands on LINUX.

7. Use TCPDUMP packet capture utility on UBUNTU and perform packet capturing exercise.
8. Using Cisco Packet tracer create a network with 4 subnets having a subnet mask of 26 bits. Each subnet has 4 hosts. Decide network address, subnet address, and host range.
9. Implementation of Routing algorithm based on criteria of the shortest path, minimal traffic & available bandwidth.
10. Use FTP on Linux and demonstrate file transfer. Use IPTABLES, on Linux and write firewall rules.

Homework

1. Implement an error detecting mechanism using Checksum in C or MATLAB.
2. Implement Transposition Cipher using Route Cipher. Use spiral technique and start from right top.
3. Implement Substitution Cipher using the technique of ROTA-13. Implement Substitution Cipher using the technique of CAESAR cipher.
4. Implement Stop & Wait for the protocol in C or MATLAB.
5. Take IP packet header value using Wireshark and perform checksum for IP header. Match checksum value with Wireshark.

List of Open Source/learning websites:

- http://vlabs.iitkgp.ernet.in/ant/
- https://nptel.ac.in/

List of Open Source software:

- Wireshark, Cisco Packet Tracer, TCPDUMP, IPTABLES, FTP