GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering
Level: UG
Course Code: BE05000171
Course Name: Computer Networks

w. e. f. Academic Year:	2024-25
Semester:	5
Category of the Course:	Professional Core Course

Prerequisite:	Basic knowledge of Computer Fundamentals, Operating Systems, Data Communication, and Programming Concepts.
Rationale:	The syllabus of Computer Networks is designed to meet the current and future requirements of the software and networking industry. The course introduces modern networking concepts including TCP/IP architecture, routing protocols, network security, cloud networking, Software Defined Networking (SDN), virtualization, IoT communication, wireless and 5G networks, cybersecurity practices, and AI-assisted network monitoring. The curriculum emphasizes practical implementation using simulation tools, packet analyzers, Linux networking, cloud infrastructure, and secure communication techniques. Students will gain industry-relevant skills required for network administration, cybersecurity, DevOps, cloud computing, and enterprise networking.

Course Outcomes:

Sr. No.	CO Statement	Marks % Weightage
1	CO-1: Understand computer network architecture, layered models, and transmission technologies.	18
2	CO-2: Analyze routing, switching, and IP addressing mechanisms in modern networks.	20
3	CO-3: Implement transport and application layer protocols for network communication.	20
4	CO-4: Apply network security, wireless networking, IoT, and cloud networking concepts.	22
5	CO-5: Evaluate emerging technologies such as SDN, virtualization, AI-driven monitoring, and 5G networking.	20

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL	Total no of hours per semester		ESE (E)	PA / CA (M)	PA/CA (I)	PBL (I)	ESE (V)	
45	0	30	45	120	4	70	30	20	30	50	200

**** Problem-Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.***

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to Computer Networks** Network models, OSI and TCP/IP models, network topologies, transmission media, switching techniques, Ethernet, LAN technologies, IPv4 and IPv6 addressing.	8
2	**Data Link and Network Layer** Error detection and correction, framing, MAC protocols, routing algorithms, RIP, OSPF, BGP, subnetting, CIDR, VLANs, switching concepts.	10
3	**Transport and Application Layer** TCP, UDP, congestion control, flow control, DNS, HTTP/HTTPS, FTP, Email protocols, socket programming basics, REST APIs and web communication.	9
4	**Wireless, IoT and Cloud Networking** Wi-Fi standards, Bluetooth, 5G architecture, IoT communication protocols in brief (MQTT, CoAP), cloud networking, virtualization, concept of container networking.	9
5	**Network Security and Emerging Trends** Firewalls, VPN, IDS/IPS, cryptography basics, secure communication, SDN, case study on AI-driven network monitoring, zero-trust networking, cybersecurity practices.	9
	Total	45 Hours

Suggested Specification table with Marks (Theory): (For B.E. only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**30**	**15**	**20**	**10**	**10**

R: Remembrance; U: Understanding; A: Application, N: Analyze and 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 above table.

Reference Books:

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education.
2. Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill.

3. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson.
4. William Stallings, Data and Computer Communications, Pearson.
5. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Elsevier.
6. Cisco Networking Academy Course Materials.
7. Research Papers and Whitepapers from IEEE, ACM, Cloudflare, Cisco, and Google.

List of Experiments:

1. Study of networking devices and LAN setup.
2. IP addressing and subnetting implementation.
3. Configuration of static and dynamic routing.
4. Simulation of TCP and UDP protocols using Packet Tracer/NS2.
5. Wireshark packet capture and protocol analysis.
6. Implementation of VLAN and switch configuration.
7. Wireless network configuration and security testing.
8. Socket programming using TCP and UDP.
9. Simulation of SDN using Mininet/OpenFlow.
10. Mini Project on Cloud or IoT based networking application.

Major Equipment:

1. Computer Systems with Internet Connectivity
2. Managed Switches and Routers
3. Wi-Fi Access Points
4. Network Cables and Crimping Tools
5. Packet Tracer / GNS3 / NS2 / NS3 Software
6. Wireshark Network Analyzer
7. Linux-based Networking Environment

List of Open Source Software

1. Packet Tracer / NS2 / NS3

List of learning website:

1. NPTEL – Computer Networks Courses (https://nptel.ac.in/)
2. Cisco Networking Academy (https://www.netacad.com/)
3. Wireshark Documentation and Labs (https://www.wireshark.org/)
4. AWS Networking Tutorials (https://aws.amazon.com/training/)
5. Microsoft Learn – Azure Networking (https://learn.microsoft.com/)

List of suggested activities for Problem-based Learning (PBL):

Sr. No.	PBL Category	Name of Activity	No. of Hours	Evaluation Criteria
1	Micro Project	Develop LAN/WAN setup or	10	Innovation, implementation

		network monitoring tool		and presentation
2	Industry Visit	Visit ISP/Data Center/Cloud Infrastructure	10	Industry report and observations
3	Complex Problem Solving	Secure network design for smart city or healthcare	15	Technical depth and SDG relevance
4	Video Based Learning	NPTEL/MOOC networking course completion	10	Quiz and presentation
5	Technical Writing	Research article on 5G, SDN or cybersecurity	10	Originality and technical content
6	Poster/Presentation	Presentation on cloud or IoT networking	6	Communication and technical accuracy
7	Group Discussion	Discussion on AI in networking and cybersecurity	5	Participation and analysis
8	Case Study/Seminar	Case study on cyberattack or network outage	10	Analysis and reporting

Note:

In alignment with Outcome-Based Education (OBE) and NBA accreditation requirements, the subject Computer Networks incorporates Mini Project, Micro Project, Seminar Activities, and Industry-oriented learning through Project-Based Learning (PBL). These activities encourage innovation, teamwork, communication skills, practical implementation, and research-oriented learning aligned with modern networking and cybersecurity industry practices.

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