

Code: BCA- 4002T (for theory) and BCA-4002P (for practical)	CC-X	Computer Networks	3L+T:4P	5 Credits (45 hours theory and 60 hours practical)
Max Marks; Theory: 100 (Int: 25; Ext: 75); Practical: 100				
Course Outcomes: Upon completion of the course, students will be able to CO1: Understand the fundamental concepts of computer networks and their applications. CO2: Develop problem-solving skills related to network design, implementation, and troubleshooting. CO3: Implement Network Protocols CO4: Configure Network devices.				
Unit	Topics			Purposed lectures
I	Introduction To Computer Networks: Overview of Computer Networks: Definition and Objectives, Applications and Examples of Network Components and Architecture, Data Communication Components and Characteristics, Data Representation and Data Flow. Network Models: OSI Model: Layers and Functions, TCP/IP Model: Layers and Functions, Comparison Between OSI and TCP/IP Models. Network Topologies: Physical Vs. Logical Topologies, Common Topologies: Star, Ring, Bus, Mesh, Hybrid, Advantages and Disadvantages of Each Topology. Data Transmission: Guided and Unguided Media, Analog Vs. Digital Signals, Transmission Modes: Simplex, Half-Duplex, Full-Duplex, Bandwidth and Latency. Networking Devices: Routers, Switches, Hubs, Bridges, Gateways, Functions and Configurations of Each Device.			11
II	Data Link Layer and Networking Protocols: Data Link Layer Fundamentals: Functions of the Data Link Layer, Framing, Error Detection, and Error Correction, Flow Control Mechanisms. Ethernet: Ethernet Standards and Frame Structure, MAC Addressing and ARP, Ethernet Switching: Basic Concepts and Methods. Network Protocols: Introduction to TCP/IP Protocol Suite, IP Addressing: Ipv4 and Ipv6 Sub netting and CIDR Notation. Address Resolution Protocol (ARP): ARP Operation and Table, ARP Spoofing and Security Considerations. Virtual LAN(VLAN): Concept of VLAN, VLAN Tagging and Configuration, Benefits and Use Case.			11
III	Network Layer and Transport Layer: Network Layer: IP Routing: Static Vs. Dynamic Routing, Routing Protocols: RIP, OSPF, BGP, Network Address Translation (NAT). Transport Layer: TCP Vs. UDP: Characteristics and Use Cases, TCP Handshake and Connection Management, Flow Control and Congestion Control in TCP. Congestion Control Algorithms: Techniques: Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery, TCP Variants: TCP Reno, TCP Vegas. Quality of Service (QoS): QoS Principles and Mechanisms, Differentiated Services (DIFFSERV) And Integrated Services (INTSERV). Network Security Fundamentals: Threats and Vulnerabilities, Basic Security Mechanisms: Firewalls, VPNS, And Encryption.			11
IV	Application Layer and Emerging Technologies: Application Layer Protocols: HTTP/HTTPS: Structure and Operation, FTP, SMTP, POP3, IMAP: Protocols and Uses, DNS: Domain Name System and Resolution. Network Applications: Web Browsing, Email Communication, File Transfer, VOICE OVER IP (VOIP) And Streaming. Emerging Technologies: Software-Defined Networking (SDN), Network Function Virtualization (NFV), Internet of Things (IOT) and its Impact on Networking, Network Management: SNMP: Simple Network Management Protocol, Network Monitoring Tools, and Techniques. Future Trends in Networking: 5G and Beyond, Network Automation and Artificial			12

	Intelligence in Networking.	
Lab Programs	<p>Configure Basic Network Settings:</p> <ol style="list-style-type: none"> 1. IP Address Configuration 2. Subnet Mask and Gateway Settings <p>Implement Network Protocols:</p> <ol style="list-style-type: none"> 3. Write a simple Python script to perform DNS resolution. 4. Implement a basic HTTP client-server application. <p>Network Simulation:</p> <ol style="list-style-type: none"> 5. Use network simulation tools (e.g., Cisco Packet Tracer) to design and simulate network topologies. 6. Configure routers and switches in a simulated environment. <p>Performance Measurement:</p> <ol style="list-style-type: none"> 7. Measure network performance using tools like 'ping', 'tracert', and 'iperf'. 8. Analyze network traffic using Wireshark. <p>Implement VLANs:</p> <ol style="list-style-type: none"> 9. Configure VLANs on a switch and verify using simulation tools. <p>Set Up a Simple Web Server:</p> <ol style="list-style-type: none"> 10. Deploy a basic web server and configure HTTP/HTTPS access. <p>Network Security Lab:</p> <ol style="list-style-type: none"> 11. Implement basic firewall rules and VPN configurations. Perform vulnerability scanning and analyze results. <p>Network Troubleshooting:</p> <ol style="list-style-type: none"> 12. Diagnose and resolve common network issues. 13. Use troubleshooting commands and techniques to fix connectivity problems. 	
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Tanenbaum, Andrew S., and David J. Wetherall. <i>Computer Networks</i>. 5th ed., Pearson Education, 2011. 2. Kurose, James F., and Keith W. Ross. <i>Computer Networking: A Top-Down Approach</i>. 8th ed., Pearson, 2021. 3. Comer, Douglas E. <i>Computer Networks and Internets</i>. 6th ed., Pearson, 2014. 4. Shay, William A. <i>Understanding Communications and Networks</i>. 3rd ed., Cengage Learning, 2004. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Forouzan, Behrouz A. <i>Data Communications and Networking</i>. 5th ed., McGraw-Hill Education, 2012. 2. Peterson, Larry L., and Bruce S. Davie. <i>Computer Networks: A Systems Approach</i>. 6th ed., Morgan Kaufmann, 2019. 	