Devi Ahilya Vishwavidhyalaya, Indore, India Institute of Engineering & Technology					B.Tech III Year Computer Engineering (FullTime)	
Course Code & Name	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total No. of Hours per Semester**	**Total Credits (Total Hours/30)**
5RCPC2 COMPUTER NETWORKS	**L**	**T**	**P**	**TW + SL**	**120**	**4**
	30	**10**	**20**	**60**		

Course Learning Objectives:

- Understand Network Fundamentals: Explain the concepts, architecture, protocols, and models (OSI and TCP/IP) used in computer networks.
- Analyze Network Communication: Describe how data is transmitted across networks using routing, switching, addressing, and transport protocols.
- Apply Networking Concepts: Configure, troubleshoot, and evaluate basic network setups while understanding network security principles and real-world applications.

Prerequisites:

Knowledge of Computer Fundamentals, Data Communication concepts, Digital Logic, Operating System basics, and basic programming concepts.

COURSE CONTENT

UNIT 1:

Computer Network: Definitions, goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Principals of physical layer: Media, Bandwidth etc

UNIT 2:

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary &Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net models. ARP/RARP/GARP, etc

UNIT 3:

MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and SlottedALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols: Basic Bit Map, BRAP, Binary Count Down, MLMA Limited Contention Protocols:

Adaptive Tree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant, etc

UNIT 4:
Network Layer: Need, Services Provided , Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding, Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6, etc

UNIT 5:
Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management.Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP), etc

CO No.	Course Outcome (CO)
CO1	Explain the fundamental concepts of computer networks, network architectures, OSI/TCP-IP reference models, and transmission media.
CO2	Apply networking concepts such as IP addressing, subnetting, switching, routing, and data transmission protocols.
CO3	Analyze the functions and performance of Data Link, Network, and Transport layer protocols, and evaluate routing and congestion control techniques.
CO4	Configure, troubleshoot, and evaluate computer networks using networking tools while implementing basic network security mechanisms.
CO5	Apply network security principles, wireless networking concepts, and emerging technologies to design reliable and efficient network solutions.

Course Outcomes
After completion of the course students will be able to
1. Characterize and appreciate computer networks from the view point of components and from the view point of services
2. Display good understanding of the flow of a protocol in general and a network protocol in particular
3. Model a problem or situation in terms of layering concept and map it to the TCI/IP stack
4. Select the most suitable Application Layer protocol (such as HTTP, FTP, SMTP, DNS, Bit torrent) as per the requirements of the network application and work with available tools to demonstrate the working of these protocols.

5. Design a Reliable Data Transfer Protocol and incrementally develop solutions for the requirements of Transport Layer
6. Describe the essential principles of Network Layers and use IP addressing to create subnets for any specific requirements

Books Recommended

1.Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks” Pearson Education.
2 Douglas E Comer, “Internetworking WithTcp/Ip Principles, Protocols, And Architecture - Volume I” 6 th Edition,Pearson Education
3.DimitriBertsekas, Robert Gallager, “Data Networks”, PHI Publication, Second Edition.
4.KavehPahlavan, Prashant Krishnamurthy, “Networking Fundamentals”, Wiley Publication.
5.Uyless Black, “Computer Networks”, PHI Publication, Second Edition.
6.Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill.
7. Data Communications and Networking, Fourth Edition by Behrouz A. Forouzan

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 12	PSO1	PSO2	PSO3
5RCPC2. CO1	3	2	1	–	2	–	–	–	–	1	–	2	1	–
5RCPC2. CO2	3	3	2	1	3	–	–	–	–	2	–	3	2	1
5RCPC2. CO3	3	3	3	2	3	–	–	–	1	2	–	3	3	2
5RCPC2. CO4	3	3	3	2	2	–	–	1	2	3	–	3	2	2
5RCPC2. CO5	3	2	2	2	2	1	–	1	2	3	–	2	3	2

List of Practical Assignments :

1. Study and implementation of basic networking commands (ping, ipconfig/ifconfig, tracert/traceroute, netstat, nslookup, arp, etc.).
2. Study of different types of network cables, connectors, networking devices, and their applications.
3. Design and simulation of a LAN network using Cisco Packet Tracer and configure PCs, switches, and basic connectivity.

4. Implementation of IP addressing and subnetting and verification of communication between different networks using Cisco Packet Tracer.
5. Configuration and simulation of VLAN (Virtual Local Area Network) and Inter-VLAN communication using Cisco Packet Tracer.
6. Configuration of static routing between multiple networks using routers in Cisco Packet Tracer.
7. Configuration and analysis of dynamic routing protocols (RIP and OSPF) using Cisco Packet Tracer.
8. Configuration of DHCP server and automatic IP address allocation using Cisco Packet Tracer.
9. Design and configuration of a Wireless LAN network using wireless devices in Cisco Packet Tracer.
10. Configuration and implementation of network security concepts such as Access Control Lists (ACL), router security, and basic firewall settings using Cisco Packet Tracer.