



TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)
Delhi Road, Moradabad (U.P.)

PhD PROGRAMME

SYLLABUS FOR DISCIPLINE-SPECIFIC COURSE COMPUTER APPLICATIONS/ COMPUTER SCIENCE & ENGINEERING

Course Code: PDS240133	ADVANCE COMPUTER NETWORKS	L	T	P	C
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Objective:	To gain an advanced understanding of advanced computer network concepts wired and wireless network architectures, protocols, and advanced topics like SDN, NFV, and IoT. and implement these concepts practically in real-time systems				
Course Outcomes:					
CO 1:	Analyze the goals, architecture, and applications of networks, including Internet structure, layering principles, OSI and TCP/IP models, network types, topologies, switching techniques, Ethernet standards, and core protocols.				
CO 2:	Evaluate wired and wireless networks by understanding routing protocols, Quality of Service (QoS), network management, wireless standards, cellular networks, and security challenges.				
CO 3:	Advanced concepts such as Software-Defined Networking (SDN), Network Function Virtualization (NFV), Internet of Things (IoT), cloud and edge networking, vehicular and industrial networks, and emerging technologies and mmWave.				
CO 4:	Cryptography, firewalls, intrusion detection systems, and VPNs while optimizing network performance through real-time threat detection, traffic engineering, and energy efficiency.				
CO 5:	Explore cutting-edge research areas including machine learning for networking, green networking and underwater and space networks while gaining hands-on experience through practical tools and research case studies.				
Course Content:					
Unit 1:	Goals and applications of networks, Categories of networks, Organization of the Internet, ISP, Network structure and architecture (layering principles, services, protocols and standards), OSI and TCP/IP models, types of networks (LAN, MAN, WAN), network topologies, network media, switching techniques (circuit, packet, message switching), Ethernet standards (IEEE 802.3), and core protocols (IP, TCP, UDP, ICMP, ARP).				
Unit 2:	Wired network protocols, routing protocols (RIP, OSPF, EIGRP, BGP), Quality of Service (QoS), network management (SNMP, NetFlow); wireless standards (IEEE 802.11, IEEE 802.15.4, IEEE 802.16), wireless LANs, PANs, MANs, cellular networks (4G LTE, 5G NR), wireless routing protocols (AODV, DSR, ZRP), and wireless security challenges.				
Unit 3:	Software-defined networking (SDN), Network Function Virtualization (NFV), Internet of Things (IoT) protocols, cloud and edge computing networking, Vehicular Ad Hoc Networks (VANETs), Industrial IoT, Wireless Sensor Networks (WSNs), and emerging technologies like Li-Fi and mmWave.				

Unit 4:	Security principles (confidentiality, integrity, availability), cryptographic techniques, firewalls, intrusion detection systems, Virtual Private Networks (VPNs), real-time threat detection, performance metrics (throughput, latency, jitter, packet loss), traffic engineering, load balancing, and energy efficiency in networks.
Unit 5:	Machine learning for networking, blockchain in networks, quantum networking, green networking, underwater and space networks, case studies on advanced networking trends, research paper analysis, and practical experiments using tools like NS3, Wireshark, GNS3, and Packet Tracer.
Textbooks:	<ol style="list-style-type: none"> 1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill 2. Andrew Tanenbaum "Computer Networks", Prentice Hall. 3. William Stallings, "Data and Computer Communication", Pearson. 4. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson
Reference Books:	<ol style="list-style-type: none"> 1. 1. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann 2. W. A. Shay, "Understanding Communications and Networks", Cengage Learning. 3. D. Comer, "Computer Networks and Internets", Pearson. 4. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill.