

ELECTIVE-1

ADVANCED COMPUTER NETWORKS

Subject Code: CS34121CS	Subject Type: Elective
Evaluation Scheme: MSE(30), TA(20), ESE(50)	L-T-P: 3-0-0

Pre-Requisites: Computer Fundamentals, Computer Architecture, Operating Systems

Course Objective: To enable students to understand and apply Network Addressing, Communication protocols, and Routing Algorithms.

Course Outcomes: At the end of the course, the student will be able to

CO-1	Understand the reference models, and layer functionalities of Network
CO-2	Demonstrate the key challenges of Channel Allocation, and various solutions
CO-3	Develop customized routing algorithms, IP addressing, and subnet masking
CO-4	Analyze Data Center Networking (DCN), and IoT communication and data exchange protocols

Course Articulation Matrix:

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	1	-	-	-
CO-2	3	2	1	-	1	1
CO-3	3	2	-	-	3	1
CO-4	3	2	1	1	-	1

1 - Slightly; 2 - Moderately; 3 – Substantially

Syllabus:

UNIT-1: Network Architecture and Communication Protocols

Introduction, Reference Models (TCP & IP), Software Defined Networking (SDN) & ATM Networks, Physical Layer - Transmission Media, Switching Techniques, Data link layer – Framing, Error Detection, Correction & Flow control.

UNIT-2: MAC Protocols and Channel Access Mechanisms

Channel Allocation Problem, Fundamentals of MAC Protocols – CSMA/CD, CSMA/CA, Token Bus & Token Ring. MAC Protocols for WSNs: Schedule-Based Protocols, Random Access-Based Protocols, Coordination, Schedule Synchronization, Adaptive Listening, Access Control and Data Exchanges.

UNIT-3: Advanced Routing and Network Optimization

Structure of a Router, Subnet, Building a Routing Table, Static Routing, Dynamic Routing Distance Vector Routing Algorithm, Link State Routing (OSPF), Hierarchical Routing. IP addressing & classes, Subnet masking, Algorithms for IP address lookup and optimization,

hardware implementation of address lookup, Differentiated Service, Quality of Service, Traffic Polishing, Traffic Shaping.

UNIT-4: Emerging Network Technologies and IoT Protocols

WSN - Low-Energy Adaptive Clustering Hierarchy, Power-Efficient Gathering in Sensor Information Systems, Geographical Routing Directed Diffusion. Network Function Virtualization (NFV) - Architecture and Concepts, Data Center Networking (DCN) – SAN & NAS architectures. Introduction To: IoT Data Transmission Protocols - MQTT, CoAP, DDS, AMQP. Network Access & Wireless Protocols - LoRaWAN, Zigbee/Z-Wave, Bluetooth Low Energy (BLE).

Learning Resources:

Text Books:

1. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Fifth Edition, Pearson Education, 2012.
2. Computer Networks: A Systems approach, Larry L. Peterson & Bruce S. Davie, 5E, Elsevier, 2012.
3. Computer Networks: A Top-Down Approach, Behrouz A. Forouzan, Firoz Mosharaf, Tata McGraw Hill, 2012.
4. Holger Karl and Andreas Wiling "Protocols and Architectures for Wireless Sensor Networks"- John Wiley & Sons.
5. Raj Kamal, Internet of Things: Architecture and Design Principles, McGraw Hill Education, private limited, 2017.