NIRMA UNIVERSITY

Institute:	Institute of Technology, School of Technology
Name of Programme:	MTech CSE
Course Code:	6CS251CC22
Course Title:	Advanced Computer Networks
Course Type:	Core
Year of Introduction:	2022-23

L	T	Practical Component				C
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Course Learning Outcomes (CLO):

At the end of the course, the students will be able to:

1. demonstrate knowledge of modern networking concepts and data center network planning (BL2)
2. apply suitable methods to optimize the performance of modern networks (BL3)
3. evaluate real-world networking case studies, including CDNs and cognitive radio networks, to recommend improvements (BL6)
4. design and configure networks to support a specified set of applications. (BL5)

Unit	Contents	Teaching Hours (Total 30)
Unit-I	**Network Concepts and Protocols:** Networking Principles, Network Elements, IPv6 addressing and interoperability with IPv4, Congestion control and TCP, QUIC, SPDY, Split TCP, Websockets	08
Unit-II	**Routing:** Router scheduling algorithms, Router architectures, Border Routing protocols BGP, MPLS	07
Unit-III	**Software Defined Networking**: Data Plane, Control Plane, Application Plane, Controller design, Virtualization, OpenFlow protocol for SDN	04
Unit-IV	**Data Center Networking:** Data center architectures, Data center congestion control, Data center network protocols, MPTCP, DCTCP, Low Latency protocols for Data center	05
Unit-V	**Case Studies and Applications:** Content delivery and video streaming networks, Content Centric Networks, Backbone of Internet, Internet exchange points and BGP, Large scale data centers, Cognitive radio networks	06

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents

Suggested Readings/ References:

1. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, Pearson
2. William Stallings, Foundations of Modern Networking (SDN, NFV, QoE, IoT and Cloud), Pearson

3. William Stallings, High-speed networks and Internets – Performance and Quality of Service, PHI
4. Hans W. Barz, Gregory A. Bassett, Multimedia Networks: Protocols, Design and Applications, Wiley
5. Rajkumar Buyya, Mukaddim Pathan and Athena Vakali, Content Delivery Networks, Springer
6. Relevant research papers for the topics.

Suggested List of Experiments:

Sr. No.	Name of Experiments/Exercises	Hours
1	Demonstrate functioning of Web request serving with DNS, ARP, and HTTP using Wireshark	04
2	Using Wireshark demonstrates TCP connection, data exchange, and termination process	04
3	Design a socket-based client-server application using transport layer primitives	04
4	Configure an IPv4/IPv6 network using a packet tracer and perform static routing using Dual Stack Server	04
5	Configure Autonomous networks using BGP and MPLS in a network simulator	04
6	Create data, control, and application planes in software-defined networking in Openflow. Build an example application and invoke services and network commands in Openflow	04
7	Simulation of Data Center with OpenDC software.	06