Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NCSC503	Advanced Computer Networks	3	1	0	4

Course Objective

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

- To study the evolving technologies and standards
- To understand the protocols, architectures and applications of various networks.
- To gain expertise in some various types of networks..

Learning Outcomes

On successful completion of this unit students will be able to:

- Identify the basic concept and understand the state-of-the-art in protocols, architectures and applications of computer networks.
- Classify and also develop new protocols in ad-hoc networks.
- Analyze, design and solve routing, transport, quality of service and traffic engineering problems.
- Understand, and effectively use, engineering principles and theories to generate solutions with multiple objectives and often-conflicting goals between customers and service providers.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Overview of Computer Networks: [OSI Reference Model, TCP/IP Protocol Suite, Network Architecture]	2	Learn basics of Computer Networks.
2	Network Layer: [IPv4, NAT, Subnetting, Supernetting, VPN, Next Generation IP, Mobile IP]	5 + 2	Understand the functioning of Internet protocol (version 4 & 6) along with Mobile IP.
3	Intra-domain and Inter-domain Routing: [RIP, OSPF, BGP]	3 +1	To learn about different intra-domain and inter-domain routing protocols and performance issues.
4	Multicast Routing [Introduction, Multicast Addressing, Routing Algorithms, Implementation of Routing Algorithms (MOSPF, DVMRP, PIM), Internet Group Management Protocol (IGMP)]	3 + 1	To learn the advantages of multicasting in network and how that can be implemented.
5	Transport Layer: [TCP and its variants, Stream Control Transmission Protocol (SCTP), Multipath TCP (MPTCP), Mobile TCP (MTCP), Congestion Control, Analysis of Network Congestion Mechanism, QoS]	5 + 2	To understand the network traffic control and management mechanisms used in the Internet. To learn about different traffic engineering solutions and their applicability in different context
6	Software-Defined Networking (SDN): [Need and use of SDN, SDN Controllers, Network Programmability, Network Function Virtualization, SDN Frameworks, Use cases for traffic monitoring & Classification, Bandwidth Scheduling and Monitoring]	4 + 1	To learn about centralized control vs. distributed control of the network. To learn about network functions, virtualization and architectural principles of SDNs. To understand technical challenges and potential issues arising in SDN deployment.

7	Network Function Virtualization (NFV): [Needs and Benefits of NFV, NFV Architecture, Valiant load balancing (VLB), Elastic scaling of NFV]	3 + 1	Learn to simplify the programming of software network functions. Learn methods to achieve high performance for software network functions.
8	Data Centre Networking (DCN): [Introduction, Types of Data Centre Network, Design of Network, Network performance metrics, Flow and Congestion Control mechanisms]	3 + 1	To learn about data centre architecture design performance measures. To build a high-performance data centre network and to achieve flexible management in a data centre network.
9	Peer to Peer Networks (P2P): [Introduction to P2P networks, Routing Technology, Transmission Technology, Resource Management, Content Delivery]	4 + 1	To learn about overlay architecture and its applications like content searching, content distribution, file sharing, real time content sharing, resilient routing, content caching etc.
10	Ad-hoc Networks and Sensor Networks: [Introduction, Challenges and Issues, AODV, DSR, DSDV Routing protocols; Architecture and factors influencing the sensor network design; Concept of MANET and VANET]	6 + 3	To understand basic properties of Ad-hoc Networks and to get an overview of different routing techniques used in MANET, WSN and VANET.
11	Delay Tolerant Networks (DTN): [Delay Tolerant Network Architecture, DTN Routing Protocols, Congestion Control in DTNs, DTN Applications]	4 + 1	To learn about challenged/opportunistic networks and their applicability. To learn about the modified network architecture which enables data transfers under delay and disruptions conditions. To learn, how to leverage such networks to connect the IP network for data transfer.
Total		**42 + 14 (T)**	

Text Books:

1. Andrew S. Tanenbaum, “Computer Networks”, Pearson Education, 6th Edition

Reference Books:

1. William Stallings, “Data and Computer Communications”, Pearson Education, 10th Edition.
2. James F. Kurose and Keith W. Ross, “Computer Networking – A top Down Approach” Pearson Education, 10th Edition.
3. Peterson and Davie, “Computer Networks: A Systems Approach”, Morgan Kaufmann, 6th Edition.
4. Behrouz A. Forouzan, “Data Communications and Networking with TCP/IP Protocol Suite”, Tata McGrawHill, 6th Edition.