Program	ADP Data Science	
Course Code	CC-214N	
Course Title	Computer Networks	
Credit Hours	**Theory**	**Lab**
	3	1
Lecture Duration	90 minutes (1.5 Hours), 2 lectures per week, 3 hours lab session per week	
Semester	6	
Pre-requisites	**Courses**	**Knowledge**
	None	
Follow Up Courses		

Course Learning Outcomes (CLOs)

CLO No	**Course Learning Outcome**	**Bloom Taxonomy**
CLO-1	Describe the key terminologies and technologies of computer networks	C2 (Describe)
CLO-2	Explain the services and functions provided by each layer in the Internet protocol stack.	C2 (Explain)
CLO-3	Identify various internetworking devices and protocols and their functions in a networking	C4 (Identify)
CLO-4	Analyze working and performance of key technologies, algorithms and protocols	C4 (Analyze)
CLO-5	Build Computer Network on various Topologies	C3 (Build)

Aims and Objectives	The course will cover computer networks in a top down manner starting from the application layer to data link layer. The course will be
	taught in the Internet perspective and will therefore cover the layers of the TCP/IP suite. After the completion of this course, students will be able to: 1. Understand the fundamental concepts of networking. 2. Know the working of each layer in TCP/IP suite. 3. Identify the challenges involved in data flow and error control. 4. understand the working of internet.
Learning Outcomes	5. CLO-1: Describe the key terminologies and technologies of computer networks 6. CLO-2: Explain the services and functions provided by each layer in the Internet protocol stack. 7. CLO-3: Identify various internetworking devices and protocols and their functions in a networking 8. CLO-4: Analyze working and performance of key technologies, algorithms and protocols 9. CLO-5: Build Computer Network on various Topologies

Syllabus	Introduction and protocols architecture, basic concepts of networking, network topologies, layered architecture, physical layer functionality, data link layer functionality, multiple access techniques, circuit switching and packet switching, LAN technologies, wireless networks, MAC addressing, networking devices, network layer protocols, IPv4 and IPv6, IP addressing, sub netting, CIDR, routing protocols, transport layer protocols, ports and sockets, connection establishment, flow and congestion control, application layer protocols, latest trends in computer networks.
Contents	I. **Introduction** i. Overview of the Internet ii. Overview of Networking Protocols iii. Network Edge iv. Network Core v. Protocol Layers / Service Model vi. Physical Media vii. Some History of the Internet
	viii. General Networking Example II. **Application Layer** i. Principles of Networking Applications ii. Web and HTTP iii. FTP iv. Email v. DNS vi. Peer-to-Peer (P2P) III. **Transport Layer** i. Transport Layer Services ii. Multiplexing and Demultiplexing iii. Connectionless Transport: UDP iv. Principles of Reliable Data Transport v. Connection-Oriented Transport: TCP vi. Principles of Congestion Control vii. TCP Congestion Control IV. **Network Layer** i. Virtual Circuits and Datagram Networks ii. Inside a Router iii. Details of the Internet Protocol (IP) iv. IP Subnetting v. Routing Algorithms vi. Link State vii. Distance Vector viii. Hierarchical Routing V. **Link Layer** i. Error Detection and Correction ii. Multiple Access Protocols iii. Local Area Networks iv. Multiprotocol Label Switching (MPLS)) v. Data Center Networking
Teaching-learning Strategies	The course will be based on the following teaching and learning activities: Lectures covering the theoretical part using PowerPoint presentations Case studies Review questions

Assignments	Total 4 Assignment
Textbooks	• Kurose, J. F., & Ross, K. W. (2021). Computer networking: A topdown approach featuring the Internet. Boston: Addison-Wesley.
Reference Material/Suggested Readings	• Tanenbaum, A. S. (2013. Computer networks. Upper Saddle River, N.J: Prentice Hall PTR. • Stallings, W. (2014). Data and computer communications. Upper Saddle River, N.J: Prentice Hall. • Forouzan, B. A., Coombs, C. A., & Fegan, S. C. (2012). Data communications and networking. Boston: McGraw-Hill.
Notes	• Power Point slides with reading material from book.

Detailed Lecture wise plan

Week	Lecture	Topic	Source Book (Ch#)	Recommendation for Learning Activities
1	1	What Is the Internet? A Nuts-and-Bolts Description A Services Description What Is a Protocol?	Ch-01	
	2	The Network Edge Access Networks Physical Media The Network Core Packet Switching Circuit Switching A Network of Networks	Ch-01	
2	3	Delay, Loss, and Throughput in Packet-Switched Networks Overview of Delay in Packet-Switched Networks Queuing Delay and Packet Loss End-to-End Delay Throughput in Computer Networks Protocol Layers and Their Service Models Layered Architecture Encapsulation Networks Under Attack	Ch-01	

Week	Lecture	Topic	Source Book (Ch#)	Recommendation for Learning Activities
	4	History of Computer Networking and the Internet The Development of Packet Switching: 1961–1972 Proprietary Networks and Internetworking: 1972–1980 A Proliferation of Networks: 1980–1990 The Internet Explosion: The 1990s The New Millennium	Ch-01	**Assignment-1**
3	5	Principles of Network Applications Network Application Architectures Processes Communicating	Ch-02	**Quiz-1**
	6	Transport Services Available to Applications Transport Services Provided by the Internet Application-Layer Protocols Network Applications	Ch-02	
4	7	The Web and HTTP Overview of HTTP Non-Persistent and Persistent Connections HTTP Message Format User-Server Interaction: Cookies Web Caching The Conditional GET	Ch-02	
	8	File Transfer: FTP FTP Commands and Replies Electronic Mail in the Internet SMTP Comparison with HTTP Mail Message Format Mail Access Protocols	Ch-02	
5	9	DNS—The Internet's Directory Service Services Provided by DNS Overview of How DNS Works DNS Records and Messages	Ch-02	
	10	Peer-to-Peer Applications P2P File Distribution Distributed Hash Tables (DHTs) Socket Programming: Creating Network Applications Socket Programming with UDP Socket Programming with TCP	Ch-02	**Assignment-2**

Week	Lecture	Topic	Source Book (Ch#)	Recommendation for Learning Activities
6	11	Introduction and Transport-Layer Services Relationship Between Transport and Network Layers Overview of the Transport Layer in the Internet Multiplexing and Demultiplexing	Ch-03	**Quiz-2**
	12	Connectionless Transport: UDP UDP Segment Structure UDP Checksum	Ch-03	
7	13	Principles of Reliable Data Transfer Building a Reliable Data Transfer Protocol Pipelined Reliable Data Transfer Protocols Go-Back-N (GBN) Selective Repeat (SR)	Ch-03	
	14	Connection-Oriented Transport: TCP The TCP Connection TCP Segment Structure Round-Trip Time Estimation and Timeout Reliable Data Transfer Flow Control TCP Connection Management	Ch-03	
8	15	Principles of Congestion Control The Causes and the Costs of Congestion Approaches to Congestion Control Network-Assisted Congestion-Control	Ch-03	
	16	TCP Congestion Control Fairness	Ch-03	
9	17	The Network Layer Introduction Forwarding and Routing Network Service Models Virtual Circuit and Datagram Networks Virtual-Circuit Networks Datagram Networks	Ch-04	**Assignment-3**
	18	What's Inside a Router? Input Processing Switching Output Processing Where Does Queuing Occur? The Routing Control Plane	Ch-04	**Quiz-3**

Week	Lecture	Topic	Source Book (Ch#)	Recommendation for Learning Activities
10	19	The Internet Protocol (IP): Forwarding and Addressing in the Internet Datagram Format IPv4 Addressing, Subnetting, CIDR Internet Control Message Protocol (ICMP) IPv6	Ch-04	
	20	Routing Algorithms The Link-State (LS) Routing Algorithm The Distance-Vector (DV) Routing Algorithm Hierarchical Routing	Ch-04	
11	21	Routing in the Internet Intra-AS Routing in the Internet: RIP Intra-AS Routing in the Internet: OSPF Inter-AS Routing: BGP	Ch-04	
	22	Broadcast and Multicast Routing Broadcast Routing Algorithms Multicast	Ch-04	
12	23	Introduction to the Link Layer The Services Provided by the Link Layer Where Is the Link Layer Implemented?	Ch-05	**Assignment-4**
	24	Error-Detection and -Correction Techniques Parity Checks Check summing Methods Cyclic Redundancy Check (CRC)	Ch-05	**Quiz-4**
13	25	Multiple Access Links and Protocols Channel Partitioning Protocols	Ch-05	
	26	Random Access Protocols Taking-Turns Protocols DOCSIS: The Link-Layer Protocol for Cable Internet Access	Ch-05	
14	27	Link-Layer Addressing and ARP Ethernet Link-Layer Switches	Ch-05	

Week	Lecture	Topic	Source Book (Ch#)	Recommendation for Learning Activities
	28	Virtual Local Area Networks (VLANs) Link Virtualization: A Network as a Link Layer Multiprotocol Label Switching (MPLS)	Ch-05	
15	29	Data Center Networking	Ch-05	
	30	A Day in the Life of a Web Page Request DHCP, UDP, IP, and Ethernet DNS and ARP	Ch-05	
16	31	Intra-Domain Routing to the DNS Server Web Client-Server Interaction: TCP and HTTP	Ch-05	
	32	Final Q & Answer session		