



FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Artificial Intelligence (AI) & Data Science)

Semester: IV

Course Code: 202044506

Course Title: Data Communication and Networking

Course Group: Professional Core Course

Course Objectives: This course provides the fundamental knowledge of the various aspects of computer networking and enables students to understand the basic concepts of data communication occurring using computer networks. This course teaches the design and implementation techniques essential for engineering robust networks. Topics include networking principles, Transmission Control Protocol/Internet Protocol, naming and addressing (Domain Name System), link layer protocols, routing protocols, transport layer services, congestion control.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				Total
Lecture	Tutorial	Practical		Theory		J/V/P*		
				Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25 / 09	25 / 09	150 / 53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Data Communication and Networking: Basis for Data Communication, Uses of Computer Networks, Network Devices, Network Software Internet Reference Models (OSI and TCP/IP), Networks Protocols and Standards, Topology and Transmission Modes, Network Types – LAN, WAN and MAN.	4
2	Physical Layer: Guided Transmission Media, Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access.	4
3	Data Link Layer - Medium Access Control Sublayer: Data Link Layer Design Issues, Error Detection and Correction, Data Link Control and Protocols, Data Link Layer Protocols: Simplex, Stop and Wait, Sliding Window Protocol, Random Access Protocols (ALOHA, CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols, Limited Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN protocols, Data link layer switching: Bridges, local Internetworking, Spanning tree bridges, Virtual LAN, Address resolution protocol (ARP), Reverse address resolution protocol (RARP)	8



4	Network layer: Introduction and Design Issues, Implementation of Connection Oriented and Connection Less Service, Virtual Circuit and Datagram Subnets, IP protocol and addressing on the Internet, Network Address Translation(NAT), ICMP, IGMP, Difference between IPv4 and IPv6, Routing Algorithms: Optimality principle, Shortest path routing, Routing Information Protocol (RIP), Border Gateway Protocol (BGP), Flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing. Congestion Control Algorithms: Principles, Prevention policies, Congestion control in virtual circuit subnets, Congestion control in datagram subnets, Load shedding, Jitter control quality of service requirements.	12
5	Transport layer: Transport Layer Service, Connectionless Protocol UDP – User Datagram, Services, Application, Connection Oriented Protocol TCP – Service, features, Segment, Windows in TCP, Multiplexing and Demultiplexing, Principles of reliable data transfer, Error and Flow Control in TCP, TCP Congestion Control, Simple Protocol, Go back N, Stop and Wait, Selective Repeat, Piggybacking	6
6	Application layer: Principles of Computer Applications, File Transfer Protocol, Electronic Mail: Architecture and services, SMTP, POP, IMAP and MIME, World Wide Web: Architectural Overview and HTTP, Domain Name System, Telnet, DHCP	6
	Total	40

List of Practicals / Tutorials:

1	Study of various networking commands in Windows and Introduction to CISCO Packet Tracer software.
2	Write a program; 1. To identify the class of given IP addresses in dotted decimal notation. 2. To Find First address, Last address, and No. of address of given IP address in dotted.
3	A basic LAN setup in Cisco Packet Tracer(Direct Connection Between Computers using hub, switch, router).
4	Implement different LAN topologies using Cisco Packet Tracer.
5	Implementation of Checksum and Cyclic Redundancy Check.
6	Introduction to Default & Static Routing and Configuring the same in CISCO packet tracer.
7	Introduction to Dynamic Routing and configuring RIP and OSPF in CISCO packet tracer.
8	Configure DHCP and DNS Server in CISCO packet tracer.
9	Configure Web Server and FTP Server in CISCO packet tracer.
10	Examine Network Address Translation (NAT) in CISCO packet tracer.
11	Introduction to packet capturing using Wireshark.
12	Case Study: Understanding of network design & components available at your institute. OR Mini Project: Implement Network Desktop Manager.

Reference Books:

1	Andrew S Tanenbaum, "Computer Networks", 5 th Edition, Pearson Education.
2	Behrouz A Forouzan, "Data Communication and Networking", 5 th Edition, McGraw Hill.



3	James Kurose and Keith Rose, "Computer Networking: A Top-Down Approach", 6th Edition, Pearson Education.
4	William Stallings, "Data and Computer Communication", 10 th Edition, Pearson Education.
5	Bhushan Trivedi, "Computer Networks", Oxford University Press.
6	Jim Kurose; Keith Ross, "Computer Networking: A Top-Down Approach", 6th Edition, Pearson Education.

Supplementary learning Material:

1	NPTEL - Swayam Courses a. https://nptel.ac.in/courses/106105183 b. https://nptel.ac.in/courses/106105081 c. https://nptel.ac.in/courses/106105080
2	CISCO Packet Tracer
3	Wireshark Packet Capturing

Pedagogy:

- Direct Classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment (Tutorials)
- Interactive methods
- Seminar/Poster presentation

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
15%	25%	25%	15%	20%	-	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	% weightage
CO-1	Understand network fundamentals, concepts of OSI reference model and real-world protocol suite such as TCP/IP.	16
CO-2	Learn different link layer terminologies like error detection-correction, multiple access protocol and link layer addressing used in networks.	26
CO-3	Ability to design network architecture and to apply various routing algorithms for network-layer packet delivery	24
CO-4	Learn essential principles of connectionless and connection-oriented protocols used for reliable data transfer, flow control and congestion control.	20
CO-5	Understand basic protocols of the application layer and how they can be used to assist in network design and implementation.	14



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Aegis: Charutar Vidya Mandal (Estd.1945)

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025