GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Information and Communication Technology

Course / Subject Code : DI03000131

Course / Subject Name : Computer Networking

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	
Rationale:	Computer Networks & Data Communication is crucial for students as it forms the backbone of modern communication systems. Understanding this subject is essential for comprehending how data is transferred and shared across devices and networks. It enables students to grasp the fundamentals of internet protocols, network security, and the seamless flow of information in the digital age. Proficiency in this subject is essential for various careers, ensuring students are well-equipped for the ever-evolving technology landscape. Thus, this course is an important course for students who want to work in network administration, cybersecurity, software development, and systems engineering.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Analyze the key concepts of Computer network, the various physical network topologies.	R,U,A
02	Select proper devices and transmission media based on network application	R,U,A
03	Manage contemporary network infrastructures and configure fundamental network devices based on criteria.	R,U,A
04	Use Internet protocols and standards, layered models	R,U,A
05	Analyze network security protocols of hardware and software layer.	R,U,A

Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	**T**	**PR**	**C**	ESE (E)	PA(M)	PA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	1.1 Need, Advantages and Applications of Computer Networks 1.2 Physical topologies of Network : Star, Ring, Bus, Mesh, Tree, Hybrid 1.3 Internet Standards: Protocol, Interface, 1.4 Network Classification i. Based on Transmission Technologies: Point-to point, broadcast ii. Based on scale: PAN, LAN, WAN, MAN, VPN, Internet iii. Based on Architecture: Peer to Peer, Client Server, advantages of Client Sever over Peer-to-Peer Model 1.5 OSI and TCP/IP models and their comparison	7	17%
2.	2.1 Classification of Transmission Media: Role of different devices 2.2 Repeaters, Hubs, Bridges, Switches (layer 2 and layer 3) 2.3 Routers 2.4 Access Points 2.5 Firewalls: Concept, principles. 2.6 Introduction to Network management system (OS, CLI, Administrative Functions, Interfaces) 2.7 Ethernet, Fast Ethernet, Gigabit Ethernet 2.8 Wireless LAN 2.9 FDDI & CDDI 2.10 Software defined network	8	19%
3.	3.1 Physical Layer: Transmission media (Twisted pair, Coaxial cable, Fiber optic cable) 3.2 Wireless Medium as Physical layer, 3.3 ISM Band 3.4 Cable modem 3.5 Sub Layers of Data Link Layer and functions: Error control, Flow control examples 3.6 Network Layer: Packet Switching 3.7 IP Addressing 3.8 CIDR & NAT 3.9 IP layer protocols (ICMP, ARP, RARP, DHCP, BOOTP) 3.10 IPv4 and IPv6 comparison	11	24%
4.	4.1 Transport Layer: Elements of Transport protocols - TCP & UDP, connection oriented and connection less 4.2 Application Layer: 4.2.1 DNS- Domain Name System	11	24%

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	4.2.2 Internet Services: World Wide Web: Web browser, HTML 4.2.3 Electronic Mail: Functions of Email system, User agent, Message format, Mail Protocols (SMTP, POP3), FTP, Remote Login 4.3 Voice and Video over IP		
5.	5.1 Introduction to Network Security, Cryptography 5.2 Security topologies - Security zones, DMZ, Internet, Intranet, VLAN, Security implication, Tunnelling. 5.3 IP security: Overview, architecture, configuration. 5.4 Virtual Private Network. 5.5 Email security : Email security standards : Working principles of SMTP, PEM, PGP, S/MINE, spam. 5.2 Information Security Standards - ISO, IT Act, Copyright Act, Cyber Laws in India. 5.3 IT Act 2000 Provisions and latest amendments 5.4 Social issues, Hacking, precautions	8	16%
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
26	23	21	NA	NA	NA

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:
(a) Books:

S. No.	Title of Book	Author Publication with place,	Year and ISBN
1	Data Communication and Networking	Forouzen	Tata McGraw Hill, Education New Delhi (Latest edition)
2	Computer Networks	Tannebaum Andrew S Wetherall David J.	Pearson, New Delhi, 5th Edition, 2011
3	Data and Computer Communication	Stallings Williams	PHI Learning, New Delhi (Latest edition)
4	Data Communication Networks	Sharma Sanjay	S.K.Kataria and Sons, New Delhi (Latest edition)

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| 5 | Cryptography and Network Security | Stallings Williams | PHI Learning, New Delhi (Latest edition) |

(b) Open source software and website:
  1. https://www.netacad.com/courses/packet-tracer
  2. https://www.javatpoint.com/computer-network-architecture
  3. https://www.geeksforgeeks.org/
  4. https://www.cisco.com/c/en_in/products/security/what-is-network-security.html

Suggested Course Practical List: If any

1	Building Ethernet Straight and Crossover	1	2
2	Verify RING Topology using Trainer Kit	1	2
3	Verify STAR Topology using Trainer Kit	1	2
4	Verify Internet connectivity using Command like IFCONFIG , PING, TRACERT,NETSTATE	2	2
5	Introduction to Network Simulator Tool Packet Tracer Simulator.	2	2
6	Build a Simple Two Computers Network and Verify the Connectivity in Packet Tracer Simulator.	2	2
7	Configure and Verify the Basic Switch Settings by using Switch.	2	2
8	Set Various Passwords on Router and Verify those Passwords.	2	2
9	Configure and Verify the Basic Router Settings by using Router.	2	2
10	Virtual LAN Configuration and Trunking in Packet Tracer by using Switch.	2	2
11	Virtual LAN Configuration Security in Packet Tracer by using Switch.	3	2
12	Using Wire shark to View Network Traffic	3	2
13	Router as a Server and as a Client Configuration using DHCPv4 Protocol.	3	2
14	Observing DNS Resolution	3	2
15	Accessing Network Devices With SSH	5	2
16	Study and Implement VPN	5	2
17	Configuring Dynamic and Static NAT	4	2
	Minimum 15 practical		**Min 30 Hrs**

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List of Laboratory/Learning Resources Required:

Suggested Project List:

1	Dynamic Cloud Network Control Under Reconfiguration Delay and Cost.
2	Measuring Web Latency and Rendering Performance.
3	Configuration to a DHCP Server
4	Implement and Verify Static Routes
5	Connectivity Tests with Trace route
6	Configure Dynamic NAT using Packet Tracer
7	configure Switch and Router VTY,Privilege and enable Password Assignment
8	Implement and Verify Default Routes
9	Client-Server based Instant Messenger.
10	Configure VLAN in Switch
11	Configure Web browser security settings.
12	Case study on Demonstration of wireless network between mobile device and PC for file transfer.
13	Install a small wireless network using access points.
14	Develop a small Network. (Hands on Training.)

Suggested Activities for Students: If any

Other than the laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in groups and prepare reports of each activity.

1 Prepare journals based on practical performance in the laboratory.

2 Students are encouraged to register themselves in various MOOCs such as: Swayam, edx, Coursera, Udemy etc to further enhance their learning.

Prepare chart to represent the Network Topology Diagrams, Protocol Stack Diagrams, Flowcharts for Protocols, Error and Flow Control Graphs, Bandwidth Utilization Charts, Network Performance Metrics, Comparison Charts for Data

3 Link Protocols, Routing Algorithm Comparison Graphs, IP Addressing Schemes, Network Security Charts, Comparison of Wireless Technologies, Network Management Tools Comparison, Data Communication Medium Comparison, Ethical Hacking Incidents etc

4 Explore real-world case studies of network implementations, failures, or security breaches, encouraging students to analyze and propose solutions.

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5	To design a network in your department such as one drive can be accessible from any other system.
6	Prepare LAN cable and test it.(Practice cable stripping, untwisting, and proper crimping techniques, Learn about different types of LAN cables, such as Cat5e, Cat6, or Cat6a, and their applications, Create a simple diagram or documentation illustrating the cable connections.)
7	List different types of Network operating system.
8	Identify the type of Network in your Institute

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