GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Postgraduate

Branch: Computer Engineering (Cybersecurity)

Course / Subject Code: ME01059021

Course / Subject Name: Computer Networks and Security Issues

w. e. f. Academic Year:	2024-25
Semester:	1
Category of the Course:	Program Core Course-II

Prerequisite:	Basic understanding of computer networks and information systems.
Rationale:	• The course will explore the in-depth understanding of computer networks and security with a layered approach. • The course will focus upon the corresponding security threats of each layer of the computer networks and its defending approach. • The course will focus upon security protocols analysis, Network and Web Security, Various cryptography algorithms and fundamentals. • The Course will focus on the security functions such as authentication and authorization.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the fundamentals of networks, OSI Model and protocols.	UN
02	Differentiate the different layers of issues, solutions and working.	AN
03	Apply the defending approach against network security threats.	AP
04	Apply cryptographic algorithms to achieve security goals.	AP
05	Assess the security protocols to provide a secure communication network.	EL

**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 / CA (M)	PA/CA (I)	ESE (V)	
03	00	02	04	70	30	20	30	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	UNIT 1: Introduction: **Internet,** Networks and Computer Networks, **Basics of OSI Model and TCP/IP Model,** Push Behind Networks, Standards and Regulations on Networks, Network Physical Infrastructure, **SCADA,** Internet of Things (IoT): Tomorrow	03	08
2.	UNIT 2: Network Protocols and Protocol Layers: Network Protocols, Protocols Layering, Network Protocol Stacks, services of a Protocol Layer, Performance: Network Delay, Packet Loss and Throughput	04	10
3.	UNIT 3: Application Layer: Application Layer Protocol: What is it and what is it not? Issues Solved by the Application Layer, Layer 4 Services Used by an Application, Programming Network Applications, Example Application Layer Protocols.	06	15
4.	UNIT 4: Transport Layer: Issues Solved by the Transport Layer, Addressing Processes and Packetization, Connection and Connectionless Service, Internet's Layer 4 Protocols: UDP and TCP.	04	10
5.	UNIT 5: Network Layer: Internetworking, Datagram Networks, Layer 3 Addressing and Subnetting, Network Layer Routing, Network Layer Connections: Virtual Circuits.	05	10
6.	UNIT 6: Data Link Layer: One Hop Data Delivery, Link Layer Addressing, Switches and Hubs, **Gateway,** Link Layer Error Control, Media Access Control.	03	07
7.	UNIT 7: Authentication and Authorization: Access Control Matrix**,** Role Based Access Control (RBAC)**,** XACML for Attribute Based Access Control (ABAC)**, Distributed Access Control, and Authentication**	02	04
8.	UNIT 8: Network and Web Security: Network Layers and Corresponding Threats, Application Layer Security, Defending against network security threats.	03	08
9.	UNIT 9: Cryptography: Basics and Security Goals of Cryptography, Symmetric Cryptography, Public Key Cryptography, Block modes: Encrypting more than one block, Example Algorithms, Computational Security.	05	12
10.	UNIT 10: Analysis of Security Protocols:	07	16

	Introduction, Example Security Protocols, what makes a security protocol tick: Protocol design.		

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
5	20	40	20	20	-

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:

1. Joseph Migga Kizza. Guide to Computer Network Security. Springer, 4th Edition, Computer Communications and Networks, 2017
2. James F. Kurose and Keith W. Ross. Computer Networking. A Top-Down Approach. Pearson, 7th edition, Pearson Education, 2017.
3. Behrouz A. Forouzan. Data Communications and Networking. McGraw-Hill Higher Education, 4th edition, 2007.

(b) Open-source software and website:

1. Course-related online MOOC on SWAYAM NPTEL/Coursera Platform.
2. Recently published papers/articles of reputed journals/conferences.

Suggested Course Practical List: If any

- List of Laboratory/Learning Resources Required: The practical work will be carried out based on the content covered during the academic sessions.

Suggested Project List: Creation of local network and its security projects.

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