



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Subject Code : 3174804

Subject Name: Modern Distributed Systems and Network Coordination

w. e. f. Academic Year:	A.Y. 2025-26
Semester:	VII
Category of the Course:	PEC

Prerequisite :	Data Structure and Algorithm, Operating System, Computer Network
Rationale:	Networked distributed systems are designed to enable multiple computers to work together in a coordinated manner. These systems operate across various devices without relying on a single clock, and components may fail independently. This course introduces foundational principles of distributed computing, peer-to-peer mechanisms, distributed file systems, and the challenges of ensuring security and consistency in distributed environments.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
1	Illustrate the communication architecture and interaction models in distributed systems.	U
2	Understand and apply synchronization mechanisms and leader election techniques.	U
3	Examine protocols for maintaining consistency and managing replication across distributed nodes.	An
4	Identify and address security vulnerabilities using cryptographic solutions.	E
5	Explore various implementations of distributed system models in real-world environments.	Ap

**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
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA / CA (M)	PA/CA (I)	ESE (V)	



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Course Content:

Unit No.	Content	No. of Hours
1	Introduction to Distributed Systems: Concept, objectives, system classifications, role of OS and networks in distributed environments.	02
2	Fundamentals of Architectures, Processes, and Communication: Architectures: Overview of different system architecture types and self-management capabilities in distributed environments. Processes: Introduction to threading concepts, virtualization, client-server roles, and code mobility. Communication: Various forms of communication including remote procedure calls, message-based communication, stream-based communication, and multicast techniques.	08
3	Naming Techniques: Exploration of name-address structures, flat vs. structured naming, and attribute-based naming schemes.	02
4	Synchronization and Coordination: Techniques for clock synchronization, logical clocks, mutual exclusion, GPS coordination, and leader election strategies.	04
5	Data Consistency, Replication, and Fault Tolerance: Overview of consistency models, replica control, client/server reliability, distributed commits, and recovery.	10
6	Security: Introduction to Security- Security Threats, Policies, and Mechanisms, Design Issues, Basics of Cryptography, Secure Channels- Authentication, Message Integrity and Confidentiality, Secure Group Communication; Access Control- General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of Service; Security Management- Key Management, Secure Group Management, Authorization Management	07
7	Categories of Distributed System: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, Security: Distributed Object-based System; Distributed File System; Distributed Web-based System; Distributed Coordination based System	09

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	20	10	05	00



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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. William Stallings – *Wireless Communications & Networks*
2. Asoke K. Telukder & Roopa R. Yavagal – *Mobile Computing Technology, Applications, and Services*
3. T.S. Rappaport – *Wireless Communications: Principles and Practices*
4. Pradeep Kothari – *Android Application Development Black Book*
5. Raj Kamal – *Mobile Computing*
6. Lauren Darcey & Shane Conder – *Android Wireless Application Development*
