GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Information Technology

Course / Subject Code : ME01000751

Subject Name: Distributed Computing Systems

WEF Academic Year:	2024-25
Semester:	1
Category of the Course:	PEC 2.3

Prerequisite:	Basic network concepts, Basic operating system concepts, Basic software engineering concepts, Knowledge of DNS, Unix Programming.
Rationale:	This course content enables to understand importance of Distributed Computing, its functionalities to manage resources of Computer and Peripherals in Distributed Environment. Student will be made aware of Distributed systems Management, Inter-process Communication as well as Security in distributed Environment. Students will also be going to study about distributed Computing Paradigms, which will be useful to them for Large Application Development in engineering field with emphasis given to Distributed networking applications.

Course Scheme:

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

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Introduction: History of Distributed Computing; Forms of computing: Monolithic, Micro, distributed, parallel, Co-operative; Distributed System Models; Issues in designing DS.	3	10

2	Synchronization in Distributed Computing Introduction; Clock Synchronization: Physical clock, Clock synchronization algorithms, use of synchronized clock; Logical clocks: event ordering, implementation of logical clocks, Lamport's Timestamps, Vector Timestamps; global state; Mutual Exclusion: Centralized algorithms, distributed algorithms, token ring algorithm; Election algorithms: bully algorithm, ring algorithm.	**7**	**20**
3	Inter process Communication: Event synchronization, Timeout and Threading, Deadlock and timeouts, Data Encoding, Request Response Protocols, Event diagram, sequence diagram, Connection-oriented/connectionless IPC, Evolution of paradigms for IPC.	**7**	**15**
4	Distributed Computing paradigms: Paradigms and Abstraction, an Example Application, Paradigms for Distributed Applications, Trade-Offs.	**6**	**15**
5	Distributed System Management: Resource management, Task management approach, Load balancing approach, Load sharing approach, Process Management, Process migration.	**8**	**15**
6	Naming in Distributed Systems: Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS.	**7**	**15**
7	Security in distributed Systems: Introduction, Cryptography, Secure Channels, Access Control, Security Management.	**7**	**10**
	Total	**45**	**100**

Reference Book:

1. M.L. Liu, "Distributed Computing: Principles and Applications", Pearson.
2. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems Principles and Paradigms".
3. P.K.sinha, " Distributed Operating Systems Concepts and design", PHI.
4. Sunita Mahajan, Seema Shah "Distributed Computing" Oxford Publications

Course Outcomes:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level*
01	Understand core concepts and principles of Distributed programming techniques.	**UN**
02	Learn and apply concepts of Load Balancing, Load Sharing as well as concepts of synchronization would be clear	**UN, AP**
03	Analyze and apply concept of inter process communication to build distributed environment applications	**UN, AP**
04	Understand, analyze and evaluate security aspects of distributed computing	**AN, EL**

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

At least 10 practical related to the course must be carried out during semester.

List of Laboratory/Learning Resources Required:

- C and Java along with distributed computing libraries and software

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