GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Computer Engineering
Subject Code: 3170719
Semester –VII
Subject Name: Distributed System

Type of course: Elective

Prerequisite: Data Structure and Algorithm, Operating System, Computer Network

Rationale: A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another.The components interact with one another in order to achieve a common goal. Three significant characteristics of distributed systems are: concurrency of components, lack of a global clock, and independent failure of components. From this course, students may learn foundations of distributed systems, idea of peer to peer services and file system, and security issues in distributed system.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs
1	**Fundamentals of Distributed System**: Definition of a Distributed System, Goals of a Distributed System, Types of Distributed Systems, Basics of Operating System and Networking.	02
2	**Basics of Architectures, Processes, and Communication:** Architectures - Types of System Architectures, Self Management in Distributed Systems; Processes - Basics of Threads, Virtualization, Roles of Client and Server, Code Migration; Communication - Types of Communications, Remote Procedure Calls, Message-Oriented Communication, Stream-Oriented Communication, Multicasting	08
3	**Naming** - Names, Identifiers, And Addresses, Flat Naming, Structured Naming, Attribute-Based Naming	02
4	**Synchronization** - Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Election Algorithms	04

5	**Consistency, Replication and Fault Tolerance-**Introduction To Replication, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, Consistency Protocols, Basics of Fault Tolerance, Process Resilience, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, 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					
R Level	U Level	A Level	N Level	E Level	C Level
15	**20**	**20**	**10**	**05**	**00**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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.

Reference Books:

1. Tanenbaum, A.S. and Van Steen, M., 2007. *Distributed systems: principles and paradigms.* Prentice-Hall.
2. Sinha, P.K., 1998. *Distributed operating systems: concepts and design.* PHI Learning Pvt. Ltd..
3. Liu, M.L., 2003. *Distributed computing: principles and applications.* Pearson Education Inc..
4. Lynch, N.A., 1996. *Distributed algorithms.* Elsevier.
5. Coulouris, G.F., Dollimore, J. and Kindberg, T., 2005. *Distributed systems: concepts and design.*pearson education.

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Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand architecture and communication systems in Distributed Systems	30
CO-2	Understand synchronization and various election algorithms in Distributed Systems	10
CO-3	Analyze various consistency and replication protocols and methods	30
CO-4	Recognize security threats and apply cryptography methods for security in Distributed Systems	15
CO-5	Understand various types of Distributed Systems	15

Sample List of Experiments:

1. Write a Program to implement Concurrent Echo Client Server Application.
2. Write at least 2 Programs for Remote Procedure call.
3. Write at least 2 Programs for Remote Method Invocation.
4. Write the Programs for Thread Programming in JAVA.
5. Implement Network File System (NFS).
6. Creation of a BPEL (Business Process Execution Language) Module and a Composite Application.
7. Implement CORBA file.
8. Study of Web Service Programming
9. Study of open source key management tool.