GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Computer Science Engineering(IoT and Cybersecurity Including Block Chain)

Subject Code : 3154502

Subject Name : Distributed Systems and Fundamentals of Block Chain Technology

WEF Academic Year :	2023-2024
Semester :	V
Category of the Course :	Elective

Prerequisite: Basic understanding of computer fundamental concepts and programming Data Structure and Algorithm, Operating System, Computer Network

Rationale: The course provide concepts of distributed system and an insight of blockchain technology and concepts. Distributed system are systems 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. From this course, students may learn foundations of distributed systems, idea of peer to peer services and file system, security issues in distributed system, block chain fundamental and how block chain will be useful in secure transaction in Distributed Enviornment

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Mark
L	T	P	C	Theory Marks		Practical Marks		
				ESE(M)	PA(M)	ESE(V)	PA(I)	
4	0	2	5	70	30	30	20	150

Sr. No.	Content	Total Hrs	% of Weightage
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.	04	10
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,	10	20

	Stream-Oriented Communication, Multicasting		
3	Naming - Names, Identifiers, And Addresses, Flat Naming, Structured Naming, Attribute-Based Naming	04	10
4	Synchronization - Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Election Algorithms	05	15
5	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	10	20
6	Fundamentals of Block chain: Introduction, Origin of Block chain, Block chain solution, Components of Block chain, Block in Block chain, The Technology Block chain Block chain Types and Consensus Mechanism - Decentralization and Distribution Bitcoin, Cryptocurrency Basics, Types of Cryptocurrency – Altcoins, Tokens Public Block chain – Block chain layers, Ethereum Block chain Smart Contracts, Characteristics of a smart contracts Types of smart contracts, Smart contracts in Ethereum Consortium Block chain – Key characteristics, Hyper ledger platform	20	25

	Private Block chain – Key characteristics, Private Block chain examples, Different algorithms of Permissioned Block chain Consensus Protocol – Byzantine General Problem, Objectives, Consensus algorithms		

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.
6. Blockchain Technology By Chandramouli Subramanian, Asha George, Abhilash K A and Meena Karthikeyan , Universities Press Publication
7. Blockchain Blueprint for a New Economy, By Melanie Swan,O'Reilly Publication
8. Blockchain for Dummies by Tiana Laurence, Wiley Publication

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Explore architecture and communication systems in	30

	Distributed Systems	
CO-2	Realize the 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	Explain different types of Blockchain	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. Study of Web Service Programming
8. Study of open source key management tool.
9. Create a simple blockchain program with proof-of-work(PoW)using Golang.
10. Write a calculator program for adding and subtracting two given numbers. Call this program from another smart contract which transacts items in cart and subtract money from Wallet.

* * * * * * *