Course code	Course Title	L	T	P	C
BITE402L	Distributed Computing	3	0	0	3
Pre-Requisite	BITE303L, BITE303P	Syllabus Version			
		1.0			

Course Objectives:

1. To provide a conceptual overview of the characteristics of distributed systems and the challenges associated in their design.
2. To highlight the very demanding requirements of distributed applications.
3. To illustrate, how all the architectural concepts, algorithms and technologies can be used in the design of an application.

Course Outcomes:

1. Identify the core concepts of distributed systems: the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
2. Analyze the core architectural concepts to meet the challenges in implementing distributed systems.
3. Examine important approaches in distributed systems to support synchronization and fault tolerance.
4. Derive solution that ensures reliability, security, scalability and robustness in Internet.
5. Build distributed application that demonstrates file system concepts, services, concurrency control and transactions.

Module:1	Trends in Distributed Systems and System Model	5 Hours

Trends in Distributed Systems - Resource Sharing – Challenges - Introduction to Physical Models - Architectural Models - Fundamental models - Types of Networks - Network Principles - Internet Protocols.

Module:2	Inter-Process communication and Remote Invocation	7 Hours

Introduction to Inter-Process Communication - API for Internet Protocols - External Data Representation and Marshalling - Multicast communication - Request-Reply protocols - Remote Procedure Call - Remote Method Invocation

Module:3	Distributed Objects and Web Services	6 Hours

Distributed Objects - From Objects to Components - Web Services - Service Descriptions and IDL for Web Services - Coordination of Web Services - Applications of Web Services

Module:4	Synchronization (Time and Global state), Coordination and Agreement	7 Hours

Clocks - Events and Process States - Synchronizing Physical Clocks - Logical Time and Logical Clocks - Global States - Distributed Mutual Exclusion - Elections, Coordination and Agreement in Group Communication

Module:5	Operating System Support	7 Hours

The Operating System Layer - Protection, Processes and Threads - Communication and Invocation - Operating System Architecture - Virtualization at the Operating System Level.

Module:6	Distributed File Systems and Name Services	5 hours

File Service Architecture - Name Services and Domain Name System - Directory Services Case study: Sun Network File System, The Andrew File System.

Module:7	Transactions, Concurrency Control and Distributed Transactions	6 hours

Transactions - Nested Transactions – Locks - Optimistic Concurrency Control - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks.		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book

1.	Coulouris, J. Dollimore, and T. Kindberg, "Distributed Systems: Concepts and Designs", 5th Edition, 2017, Addison Wesley.

Reference Books

1.	Andrew.S.Tanenbaum, Maarten Van Steen, "Distributed Systems –Principles and Paradigms", 3rd Edition, 2016, Prentice Hall.
2.	Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems, Distributed, Database, and Multiprocessor Operating Systems", 2017, 1st Edition, McGraw Hill.
3.	Vijay K. Garg, "Elements of Distributed Computing", 2014, 1st Edition, Wiley & Sons.

Mode of Evaluation: Continuous Assessment Tests, Assignment, Quiz, Final Assessment Test			
Recommended by Board of Studies	20-05-2022		
Approved by Academic Council	No. 66	Date	16-06-2022

'