

Branch Name:	Computer Engineering
Program Code:	ET103
Course Title:	Distributed System
Course Code:	2ET1030601T
Pre-requisite Course:	Data Structure and Algorithm, Operating System, Computer Network

Course Objectives: 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 and Examination Scheme.														
Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)									
					Theory (Marks)				Practical (Marks)				Total (Marks)	
	L	T	P	Total	SEE		CCA		SEE		CCA			
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
3	3	-	-	3	24	60	16	40	-	-	-	-	100	

Course Contents:

Unit No	Topics	Total Hours	Weightage (%)
1	Fundamentals of Distributed System: Definition of a Distributed System, Goals of Distributed System, Types of Distributed Systems, Basics of Operating System and Networking.	02	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, Stream-Oriented Communication, Multicasting	06	15
3	Naming & Synchronization - Names, Identifiers, And Addresses, Flat Naming, Structured Naming, Attribute-Based Naming, Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Election Algorithms	05	15
4	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	08	25
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	07	20

6	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	05	15
---	---	----	----

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.

E-Resource / Web Links:

1. https://vowi.fsinf.at/images/b/bc/TU_Wien-Verteilte_Systeme_VO_%28G%C3%B6schka%29_-_Tannenbaum-distributed_systems_principles_and_paradigms_2nd_edition.pdf
2. <http://cs-www.cs.yale.edu/homes/aspnes/classes/465/notes.pdf>
3. https://onlinecourses.nptel.ac.in/noc21_cs87/preview

Course Learning Outcomes (CLO):

Course Outcomes	Description	Bloom's Taxonomy Level
COL1	Understand architecture and communication systems in Distributed Systems	1.Remembering 2.Understanding
COL2	Understand synchronization and various election algorithms in Distributed Systems	1.Remembering 4. Analyze 5. Creating
COL3	Analyze various consistency , replication protocols and methods in Distributed Systems	1.Remembering 2. Understanding 5. Creating
COL4	Recognize security threats and apply cryptography methods for security in Distributed Systems	1.Remembering 3.Applying 2.Understanding
COL5	Understand various types of Distributed Systems	1.Remembering 2.Understanding

Mapping of CLO with PO and PSO :

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CLO1		L		L									M	
CLO2		L												M
CLO3	L	H	M	H	L				L		M		H	

CLO4		M	H		L				L		H		H	H
CLO5	L		L			M								H

H: High, M: Medium, L: Low