CS309: Distributed System	L	T	P	Computer Networks, Operating System
	3	1	0	

Course Objective: The objective of the course is to help students understand the fundamental goals of Distributed Systems and concepts communication, synchronization, resource allocation, file systems, fault tolerance and security.

S. No.	Course Outcomes (CO)
CO1	Apply knowledge of computer networks and operating system to perform of various (DS) algorithms and techniques related to communication, synchronization, resource allocation, file systems, fault tolerance and security.
CO2	Demonstrate limitations and applicability of various DS concepts in real life problems.
CO3	Investigate real life problems and formulate as computer engineering (DS) problems.
CO4	Design, select and apply appropriate DS concepts to solve computer engineering problems.
CO5	Compose and provide solution through computer program for DS concepts using modern computer languages such as C, Java and Python.

S. No	Contents	Contact Hours
UNIT 1	Introduction to Distributed Systems, Design Goals, Types of Distributed systems, system architectures and fundamental models, middleware, Threads, virtualization, client-Server Model, Code migration.	8
UNIT 2	Communication fundamentals, Remote Procedure Call, message oriented communication, and stream oriented communication, multicast communication.	8
UNIT 3	Synchronization: clock synchronization, logical clocks, mutual exclusion algorithms: centralized, decentralized, distributed and token ring algorithms, election algorithms.	8
UNIT 4	Replication management: need for replication, consistency models: data centric and client centric consistency models, replica management, consistency protocols: continuous, primary-based, replicated-write and cache-coherence protocols.	8
UNIT 5	Fault tolerance: basic concepts and failure models, process resilience, reliable client-server and group communication, distributed commit recovery mechanisms.	8
UNIT 6	Security in distributed systems, secure channels, authentication, integrity and confidentiality, access control, security management. Naming: Flat naming approaches, structured naming, name space and resolution, attribute- based naming, directory services, LDAP, decentralized implementations.	8
	Total	**48**