Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NCSD524	**Distributed Systems**	3	0	0	3

Course Objective
This course provides an in-depth knowledge about concepts in distributed systems, knowledge about their construction, and understanding of advantages and disadvantages of their application. It covers distributed operating system in detail, including communication process, file system and memory management synchronization and so on. The various design and implementation issues will be discussed.
Learning Outcomes
The students will gain an understanding of the principles and techniques behind the design of distributed systems, such as locking, concurrency, scheduling, and communication across networks. Students will identify the way in which several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to Distributed Systems: [Introduction to Distributed Computing System Models, Distributed Operating System, Difference between Network and Distributed System, Goals of Distributed System.]	4	Understanding of various distributing computing system models along with the issues in designing a DOS.
2	Message Passing: [Desirable features, Issues in IPC, Synchronization, Buffering, Encoding and Decoding, Process Addressing, Failure Handling, Group Communication.]	4	Presents a desirable features and the issues in designing a good message passing system
3	Remote Procedure Calls: [RPC Model, Transparency of RPC, Implementation of RPC Mechanism, RPC Messages, Marshalling, Server Management (Stateful and Stateless Server), Parameter-Passing Semantics (Call by- Value, Call-by Reference), Call-Semantics, Communication Protocols for RPCs, Client Server Binding, Special Types of RPCs.]	6	Learn about a general IPC protocol that can be used for designing several distributed applications.
4	Distributed Shared Memory: [General Architecture of DSM Systems, Design and Implementation Issues of DSM, Structure of Shared-Memory Space, Consistency Models, Replacement Strategy, Thrashing, Advantages of DSM.]	6	Know about the general architecture of DSM systems along with the design and implementation issues of the same.
5	Synchronization: [Clock Synchronization, Event Ordering, Mutual Exclusion, Deadlock, Election Algorithms.]	6	Understand the synchronization mechanisms that are suitable for distributed systems.
6	Resource Management: [Task Assignment Approach, Load-Balancing Approach, Load sharing Approach.]	6	Concepts related to widely differing techniques and methodologies for scheduling processes of a distributed systems.
7	Process Management: [Process Migration, Process Migration mechanisms, Advances of Process Migration, Threads, Model for Organizing Threads, Implementing Thread package.]	4	The best possible use of the processing resources of the entire system by sharing them among all processes running in distributed environment.
8	Distributed File Systems: [File Models, File Accessing Models, File Sharing Semantics, File-Caching Schemes, and File Replication.]	6	Understanding about the desirable features of a good distributed file system along with the concepts of design and implantation of a distributed file system.
Total		42	

Text Books:

1. "Distributed Operating Systems – Concepts and Design", by Pradeep K. Sinha (PMH).

Reference Books:

1. "Distributed Systems – Principles and Paradigms", by Andrew S. Tanenbaum and Maarten Van Steen (PHI)
2. "Distributed Systems – Concepts and Design", by G. Coulouris, J Dollimore and T. Kindberg (Pearson Education)