

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Information Technology)			
Subject Code & Name	Instructions Hours per Week			Credits			
SITRE5 Distributed Operating Systems	L	T	P	L	T	P	Total
Duration of Theory Paper:3 Hours	3	1	2	3	1	1	5

Learning Objectives:

- Provide an understanding of the principles of distributed operating systems.
- Questions concerning distributed system architecture, concepts and design, functioning; and how these meet the demands of contemporary distributed applications will be addressed.
- Undertake problem identification, formulation and solution. Capacity for independent critical thought, rational inquiry and self-directed learning.
- Realizing the challenges encountered during the design and analysis of a distributed system.
- Identifying efficient methods for facing these challenges and designing efficient distributed algorithms and systems.

Pre requisites: Basic knowledge of Operating System concepts.

COURSE CONTENTS

UNIT-I

Introduction to Distributed Systems: Distributed Computing Systems, Evolution of Distributed Computing System, Distributed Computing System Models, Distributed Operating System, Examples of Distributed Systems, Design Approaches & Issues, Computer Network and Layered protocols, Network Operating System and Distributed Operating System, Introduction to Distributed Computing Environment (DCE), Operating System Structures.

UNIT-II

Message Passing & Remote Procedure Calls(RPC): Overview of Computer Networks, Communication Inter-process communication(IPC), The Critical Section Problem, Features of a Good Message Passing System, Issues in IPC by Message Passing, Synchronization, Group Communication, Case Study: 4.3 BSD UNIX IPC Mechanism. The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Case Studies: Sun RPC.

UNIT-III

Synchronization in Distributed Systems: Logical clocks, Physical clocks, Vector Clock, Clock synchronization and related algorithms, Mutual Exclusion, Non-Token Based Algorithms – Lamport’s Algorithm, Token-Based Algorithms, Suzuki-Kasami’s Broadcast Algorithm, Election Algorithms, Dead locks in Distributed Systems, Thrashing.

UNIT-IV

Distributed Shared Memory: Introduction, General Architecture of DSM Systems, Algorithm, Protocols, Design and Implementation Issues of DSM, Page based Distributed Shared Memory, Shared variable Distributed shared Memory, and Object based Distributed shared Memory, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. Resource Management: Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load–Sharing Approach, Process Management: Introduction, Process Migration, Threads, Case studies.

UNIT-V

Distributed File Systems: Introduction, Desirable Features & Goals of Distributed File System, File models, File–Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions, Design Principles, Security in Distributed File system. Trends in distributed file system, case study Case study: Amoeba, Mach, Chorus and their comparison.

Learning Outcomes:

Upon completing the course, students will be able to:

1. Distinguish the theoretical and conceptual foundations of distributed computing. Recognize the feasibility and the impossibilities in managing resources.
2. Apply existing solutions to the core problems and develop appropriate variations of existing solutions to meet the development contexts.
3. Examine how existing systems have applied the concepts of distributed operating systems in designing large systems, and will additionally apply the concepts to develop sample systems.

Books Recommended:

- [1]. P K Sinha, “Distributed operating systems; Concepts and design”, PHI Learning.
- [2]. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson
- [3]. Ed.
- [4]. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson
- [5]. Ed.
- [6]. Sunita Mahajan & Shah, Distributed Computing, Oxford Press
- [7]. Tanenbaum and steen, “Distributed systems: Principles and paradigms”, 2nd edition,
- [8]. PHI Learning.
- [9]. Asilberschatz P.B Garvin Operating System Concept, John Wiley & Sons (Asia) Pte 2000.

List of Practical Assignment:

1. Implementation of Deadlock using JAVA programs.
2. Implementation of Bankers algorithms to avoid deadlocks.
3. Implementation Ring Election algorithm.
4. Implementation of Bully Election algorithm.
5. Prepare a multi-cast program using JAVA APIs.
6. Simulate Sequential file allocation strategy.
7. Simulate Indexed file allocation strategy.
8. Simulate Linked file allocation strategy.
9. Implement file organization strategies single level, Two level and Hierarchical.