

Branch Name:	Information and Communication Technology
Semester/Year:	Semester VI / Third Year
Subject Title:	Distributed Operating System (Elective-I)
Subject Code:	1ET1070605
Pre-requisite:	Fundamentals of Operating Systems and Computer Networks

Course Objective:

The objectives of this course are:

- To provide students with contemporary knowledge in distributed system.
- To provide the detail knowledge about models of distributed system including synchronization, deadlocks, IPC, various distributed objects like RMI and more.
- To provide knowledge on principles and practice underlying in the design of distributed systems.
- To equip students with skills to design a distributed application.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	-	02	04	70	30	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Introduction to Distributed System: Definition, Architecture of Distributed System, various distributed system models, Issues in Distributed System, Client-Server Model., Protocols for Distributed System.	4	10
2	Message Passing: Inter process Communication(IPC), Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.	6	10
3	Remote Procedure Calls: The Remote Procedure Call (RPC) Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling, Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs.	7	15
4	Distributed Objects and Remote Invocation : Introduction, Communication between distributed objects, Java RMI, CORBA	5	10
5	Distributed Shared Memory: Design and Implementation issues of Distributed Shared Memory (DSM), Granularity, Structure of Shared memory Space, Consistency Models, replacement Strategy, Thrashing, Advantages of DSM.	6	15
6	Synchronization: Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms: The Bully Election Algorithm, The Ring Election Algorithm, Deadlock in Distributed System.s	4	15
7	Resource and Process Management: Desirable Features of a good global scheduling algorithm, Task assignment approach, Load Balancing approach, Load Sharing Approach, Process Migration	5	15
8.	Threads and Naming: Process vs Threads, Thread Models, design issues in thread, Fault tolerance, introduction to naming, features of a good naming system, basic concepts of naming.	4	10

Course Outcome:

At the end of the course the student will be able to:

- Analyze various components of distributed systems
- classify distributed shared memory models
- analyze algorithms for coordination, communication, synchronization in distributed systems
- Integrate OS and programming language concepts to solve/implement the (distributed) components of the systems

List of References:

1. Distributed Operating Systems Concepts and Design by Pradeep K. Sinha (PHI)
2. Distributed computing by Sunita Mahajan and Seema Shah, Oxford University Press.
3. Distributed Systems Concepts and Design Fifth Edition George Coulouris, Jean Dollimore and Tim Kindberg, Addison-Wesley Inc./Pearson Education
4. Distributed Systems Principles and Paradigms by Andrew S. Tanenbaum and Maarten Van Steen (PHI)

E-Resource / Web Links:

- ☐ <https://www.cs.uic.edu/~ajayk/DCS-Book>
- ☐ <http://cs-www.cs.yale.edu/homes/aspnes/classes/465/notes.pdf>
- ☐ <http://nptel.ac.in/courses/106106107/>

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

- 1 Introduction of Communication Programming Concepts using RPC.
- 2 Write a program to convert given digit into appropriate word using rpcgen command.
- 3 Write a program to add two given numbers at server side using rpcgen command.
- 4 Write a program to find average of given numbers using rpcgen command.
- 5 Write a program to find length of given string using rpcgen command.
- 6 Write a program to solve Producer-Consumer Problem.
- 7 Concepts of Implementation of RMI (Remote Method Invocation) using Java.
- 8 Implementation of Date & Time Server using Java RMI.
- 9 Implementation of Server that adds given two values by the clients using Java RMI.
- 10 Implementation of threads using pthread package.
- 11 Write a Thread Program for Thread Creation & Thread Termination.
- 12 Write a Thread Program for Thread Synchronization
- 13 Write a Thread Program for Thread Joins