

## Subject Name: Distributed Systems

## Subject Code: CE 606-1 / IT 606-1

### Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
03	00	04	07	05	3	70	30	20	30	150

### Learning Objectives:

The objective of this course is

- Understanding Remote Communication and Interprocess Communication
- Study about various distributed client server models
- Create an awareness of the major technical challenges in distributed systems design and implementation
- Emerging trends in distributed computing
- Understanding Distributed Shared Memory and File System

### Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Introduction Distributed System Concepts	4
2	Basic Network Communication	4
3	Interprocess and Remote Communication	6
4	Distributed System Synchronization	7
5	Distributed System Management	6
6	Distributed Shared Memory	6
7	Distributed File System	6
8	Emerging Trends in Distributed Systems	6

**Total hours (Theory): 45**

**Total hours (Practical): 60**

**Total hours: 105**

## Detailed Syllabus:

Sr. No	Topic	Lecture Hours	Weight age (%)
1	<b>Introduction Distributed System Concepts:</b> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Distributed Computing Models</li> <li>• Software Concepts</li> <li>• Issues in Designing Distributed Systems</li> <li>• Client-Server Model</li> <li>• Case Studies: WWW 1.0 , 2.0 , 3.0</li> </ul>	4	5
2	<b>Basic Network Communication:</b> <ul style="list-style-type: none"> <li>• LAN and WAN Technologies</li> <li>• Classification of Networks</li> <li>• Protocols for Network Systems</li> <li>• ATM</li> <li>• Protocols for Distributed Systems</li> </ul>	4	5
3	<b>Interprocess and Remote Communication:</b> <ul style="list-style-type: none"> <li>• Message Passing</li> <li>• IPC in Mach</li> <li>• CBCAST protocol in ISIS</li> <li>• RPC Introduction and Basics</li> <li>• RPC Implementation and Communication</li> <li>• Sun RPC</li> <li>• RMI Implementation</li> </ul>	6	20
4	<b>Distributed System Synchronization:</b> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Clock Synchronization</li> <li>• Logical and Global state</li> <li>• Mutual Exclusion</li> <li>• Election Algorithms</li> <li>• Deadlocks in Distributed Systems</li> <li>• Deadlocks in Message Communication</li> </ul>	7	20
5	<b>Distributed System Management:</b> <ul style="list-style-type: none"> <li>• Introduction</li> <li>• Resource Management</li> <li>• Task Assignment Approach</li> <li>• Load Balancing Approach</li> <li>• Load Sharing Approach</li> <li>• Process Management and Migration</li> <li>• Threads</li> <li>• Fault Tolerance</li> </ul>	6	20
6	<b>Distributed Shared Memory:</b> <ul style="list-style-type: none"> <li>• DSM Concepts</li> </ul>	6	10

	<ul style="list-style-type: none"> <li>• Hardware DSM</li> <li>• Design Issues in DSM Systems</li> <li>• Implementing Issues in DSM Systems</li> <li>• Heterogeneous and other DSM systems</li> </ul>		
7	<b>Distributed File System:</b> <ul style="list-style-type: none"> <li>• Introduction DFS</li> <li>• File Models</li> <li>• DFS Design</li> <li>• Semantics File Sharing</li> <li>• DFS Implementation</li> <li>• File Caching in DFS</li> <li>• Replication in DFS</li> <li>• Sun Network File System</li> <li>• Google File System</li> </ul>	6	10
8	<b>Emerging Trends in Distributed Systems</b> <ul style="list-style-type: none"> <li>• Emerging Trends Introduction</li> <li>• Grid Computing</li> <li>• Service Oriented Architecture</li> <li>• Cloud Computing</li> <li>• The Future of Emerging Trends</li> </ul>	6	10
	<b>Total</b>	<b>45</b>	<b>100</b>

### **Instructional Method and Pedagogy:**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

## Learning Outcome:

On successful completion of the course, the student will:

- On successful completion of the course, the student will be having the basic knowledge of Distributed Computing.
- Student will be able to understand Distributed Models.
- To know about interposes communication and remote communication.
- Student will be able to know distributed service oriented architecture.
- To know about emerging trends in distributed computing.
- Student will be able to know Distributed Shared Memory and File System.

## Text Books:

1. Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University
2. Distributed Operating Systems by P. K. Sinha, PHI

## Reference Books:

1. Distributed Systems: Principles and Paradigms, Taunenbaum
2. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, Hagit Attiya and Jennifer Welch, Wiley India
3. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg,
4. Java Network Programming & Distributed Computing by David Reilly, Michael Reilly

## List of Practicals:

Sr. No	Name of Experiment
1	Write a program to implement hello world service using RMI
2	Write a program to implement calculator using RMI
3	Write a program to implement time service using RMI
4	Write a program to implement hello world service using RPC
5	Write a program to implement date service using RPC
6	Write a program to implement Echo SOCKET in JAVA
7	Write a program to implement Echo server using RPCGEN
8	Write a program to implement producer-consumer concept using THREAD
9	Write a program to find the length of string using THREAD
10	Hadoop Distributed File System