

Objective: To achieve knowledge about distributed operating system, its communication using remote procedure call, algorithms used for synchronization and resource management when the load or the number of users increases.

Prerequisite: Operating System, Computer Network

Credits Earned: 6 Credits

Course Outcomes: After completion of this course, student will be able to

- Knowledge of various distributed systems principles
- Understand the communication using RPC
- Apply various algorithms for resource management
- Understand concepts of distributed shared memory
- Understand synchronization using different clock and mutual exclusion algorithms

Teaching and Examination Scheme

| Teaching Scheme (Hours) | | | Credits | Theory Marks | | | Tutorial/ Practical Marks | | Total Marks |
|-------------------------|----------|-----------|---------|--------------|-------------|--------------|---------------------------|----------------|-------------|
| Theory | Tutorial | Practical | | ESE (E) | Mid Sem (M) | Internal (I) | Viva (V) | Term work (TW) | |
| 2 | 0 | 4 | 6 | 50 | 30 | 20 | 25 | 25 | 150 |



Contents:

| Unit | Topics | Contact Hours |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1 | Introduction to Distributed Operating System Concept of Distributed operating systems, Goals of DOS, Distributed OS design issues, types distributed systems. | 4 |
| 2 | Communication in Distributed Operating System Issues in Inter process communication using message passing, synchronization, Remote procedure call (RPC), RPC implementation, stub generation, parameter passing, communication protocols for RPC | 6 |
| 3 | Synchronization in Distributed System Clock synchronization algorithm – Cristian, Berkeley Algorithm, Mutual Exclusion algorithms – Centralized, Distributed and Token Ring Approach, Election algorithms – The Bully, Ring Algorithm | 6 |
| 4 | Resource Management Features of good global scheduling algorithm, Task assignment, Types of distributed load balancing algorithms, load estimation policy, process transfer, location policy, state information exchange policy, priority assignment policy, process migration. | 6 |
| 5 | Distributed shared Memory Design and implementation issues of DSM, consistency models – strict consistency, casual consistency, pipelined random-access memory consistency, processor consistency, weak consistency, release consistency | 6 |
| | Total Hours | 28 |

Reference Books:

1. Andrew S. Tanenbaum & Maarten van Steen, Distributed Systems: Principles and Paradigms, Prentice-Hall
2. Pradeep K. Sinha, Distributed Operating System : Concepts and Design , Prentice-Hall
3. D. L. Galli, Distributed Operating Systems, Prentice-Hall



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4. Distributed Operating Systems and Algorithms, Randy Chow, T. Johnson, Addison Wesley

Suggested Theory distribution:

The suggested theory distribution as per Bloom’s taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

| Distribution of Theory for course delivery and evaluation | | | | | |
|-----------------------------------------------------------|------------|-------|---------|----------|--------|
| Remember | Understand | Apply | Analyze | Evaluate | Create |
| 35% | 35% | 30% | 0% | 0% | 0% |

Suggested List of Experiments:

1. Study of commands and filters of Linux
2. Write a shell script to add and print all odd numbers between given range using Linux.
3. Write a shell script to check whether the entered number is Armstrong number or not between given range using the command line argument.
4. Write a script to construct the following pattern, using nested for loop.

```

1
1 3
1 3 5
1 3 5 7

```

5. Write a shell script to read n numbers as command arguments and sort them in descending order.
6. Write a shell script to convert uppercase to lowercase letter for a given file.
7. Write a shell script to copy content of one file into another file.
8. Write a program to count number of vowels in a given string.
9. Demonstrate client server application.
10. Implement Remote Procedure Call program.
11. Implement Remote Method Invocation
12. Thread Programming in any application using JAVA.
13. Learning of RPCGEN interface.



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14. Demonstration of basic arithmetic operations to understand RPCGEN.
15. Find given string is palindrome or not using RPCGEN utility.
16. Convert temperature from Celsius to Fahrenheit using RPCGEN.
17. Basic calculator program using RMI.
18. Implementation of state-full and stateless server.

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in may be using following teaching approaches: black board, or use of any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination/Viva will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1. <http://nptel.ac.in/syllabus/106106107/>