

# 10M11CI212: Advanced Operating Systems

**Course Credit: 3**

**Semester: M.Tech, I**

## **Introduction**

The programme focuses on utilizing networks, from concurrent processes inside a computer to world-wide cooperating systems using the Internet.

## **Course Objectives (Post-conditions)**

### **Knowledge objectives:**

1. Implement a simple distributed application using a message based protocol.
2. Specify the four main goals of a Distributed System and the use of middleware in achieving those goals.
3. Model connection-oriented and connectionless communication in a 2 tier Client Server architecture.
4. Distinguish the five main failure types in a Distributed System and specify algorithms for achieving fault tolerance and error recovery within such a system.
5. Implement a remote object based system to demonstrate parameter passing and code migration in a Distributed System.
6. Discuss the issues involved in achieving synchronisation among a group of processes in a distributed system.
7. Specify algorithms for determining global state, electing a co-ordinator for a group of communicating processes and implementing mutual exclusion in a Distributed System.
8. Differentiate between client centric and data centric consistency models and describe protocols for implementing consistency models and updating replicas in a Distributed System

### **Application objectives:**

1. To implement design patterns
2. Implementation of aspect-oriented programming (AOP).
3. Implementation of service-oriented architecture framework.

## **Expected Student Background (Preconditions)**

Students are expected to have a solid grasp of the fundamentals of computer system, including a basic understanding of the operation of the computer, especially CPU. In addition, students are expected to know application development environment and programming concepts. Assembly programming ability will be helpful, as we will be looking at implementations of microprocessor operations.

## **Topics Outline:**

S NO	Topics	Hrs
1	Operating System Fundamentals: Evolution Of Modern Operating Systems, Centralized Operating System Overview, Network operating System, Distributed Operating System, Cooperative Autonomous Systems, Distributed Algorithms.	3

2	Distributed Systems Concepts and Architecture: Goals, Transparency, Services, Architecture Models, Communication Network protocols, Major Design Issues, Distributed Computing Environment.	3
3	Concurrent Process and Programming : Process and Threads, Graph Model for Process Representation, The Client/Server Model , Time Services , Language Mechanisms for Synchronization , Object Model Resource Servers, Concurrent programming languages, Distributed and Network Programming.	7
4	Interprocess Communication and Coordination: Message passing communication, Request/Reply Communication, Transaction Communication, Name and Directory Services, Distributed Mutual Exclusion, Leader Election.	6
5.	Distributed Process Scheduling : A System Performance Model, Static Process Scheduling , Dynamic Load Sharing and Balancing, Distributed Process Implementation , Real time Scheduling.	6
6.	Distributed File Systems: Characteristics of a DFS, DFS Design and Implementation, Transaction and Concurrency Control, Data File Replication.	6
7.	Distributed Shared Memory: Nonuniform Memory Access Architectures, Memory Consistency Models, Multiprocessor Cache Systems, Distributed Shared Memory, Implementation of DFS Systems	5
8.	Distributed Computer Security: Fundamentals of Computer Security, Discretionary Access Control Models , Cryptography , Authentication and Key Distribution , Issues Relevant to Distributed Security	6
	Total Hours	42

### **References**

1. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, Inc.,
2. 2001.
3. G. Coulouis, et al. Distributed Systems: Concepts and design, Pearson Education Asia,2004
4. [www.cdk3.net/refs](http://www.cdk3.net/refs)
5. [www.ietf.org/rfc](http://www.ietf.org/rfc)

**Evaluation Scheme:**

S.No	Examination	Marks
1	T-1	15
2	T-2	25
3	T-3	35
4	*Internal Marks	25

\*Internal Marks Breakdown:

Assignments            9 marks (3x3)

Quizzes                12 marks (3x4)

Regularity            4 Marks