

GUJARAT TECHNOLOGICAL UNIVERSITY

MASTER OF COMPUTER APPLICATION

SEMESTER: III

Subject Name: **Operating System (OS)**

Subject Code: **630004**

Objective:

- To provide an understanding of the basic concepts of modern OS. Describe the role and purpose of OS.
- To understand the concept of the interaction between user application, OS and hardware architecture.
- To provide an understanding of concept of process, concurrency problems. Using these concepts, learners can develop effective parallel applications/Programs.
- To give an understanding of the concept of deadlock prevention, avoidance, detection and recovery for identification of solution strategies.
- To understand the issues involved with preemptive vs nonpreemptive scheduling.
- To study the concept of management of memory, disk and file. Students can understand the efficient use of primary and secondary storage for their application.
- To provide an understanding of security and protection in OS and distributed applications.

Prerequisites:

- Basic knowledge of Computer hardware and software
- Knowledge of programming language like C/C++

Contents:

Unit-1: Computer System Overview, Operating System Overview, Processes (35%)

- **Computer System Overview:** Basic Elements, Processor Registers, Instruction Execution, Interrupts, The Memory Hierarchy, Cache Memory.
- **Operating System Overview:** Operating System Objectives and Functions, The Evolution of OS, Major Achievements, Characteristics of Modern OS
- **Process Description and Control:** Process States, Process Description, Process Control, UNIX Process Management.
- **Threads:** Processes and Threads.
- **Concurrency: Mutual Exclusion and Synchronization:** Principles of Concurrency, Mutual Exclusion, Software Approaches, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Reader/Writer Problem.
- **Concurrency: Deadlock and Starvation:** Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problem, UNIX Concurrency Mechanisms

Unit-2: Memory

(15%)

- **Memory: Memory Management:** Memory Management Requirements, Memory Partitioning, Paging, Segmentation.
- **Virtual Memory:** Hardware and Control Structures, OS Software, UNIX Memory Management

Unit-3: Scheduling

(15%)

- **Uni-processor Scheduling:** Types of Scheduling, Scheduling, Algorithms, Traditional UNIX Scheduling.
- **Multiprocessor and Real-time Management:** Multiprocessor Scheduling, Thread Scheduling, Real-Time Scheduling

Unit-4: Input/Output and Files

(20%)

- **I/O Management and Disk Scheduling:** I/O Devices, Organization of the I/O Function, OS Design Issues, I/O Buffering, Disk Scheduling, RAID, Disk cache, UNIX SVR4 I/O.
- **File Management:** Overview, File Organization, File Directories, File Sharing, Record Blocking, Secondary Storage Management, UNIX File Management

Unit-5: Distributed System and Security

(15%)

- **Distributed Processing, Client/Server and Clusters:** Client/Server Computing, Distributed Message Passing, Remote Procedure Calls, Clusters.
- **Computer Security:** Security Threats, Protections, Intruders, Trusted Systems, Case Study of Linux/UNIX/XP is desirable.

Main Reference Book(s):

1. Stallings W, "Operating Systems", 6th edition, Prentice Hall India.

Suggested Additional Reading:

1. Silberschatz, A., Peter B. Galvin and Greg Gagne, "Operating System Principles", Wiley-Indian Edition, 8th Ed., 2009
2. Tanenbaum A.S., "Modern Operating Systems", 4th Edition, PHI, 2001
3. Flynn I.M., "Understanding Operating Systems", Cengage India Publication
4. Bach M J, "The Design of UNIX Operating System", Prentice Hall India, 1993.

Chapter wise Coverage from Main Reference Book:

Book-1: Chapter 1-9, 10(10.1-10.2), 11-13, 15

Accomplishments of the Student after Completing the Course:

- Understanding the principles and internals of Operating System.
- Working knowledge of LINUX/UNIX System.
- Harnessing the facilities provided by Operating System in application development.
- Ability to develop Parallel Programs and Kernel Modules.