

CS5T1

**3/4 B.Tech. FIRST SEMESTER
OPERATING SYSTEMS
(Common to CSE & IT)
Required**

Credits: 4

**Lecture: 4 periods/week
Tutorial: 1 period /week**

**Internal assessment: 30 marks
Semester end examination: 70 marks**

Course context and Overview: This course examines operating system design concepts, data structures and algorithms, and systems programming basics.

Prerequisites: Programming in some high level language and Computer Architecture

Objectives:

1. To explain the basic objectives, functions and architecture of the operating systems.
2. To discuss the services provided and structure of operating systems.
3. To discuss about process concept and understand various process scheduling algorithms.
4. To explain critical section problem, its solutions and the concept of deadlock.
5. To discuss in detail about memory management and virtual memory management.
6. To discuss about various concepts in File system and Disk management.

Learning Outcomes:

Ability to:

1. Understand the structure and functionalities of Operating System.
2. Apply CPU scheduling algorithms, deadlock prevention and detection algorithms and different page replacement algorithms.
3. Illustrate different problems and solutions related to process synchronization.
4. Describe the concepts of paging and segmentation for memory management.
5. Analyze the operating system support for virtual memory, disk scheduling and I/O management.
6. Discuss the concepts of file systems.

UNIT-I:

Computer System and Operating System Overview:

Operating System Objectives & Functions, Computer System Organization & Architecture, Operating System Structure & Operations, Evaluation of operating systems (Serial Processing, Simple Batch, Multi-programmed, Time-sharing, distributed and Special purpose Systems).

UNIT-II:

System Structure: Operating System Services, System Calls, Operating System Structure (simple, layered, Microkernel, Modules).

Process Management: Process Concept, Process scheduling, Operations on processes, Co-Operating Processes, Interprocess Communication.

UNIT-III:

Threads: Overview, Multithreading Models, user and kernel threads.

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS,SJF, Priority, RR).

UNIT-IV:

Process Synchronization: Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical problems of Synchronization, Monitors.

UNIT-V

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance (including Banker's Algorithm), Deadlock Detection & Recovery.

UNIT-VI

Memory Management: Logical vs. Physical address space, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

UNIT-VII:

Virtual Memory Management: Page fault, Demand Paging, Performance, Page Replacement & its Algorithms (FIFO, LRU Optimal, Clock), Allocation of frames, Thrashing.

UNIT-VIII

Storage Management

File System: File Concept, Access Methods, Directory & Disk Structure, File System Structure, Directory Implementation (linear list, hash table), Allocation methods (contiguous, linked, and indexed). **Disk Management:** Overview of Mass Storage Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN).

Learning Resources

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, John Wiley.

REFERENCES:

1. Operating Systems – Internals and Design Principles, Stallings, Sixth Edition–2005, Pearson.
2. Operating System Design & Implementation, Tanenbaum A.S., Prentice Hall NJ.
3. Operating System Concepts, Silbersehatz A. and Peterson J. L., Wiley.
4. Operating System, Dhamdhare, TMH
5. An Introduction to Operating Systems, Deitel H. N., Addison Wesley.