

CS5T5B	3/4 B.Tech. FIRST SEMESTER OPERATING SYSTEMS Free Elective	Credits: 4
Lecture: 4 periods/week		Internal assessment: 30 marks
Tutorial: 1 period /week		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 by operating systems and understand the structure of O.S.
3. To discuss about process concept and understand various process scheduling algorithms.
4. To explain critical section problem and its solutions.
5. To discuss about the concept of deadlock.
6. To discuss in detail about memory management.
7. To explain different concepts in virtual memory.
8. To discuss about various concepts in File system and Disk management.

Learning Outcomes:

After the completion of the course the student will be able to:

1. Understand the basic operating system structure and functions as well as objectives of the operating system.
2. Distinguish between different types of operating systems.
3. Understand different structures of operating systems.
4. Understand the concept of process along with different operations performed on process.
5. Identify the difference between various scheduling algorithms.
6. Understand the concept of semaphores and monitors along with various problems of synchronization
7. Understand in detail about deadlock such as their characterization, prevention, avoidance, detection and recovery.
8. Understand the logical and physical memory and also regarding different memory management techniques like paging and segmentation.
9. Understand virtual memory technique and different page replacement algorithms.
10. Understand file access methods, directory structures, allocation methods.
11. Understand structure of mass storage devices and disk scheduling algorithms.

UNIT-I:

Computer System and Operating System Overview:

Operating System Objectives & Functions, Computer System Organization & Architecture, Operating System Structure & Operations, Evaluation of O.S(Serial Processing, Simple Batch, Multi-programmed, Time-sharing, distributed, 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, Dhamdhere, TMH
5. An Introduction to Operating Systems, Deitel H. N., Addison Wesley.