Program	BACHELOR OF TECHNOLOGY (B.Tech)	**Semester - 4**
Type of Course	Professional Core Course	
Prerequisite		
Rationale	-	
Effective From A.Y.	2025-26	

Teaching Scheme (Contact Hours)				Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
Lecture	Tutorial	Lab	Credit	SEE TH	IAT	SEE P	CCE	
3	0	2	4	70	-	50	-	200

***SEE** - Semester End Examination, **IAT** - Internal Assessment Test, **CCE** - Continues & Comprehensive Evaluation*

Course Content

T - Teaching Hours | **W** - Weightage

Sr.	Topics	T	W
1	**Introduction & Linux/UNIX**	5	10
	Introduction: Operating Systems (OS) Objectives, Evolution, Types of Operating Systems, OS Service, OS structure, Virtual Machine, Modern Operating Systems, OS Design Considerations for Multiprocessor and Multicore **Linux/UNIX**: Basic commands of Linux/UNIX, Linux system structure, Advance commands and filters of Linux/UNIX		
2	**Process Management Processes & Process Scheduling**	9	20
	Process Management Processes: Definition, Process states, Process State transitions, System Calls, Process Control Block, Context switching – Threads – Concept of multithreads, Benefits of threads, Types of threads. **Process Scheduling:** Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time, Scheduling algorithms: Preemptive and Non preemptive, FCFS, SJF, RR, SRTF, Priority, Multiprocessor scheduling		
3	**Interprocess Communication & Deadlocks**	9	20
	Interprocess Communication: Race Conditions, Critical Section, Mutual Exclusion, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.. **Deadlocks**: Deadlock characteristics, Prevention, Avoidance, Detection, Recovery - banker's algorithm		
4	**Memory Management & Virtual Memory**	9	20
	Memory Management: Memory Hierarchy, Static and Dynamic Memory Allocation, Overview of Swapping, Multiple Partitions Contiguous and Non-Contiguous Memory Allocation, Concepts of Paging, Segmentation, **Virtual Memory**: Virtual Memory Concepts, Demand paging, Performance, Fragmentation & Compaction. Page replacement: Optimal (OPT), First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)		
5	**File Systems & Input/output Management**	9	20
	File Systems: Naming, Structure, Types, Access, Attributes, Operations. Directories: Single-level, Hierarchical Directory Systems, Operations. File System Management, File System Backups **Input/output Management**: Principles of I/O Hardware & Software, Direct memory access, Interrupt handlers, RAID, Disk Arm Scheduling Algorithm: FCFS (First Come First Serve), SSTF (Shortest Seek Time First), SCAN, C-SCAN, LOOK, C-LOOK		
6	**Advanced Topics in Operating System:**	4	10
	Advanced Topics in Operating System: Containerization (Docker essentials), Virtualization fundamentals, Kernel module's introduction, OS security principles, Cloud OS resource management concepts		
	Total	**45**	**100**

Suggested Distribution Of Theory Marks Using Bloom's Taxonomy

Level	Remembrance	Understanding	Application	Analyze	Evaluate	Create
Weightage	30	40	30	0	0	0

NOTE : This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes

At the end of this course, students will be able to:	
CO1	Remember fundamental concepts, objectives, and evolution of operating systems.
CO2	Apply the concepts of processes, process states, and state transitions to analyze how an operating system manages active programs
CO3	Understand the concept of basic process synchronization and hardware/software techniques to manage process execution.
CO4	Apply virtual memory operations and evaluate the performance of demand paging.
CO5	Apply disk scheduling algorithms for optimizing disk access time.
CO6	Remember advanced concepts of OS.

CO PO Mapping

CO	CO - 1	CO - 2	CO - 3	CO - 4	CO - 5	CO - 6
PO - 1						
PO - 2						
PO - 3						
PO - 4						
PO - 5						
PO - 6						
PO - 7						
PO - 8						
PO - 9						
PO - 10						
PO - 11						

Reference Books

1.	• Operating System Concepts. 10th edn. Wiley, 2025. Silberschatz, A., Galvin, P.B. and Gagne, G. (TextBook)
2.	• Modern Operating Systems. 5th edn. Pearson, 2022.Tanenbaum, A.S. and Bos, H. (TextBook)
3.	• Operating Systems: Internals and Design Principles. 9th edn. Pearson, 2024.Stallings, W. (TextBook)
4.	• Operating Systems: Design and Implementation. 3rd edn. Prentice Hall, 2006.Tanenbaum, A.S. and Woodhull, A.S.
5.	• Operating Systems: Principles and Practice. 2nd edn. Recursive Books Ltd./CreateSpace, 2014. Anderson, T. and Dahlin, M.
6.	• Understanding the Linux Kernel. 3rd edn. O'Reilly Media, 2005.Bovet, D.P. and Cesati, M.

List of Practical

1.	Basic Linux/Unix Commands Practice Aim : To familiarize students with Linux/Unix environment and basic file & directory operations. Commands : ls, pwd, cd, mkdir, rmdir, cat, cp, mv, rm, touch, man.
2.	Shell Script Using Arithmetic Operations Aim : To practice shell scripting and perform arithmetic operations Commands : read, echo, $(( ))
3.	Process Management Commands & Scripting Aim : To monitor and manage active processes in OS Commands : ps, top, kill, jobs, bg, fg, nice
4.	Simulation of Page Replacement Algorithms Aim : To analyze virtual memory behaviour and compare page replacement algorithms
5.	Simulation of Disk Scheduling Algorithms Aim : To optimize disk access by simulating disk scheduling algorithms
6.	File Permissions and Ownership Aim : To understand file security and access control in Linux/Unix Commands : chmod, chown, chgrp, umask, ls -l
7.	Filters and Text Processing Commands Aim : To perform text searching, filtering, and processing Commands : grep, sort, uniq, cut, awk, sed
8.	Shell Script Using Decision-Making (if/else/case) Aim : To implement conditional logic in shell scripts Commands : if, elif, else, case
9.	Shell Script Using Looping Constructs (for, while) Aim : To automate repetitive tasks using loops in shell scripts Commands : for, while, until
10.	Shell Script for User Management Automation Aim : To automate user monitoring and management tasks Commands : who, id, useradd, passwd, groups