



SRI KRISHNA INSTITUTE OF TECHNOLOGY

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#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Department of computer science and Engineering

Academic Year	:	2025-2026	Course Name	:	Operating Systems
Semester	:	3 RD SEM	Course Code	:	BCS303
Scheme	:	2022	L:T:P: C	:	3:0:2:4
Total Contact hours	:	40 Hours Theory + 20 Hours Lab	CIE Marks	:	50
Course Plan Author	:	Mrs. Manjushree G	SEE Marks	:	50
Date	:	21-07-2025	Total Marks	:	100

Course Prerequisites:

- Basic Programming in C
- Basic Computer Organization
- Basic Data Structures

Learning Objectives:

- To Demonstrate the need for OS and different types of OS
- To discuss suitable techniques for management of different resources
- To demonstrate different APIs/Commands related to processor, memory, storage and file system management.

Course Outcomes:

CO	At the end of the course, student should be able to . . .	Blooms' Level
CO1	: Describe the structure and functionality of operating system.	L2
CO2	: Apply appropriate CPU scheduling algorithms for the given problem.	L3
CO3	: Analyze the various techniques for process synchronization and deadlock handling.	L3
CO4	: Apply the various techniques for memory management.	L3
CO5	: Apply the various techniques for secondary storage management strategies.	L3



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Blooms' Taxonomy:

L1	L2	L3	L4	L5	L6
Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

Program Outcomes:

PO1	:	Engineering knowledge	PO7	:	Environment and sustainability
PO2	:	Problem analysis	PO8	:	Ethics
PO3	:	Design/ development of solutions	PO9	:	Individual and team work
PO4	:	Conduct investigations of complex problems	PO10	:	Communication
PO5	:	Modern tool usage	PO11	:	Project management and finance
PO6	:	The engineer and society	PO12	:	Life-long learning

Program Specific Outcomes:

PSO1:	Model computational problems by applying mathematical concepts and design solutions using suitable data structures & algorithmic techniques.	
PSO2:	Demonstrate basic knowledge of computer science in efficient design of problem solutions of varying complexity.	
PSO3:	Create career path to become a successful computer science professional, entrepreneur and relish for higher studies.	

CO-PO-PSO Mapping:

CO	Program Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 12	PSO 1	PSO 2	PSO 3
CO1	1	-	-	-	-	-	-	-	-	-	-	2	1	1
CO2	2	1	-	-	-	-	-	-	-	-	-	2	1	1
CO3	2	2	1	-	-	-	-	-	-	-	-	2	1	1
CO4	2	1	-	-	-	-	-	-	-	-	-	2	1	1
CO5	1	1	-	-	-	-	-	-	-	-	-	2	1	1
Target	1.5	1.25	1	-	-	-	-	-	-	-	-	2	1	1



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Course Content (Syllabus):

Module 1	CH
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System debugging, Operating System generation; System boot. Textbook 1: Chapter – 1 (1.1-1.12), 2 (2.2-2.11)	08
Module 2	
Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling, Textbook 1: Chapter – 3 (3.1-3.4), 4 (4.1-4.4), 5 (5.1 -5.5)	08
Module 3	
Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Textbook 1: Chapter – 6 (6.1-6.6), 7 (7.1 -7.7)	08
Module 4	
Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. Textbook 1: Chapter -8 (8.1-8.6), 9 (9.1-9.6)	08
Module 5	
File System, Implementation of File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. Secondary Storage Structure, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management;	08



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Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix.

Textbook 1: Chapter – 10 (10.1-10.5), 11 (11.1-11.5), 12 (12.1-12.5), 14 (14.1-14.4)

Schedule of Instruction:

Class No	Topic	Date	RBT	CO	Mode
Module-1					
Introduction to Operating Systems					
1.	Introduction to Operating Systems Definition, goals, what OS does, examples	15/09/2025	L2	CO1 ,5,6	PPTs , Chalk & Talk
2.	Computer System Organization & Architecture Hardware components, single vs multi-core, multiprocessor, clusters	16/09/2025	L2		
3.	System Structures I OS structure, operations, user & kernel modes, system components	17/09/2025	L2		
4.	Process, Memory & Storage Management Process management basics, memory management overview, storage basics	19/09/2025	L2		
5.	Protection, Security & Computing Environments Protection vs security, distributed systems, special-purpose systems, cloud, virtualization	22/09/2025	L2		
6.	OS Services & User Interface OS services to users & programs, User-OS interfaces, command-line & GUI	23/09/2025	L2		
7.	System Calls, System Programs & OS Implementation Types of system calls, system programs, OS design & implementation, structure models	26/09/2025	L2		
8.	Virtual Machines, Debugging, Generation & Booting Concept of VMs, OS debugging tools, system generation, system boot process	26/09/202	L2		
9.	Module1-Test	29/09/2025			
Module-2					
Process Management					
10.	Process Concept Program vs Process, PCB, process states, process control	30/9/202	L2		
11.	Process Scheduling Introduction Scheduling levels, schedulers, context switching	6/10/202	L2		



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Class No	Topic	Date	RBT	CO	Mode
12.	Operations on Processes Creation, termination, fork(), exec(), process hierarchy	7/10/2025	L2	CO1 ,2	PPTs , Chalk & Chalk & Talk
13.	Inter Process Communication (IPC) IPC basics, shared memory, message passing	9 /10/2025	L2		
14.	Multithreading Overview & Models Threads vs processes, Many-to-One, One-to-One, Many-to-Many models	10/10/202	L2		
15.	Thread Libraries & Threading Issues POSIX threads, thread creation, cancellation, thread pools	13/10/2025	L2		
16.	Process Scheduling I Scheduling criteria, FCFS, SJF — Gantt charts & problems	14/10/2025	L3		
17.	Process Scheduling II RR, Priority Scheduling,	16/10/2025	L3		
18.	Process Scheduling II Thread Scheduling, Multiprocessor Scheduling	17/10/2025	L3		
19.	Module-2:Case Study	23/10/2025	L3		
Module-3					
Process Synchronization					
20.	Critical Section Problem	24/10/2025	L2	CO3 , 2	PPTs , Chalk & Talk
21.	Peterson’s Solution + Synchronization Hardware	27/10/2025	L2		
22.	Semaphores: Definition, types	28/10/202	L2		
23.	Semaphores: Classical Problems	30/10/2025	L2		
24.	Deadlocks: System Model & Characterization	31/10/202	L2		
25.	Deadlock Prevention: Mutual Exclusion, Hold and Wait, No Preemption, Circular Wait	3/11/202	L2		
26.	Deadlock Avoidance: Banker’s Algorithm, Resource-Allocation Graph Algorithm	4/11/202	L2		
27.	Deadlock Detection Problem solving	6/11/2025	L3		
28.	Deadlock Detection & Recovery solving	7/11/2025	L3		
29.	Module-3:Case Study	10/11/2025	L3		
Module-4					



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Class No	Topic	Date	RBT	CO	Mode
Memory Management					
30.	Memory Management Overview Basics, role of memory management, requirements	11/11/2025	L2	CO4 ,1	PPTs , Chalk & Talk
31.	Swapping Basic concept, how swapping works, swapping in modern OS	17/11/2025	L2		
32.	Contiguous Memory Allocation Single partition, multiple partition, fragmentation types	18/11/2025	L2		
33.	Paging Basic concept, address translation, advantages	20/11/2025	L2		
34.	Page Table Structures Single-level, multi-level, inverted page tables	21/11/2025	L2		
35.	Segmentation Concept, logical vs physical address, comparison with paging	24/11/2025	L2		
36.	Virtual Memory Concepts Background, demand paging, copy-on-write	25/11/2025	L2		
37.	Page Replacement, Frame Allocation, Thrashing Concepts only — LRU, FIFO, Optimal, allocation methods, thrashing.	27/11/2025	L2		
38.	Page Replacement FIFO & LRU Problem Solving	28/11/2025	L3		
39.	Page Replacement Optimal Replacement Problem Solving	01/12/2025	L3		
	Module-4:Case Study	02/12/2025	L3		
Module-5					
File System, Implementation of File System					
40.	File Concept Types of files, attributes, operations	04/12/2025	L2	CO1 ,5,6	PPTs , Chalk & Talk
41.	Access Methods Sequential, direct, indexed access	5/12/2025	L2		
42.	Directory & Disk Structure Directory structure, single-level, two-level, tree, Mounting concept, overview of sharing	8/12/2025	L2		
43.	File System Structure & Implementation Layers of file system, on-disk structures	9/12/2025	L2		
44.	Allocation Methods Contiguous, linked, indexed — concepts only Free Space Management & Directory Implementation Bitmaps, free lists, simple directory lookup,	11/12/2025	L2		



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Class No	Topic	Date	RBT	CO	Mode
45.	Secondary Storage & Disk Scheduling Disk structure, scheduling (FCFS, SSTF)	12/12/2025	L3		
46.	Secondary Storage & Disk Scheduling Disk structure, scheduling (SCAN, C-SCAN),	15/12/2025	L3		
47.	disk management overview, Goals of protection, Principles of protection, Domain of protection, Access matrix.	16/12/2025	L2		
48.	Module 5-Test	18/12/2025			



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Practical Component of IPCC

Lab	Topic	Date	RBT	CO	Mode
1.	Develop a c program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process)	16,17/09/2025	L3	CO1,2	Demo
2.	Simulate the following CPU scheduling algorithms to find turnaround time and waiting time a) FCFS b) SJF c) Round Robin d) Priority.	23,24/9/2025		CO2	
3.	Develop a C program to simulate producer-consumer problem using semaphores.	30/9/2025, 8/10/2025	L3	CO3	
4.	Develop a C program which demonstrates interprocess communication between a reader process and a writer process. Use mk fifo, open, read, write and close APIs in your program.	7,15/10/2025	L3	CO1,3	
5.	Develop a C program to simulate Bankers Algorithm for DeadLock Avoidance.	28,14/11/2025	L3	CO3	
6.	Develop a C program to simulate the following contiguous memory allocation Techniques: a) Worst fit b) Best fit c) First fit.	29,4/11/2025	L3	CO4	
7.	Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU	5,11/11/2025	L3	CO4	
8.	Simulate following File Organization Techniques a) Single level directory b) Two level directory	11,19/12/2025	L3	CO5	
9.	Develop a C program to simulate the Linked file allocation strategies.	18,26/11/2025	L3	CO5	
10.	Develop a C program to simulate SCAN disk scheduling algorithm.	25/11/2025, 3/12/2025	L3	CO5	

Textbooks:

T1	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 8th edition, Wiley-India, 2015
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Reference books:

R1	Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
R2	D.M Dhamdhare, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
R3	P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.



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R4	William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.
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Web links and Video Lectures (e-Resources):

1.	https://youtu.be/mXw9ruZaxzQ
2.	https://youtu.be/vBURt97EkA
3.	https://www.youtube.com/watch?v=783KAB-tuE4&list=PLJemF3uozcAKTgsClj82voMK3TMR0YE_f
4.	https://sites.google.com/view/manujshree-coursewebsite/home

Assessment Schedule:

Assessment Type	Content	CO	Duration	Marks	Date
CIE 1 (Theory)	Module1, 2 & Module 3 (Half)	CO1,2,3,5,6		15	12/10/25
CIE 2 (Theory)	Module 3(Half), 4 & Module 5	CO1,4,5,6			29/12/25
CIE (Lab) - Record	Program 1 to 10	CO1-CO5		15	weekly
CIE (Lab) - Test	Program 1 to 10	CO1-CO5		10	10/12/2025
Unit Test	Module-1&5	CO1-CO5		10	29/9/2025
Case study-1					23/10/2025
Case study-2					10/11/2025
Case study-3					2/12/2025
Semester End Examination	Modules 1 to 5	CO1-CO5		50	18/12/2025

Case Study Guidelines

Each team should address the following:

Case Study Guidelines

Each team should address the following based on respective problem statement



1. Overview of the OS, Processor, and Memory Configuration

- OS version and architecture
- CPU and RAM (DDR4) details
- Key features relevant to CPU, memory, and synchronization management

2. Implementation Techniques Used

- CPU Scheduling: Which scheduler, how tasks are prioritized
- Synchronization: Mechanisms like mutexes, semaphores, spinlocks
- Memory: Paging, segmentation, swapping, virtual memory

3. Core Features and Performance Insights

- Multicore handling, fairness, deadlock prevention
- Memory throughput and optimization methods
- Real-time task scheduling (if any)

4. Tools Used for Observation (if applicable)

- E.g., `top`, `htop`, Task Manager, Activity Monitor, `vmstat`, `free`, memory profilers

5. Comparison with Classical Concepts

- CPU Scheduling: FCFS, SJF, Round Robin, Priority
- Synchronization: Peterson's, Dekker's, Semaphores, Mutexes
- Memory: Paging vs segmentation, static vs dynamic allocation

6. Conclusion & Key Takeaways

- Unique findings or strengths of the platform
- Real-world implications

Deliverables

- **Format:** 5-8 slide PPT & written report
- **Optional:** Live demo or screenshots of tools used
- **Deadline:** xx-xx-2025



Suggestion for teams

- Split tasks among teammates (research, design, writing, presentation)
- Refer to official OS documentation and credible tech sources
- Use visuals to simplify complex explanations

Sl No	Activity	Topic	Team No (10 Students/Team)
1	Case Study	CPU SCHEDULING IS WINDOWS 11, Core i3/i5/i7/i9, Xeon, Atom	Team-1
2	Case Study	CPU SCHEDULING IS Linux 6.15., Core i3/i5/i7/i9, Xeon, Atom	Team-2
3	Case Study	Ubuntu 24.04.2 LTS, Core i3/i5/i7/i9, Xeon, Atom	Team-3
4	Case Study	macOS 15 Sequoia, Apple Silicon (M1, M2&M3), Intel Xeon-W (Cascade Lake) and 8th-generation Coffee Lake CPUs	Team-4
5	Case Study	Synchronization in Windows 11 using Mutexes, Semaphores, and Critical Sections	Team-5
6	Case Study	Synchronization in Linux Kernel 6.15 with Spinlocks, Mutexes, RCU, and Semaphores	Team-6
7	Case Study	Ubuntu 24.04.2 LTS: Thread-level synchronization using pthread library	Team-7
8	Case Study	macOS 15 Sequoia: Grand Central Dispatch (GCD) and synchronization primitives (M1/M2/M3)	Team-8
9	Case Study	Memory Management in Windows 11 with 8GB DDR4/DDR5 on Intel/AMD processors	Team-9
10	Case Study	Memory Management in Linux 6.15 with 8GB DDR4 on Intel/AMD processors	Team-10
11	Case Study	Ubuntu 24.04.2 LTS : Memory management with Swap, Paging, and DDR4 handling	Team-11
12	Case Study	macOS 15 Sequoia : Unified memory architecture on M1/M2/M3 , 8GB DDR with Intel Xeon	Team-12



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2	Case Study	CPU SCHEDULING IS Linux 6.15., Core i3/i5/i7/i9, Xeon, Atom	Team-2
3	Case Study	Ubuntu 24.04.2 LTS, Core i3/i5/i7/i9, Xeon, Atom	Team-3
4	Case Study	macOS 15 Sequoia, Apple Silicon (M1, M2&M3), Intel Xeon-W (Cascade Lake) and 8th-generation Coffee Lake CPUs	Team-4
5	Case Study	Synchronization in Windows 11 using Mutexes, Semaphores, and Critical Sections	Team-5
6	Case Study	Synchronization in Linux Kernel 6.15 with Spinlocks, Mutexes, RCU, and Semaphores	Team-6
7	Case Study	Ubuntu 24.04.2 LTS : Thread-level synchronization using <code>pthread</code> library	Team-7
8	Case Study	macOS 15 Sequoia : Grand Central Dispatch (GCD) and synchronization primitives (M1/M2/M3)	Team-8

Manjushree G

Dr. Sandeep V M

Dr. Hemalatha K L

Faculty in charge

Course - Coordinator

HOD