



Department of Artificial Intelligence and Machine Learning

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	:	Mr. Asghar Pasha	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:

C0	At the end of the course, student should be able to ...	Blooms' Level
C01	: Describe the structure and functionality of operating system.	L2
C02	: Apply appropriate CPU scheduling algorithms for the given problem.	L3
C03	: Analyze the various techniques for process synchronization and deadlock handling.	L3
C04	: Apply the various techniques for memory management.	L3
C05	: 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:

P01	:	Engineering knowledge	P07	:	Ethics
P02	:	Problem analysis	P08	:	Individual and team work
P03	:	Design/development of solutions	P09	:	Communication
P04	:	Conduct investigations of complex problems	P010	:	Project management and finance
P05	:	Engineering tool usage	P011	:	Life-long learning
P06	:	The engineer and The World			

Program Specific Outcomes:

PS01:	Graduates will have the ability to adapt, contribute and innovate ideas in the field of Artificial Intelligence and Machine Learning.
PS02:	To provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in various domains of Artificial Intelligence and Machine Learning such as Data Science, Computer Vision, Natural Language Processing with Ethical Values..
PS03:	Graduates will acquire the practical proficiency with niche technologies and open- source platforms and to become Entrepreneur in the domain Artificial Intelligence and Machine Learning.

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 11	PSO 1	PSO 2	PSO 3
CO1	1	-	-	-	-	-	-	-	-	-	-	2	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	3	2	2
CO3	2	2	1	-	-	-	-	-	-	-	-	2	2	3
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO5	1	1	-	-	-	-	-	-	-	-	-	1	-	2
Target	1.5	1.25	1	-	-	-	-	-	-	-	-	2	2	1.83



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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	22/09/2025	L2	CO1 ,5,6	PPTs , Chalk & Talk
2.	Computer System Organization & Architecture Hardware components, single vs multi-core, multiprocessor, clusters	23/09/2025	L2		
3.	System Structures I OS structure, operations, user & kernel modes, system components	26/09/2025	L2		
4.	Process, Memory & Storage Management Process management basics, memory management overview, storage basics	3/10/2025	L2		
5.	Protection, Security & Computing Environments Protection vs security, distributed systems, special-purpose systems, cloud, virtualization	3/10/2025	L2		
6.	OS Services & User Interface OS services to users & programs, User-OS interfaces, command-line & GUI	6/10/2025	L2		
7.	System Calls, System Programs & OS Implementation Types of system calls, system programs, OS design & implementation, structure models	7/10/2025	L2		
8.	Virtual Machines, Debugging, Generation & Booting Concept of VMs, OS debugging tools, system generation, system boot process	10/10/202	L2		
9.	Revision	11/10/2025			
Module-2					
Process Management					
10.	Process Concept Program vs Process, PCB, process states, process control	13/10/202	L2	CO1 ,2	PPTs , Chalk &
11.	Process Scheduling Introduction Scheduling levels, schedulers, context switching	14/10/202	L2		



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



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Class No	Topic	Date	RBT	CO	Mode
30.	Memory Management Overview Basics, role of memory management, requirements	21/11/2022	L2	CO4 ,1	PPTs , Chalk & Talk
31.	Swapping Basic concept, how swapping works, swapping in modern OS	24/11/2025	L2		
32.	Contiguous Memory Allocation Single partition, multiple partition, fragmentation types	25/11/2025	L2		
33.	Paging Basic concept, address translation, advantages	28/11/2025	L2		
34.	Page Table Structures Single-level, multi-level, inverted page tables	28/11/2025	L2		
35.	Segmentation Concept, logical vs physical address, comparison with paging	01/12/2025	L2		
36.	Virtual Memory Concepts Background, demand paging, copy-on-write	02/12/2025	L2		
37.	Page Replacement, Frame Allocation, Thrashing Concepts only — LRU, FIFO, Optimal, allocation methods, thrashing.	05/12/2025	L2		
38.	Page Replacement FIFO & LRU Problem Solving	05/12/2025	L3		
39.	Page Replacement Optimal Replacement Problem Solving	08/12/2025	L3		
Module-5					
File System, Implementation of File System					
40.	File Concept Types of files, attributes, operations	09/12/2025	L2	CO1 ,5,6	PPTs , Chalk & Talk
41.	Access Methods Sequential, direct, indexed access	12/12/2025	L2		
42.	Directory & Disk Structure Directory structure, single-level, two-level, tree, Mounting concept, overview of sharing	12/12/2025	L2		
43.	File System Structure & Implementation Layers of file system, on-disk structures	15/12/2025	L2		
44.	Allocation Methods Contiguous, linked, indexed — concepts only Free Space Management & Directory Implementation Bitmaps, free lists, simple directory lookup,	16/12/2025	L2		



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Class No	Topic	Date	RBT	CO	Mode
45.	Secondary Storage & Disk Scheduling Disk structure, scheduling (FCFS, SSTF)	19/12/2025	L3		
46.	Secondary Storage & Disk Scheduling Disk structure, scheduling (SCAN, C-SCAN),	19/12/2025	L3		
47.	disk management overview, Goals of protection, Principles of protection, Domain of protection, Access matrix.	22/12/2025	L2		
48.	Revision	23/12/2025			



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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)	22,23/09/2025	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.	6,7/10/2025		CO2	
3.	Develop a C program to simulate producer-consumer problem using semaphores.	13,14/10/2025	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.	27,28/10/2025	L3	CO1,3	
5.	Develop a C program to simulate Bankers Algorithm for DeadLock Avoidance.	3,4/11/2025	L3	CO3	
6.	Develop a C program to simulate the following contiguous memory allocation Techniques: a) Worst fit b) Best fit c) First fit.	10,11/11/2025	L3	CO4	
7.	Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU	17,18/11/2025	L3	CO4	
8.	Simulate following File Organization Techniques a) Single level directory b) Two level directory	24,25/12/2025	L3	CO5	
9.	Develop a C program to simulate the Linked file allocation strategies.	1,2/12/2025	L3	CO5	
10.	Develop a C program to simulate SCAN disk scheduling algorithm.	9,12/12/2025	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/vBURTt97EkA
3.	https://www.youtube.com/watch?v=783KAB-tuE4&list=PLIemF3uozcAKTgsCIj82voMK3TMR0YE_f
4.	https://www.youtube.com/watch?v=3ITLMMeeXY&list=PL3pGy4HtqwD0n7bQfHjPnsWzkeRn6mkO
5.	https://sites.google.com/skit.org.in/operating-system-bcs303/about-the-course

Assessment Schedule:

Assessment Type	Content	CO	Duration	Marks	Date
IA- 1 (Theory)	Module1, 2 & Module 3 (Half)	CO1,2,3,5, 6	1.5 Hrs	15	16/10/25
IA-2 (Theory)	Module 3(Half), 4 & Module 5	CO1,4,5,6	1.5 Hrs		18/11/25
CIE (Lab) – Record	Program 1 to 10	CO1-CO5	2.0 Hrs	15	weekly
CIE (Lab) – Test	Program 1 to 10	CO1-CO5	2.0 Hrs	10	15/12/2025
Unit Test	Module-1&5	CO1-CO5	NA	10	10/10/2025 23/12/2025 4/11/2025 21/11/2025
Case study-1 Case study-2					
Semester End Examination	Modules 1 to 5	CO1-CO5	NA	50	

Asghar Pasha

Dr. Sandeep V M

Dr. Jayasudha K

Faculty in charge

Course - Coordinator

HOD



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