SAHYADRI
COLLEGE OF ENGINEERING & MANAGEMENT
An Autonomous Institution
MANGALURU

OPERATING SYSTEMS

(Effective from the Academic Year 2022 - 2023)

IV SEMESTER

Course Code	**21CS43**	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40L + 20P	Exam Hours	03

CREDITS – 4

COURSE PREREQUISITES:

- Data Structures, Object Oriented Programming, Computer Organization..

COURSE OBJECTIVES:

- Students will understand the types of operating system and ability to create threads and perform Inter process communication.
- Students can understand CPU scheduling and be able to solve process synchronization problems.
- Students can understand the issues surrounding deadlock handling and memory management.
- Students can gather knowledge about paging and segmentation methods suitable for virtual memory. Ability to manage files and directory.
- Students will be able to understand the recovery and manage disk spaces. Knowledge of files systems and Android OS.
- Students can simulate the working of operating system, also algorithm used in operating system and develop dummy operating system

TEACHING - LEARNING STRATEGY:

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS

MODULE - I

Operating Systems and Structures: Introduction, user view, system view, Single processor systems, multiprocessors systems, clustered systems, multiprogramming and multitasking, dual mode and multimode operations, Distributed systems, Computing environments, Operating System services, System Calls, Linkers and Loader, Operating system design and implementation, Operating System Structures. **Process Management:** Process concept, process state, process control block, context switch; operations on processes, inter process communication.	**8 Hours**

MODULE - II

Multi-Threaded Programming: Overview of threads, multithreading models, thread libraries, threading issues. CPU Scheduling: Schedulers, Pre-emptive and non-pre-emptive scheduling, dispatcher; Scheduling Criteria. **Scheduling Algorithms:** FCFS, SJF, SRTF, RR, Priority, HRRN, multi-level feedback Queue scheduling, Multiprocessor scheduling.	**8 Hours**

MODULE - III

Process Synchronization: Background, critical section problem, Peterson's solution; synchronization hardware- mutex, semaphores, monitors.	**8 Hours**

Deadlocks: System model, necessary conditions for deadlocks, methods for handling deadlocks, deadlock prevention, deadlock avoidance -resource allocation graph algorithm, banker's algorithm, deadlock detection, recovery from deadlock	

MODULE - IV

Memory Management: Background, contiguous memory allocation, paging, swapping. **Virtual Memory Management:** Background; demand paging: copy-on-write; page replacement algorithms - FIFO, Optimal, LRU; thrashing **File System Interface and Operations:** Access methods, Directory structures, Protection, File system structure, Directory implementation, Allocation methods, Free space management.	**8 Hours**

MODULE - V

Storage Management and Security: Mass storage structures; Disk scheduling algorithms, Swap space management. **Protection:** Goals, Principles and Domains of protection, Access matrix, Implementation of access matrix, Revocation of access rights, Access control.	**8 Hours**

COURSE OUTCOMES

Upon completion of this course, the students will be able to:

CO No.	Course Outcome Description	Bloom's Taxonomy Level
CO1	Illustrate the operating system, its components, and the ideas behind system calls and inter-process communication.	CL3
CO2	Apply the concepts of multithreading and demonstrate various algorithms by considering different scheduling criteria.	CL3
CO3	Illustrate the process synchronization, its classical approaches and discuss the concepts of deadlock.	CL3
CO4	Apply the concept of memory management, demand paging, and demonstrate the working of various page replacement algorithms and file system operations.	CL3
CO5	Analyze the structure of mass storage devices, various disk scheduling techniques and concepts of operating system protection.	CL4

LABORATORY COMPONENTS

Exp. No.	Experiment Description	CO No.	Bloom's Taxonomy Level
1.	Demonstrate the system assembly and disassembly of computer hardware components	CO1	CL2
2.	Demonstrate the Process creation and Termination using System calls –fork(), vfork(), exit(), return 0.	CO1	CL3
3.	Simulate the following CPU scheduling algorithms 1. FCFS 2. SJF 3. Priority 4. Round Robin.	CO2	CL3
4.	Demonstrate the following Classical problems of synchronization a. producer-consumer, b. reader writer, c. dining philosopher problems using	CO3	CL3

	semaphores.		
5.	Apply Banker's algorithm for deadlock avoidance.	CO3	CL3
6.	Demonstrate following page replacement algorithms- a. FIFO, b. LRU and c. OPTIMAL.	CO4	CL3
7.	Analyze the seek time for the following Disk scheduling algorithms – 1. FCFS, 2. SCAN, 3. C-SCAN, 4. LOOK, C-LOOK	CO5	CL3
8.	Simulate and Analyze following file allocation strategies –Indexed and sequential approaches.	CO5	CL3
9.	Demonstrate the OS installation with Multi Booting and Virtual Machine platform, OS Protection and Security – Firewall, Protections, Threat Detections and prevention.	CO1, CO5	CL3

CO-PO-PSO MAPPING

CO No.	Programme Outcomes (PO)												Programme Specific Outcome (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	1	1			1	2	1		2		
CO2	3	3	3	2	1			1	2	1		2		
CO3	3	3	3	2	1			1	2	1		2		
CO4	3	3	3	2	1			1	2	1		2		
CO5	3	3	3	3	2			1	2	1		2		

3: Substantial (High)	2: Moderate (Medium)	1: Poor (Low)

ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.	Assessment Description	Weightage (%)	Max. Marks
1	**Continuous Internal Assessment (CIA)**	**100 %**	**50**
	Continuous Internal Evaluation (CIE)	60 %	30
	Practical Session (Laboratory Component)	40 %	20
2	**Semester End Examination (SEE)**	**100 %**	**50**

ASSESSMENT DETAILS

Continuous Internal Assessment (CIA) (50%)				Semester End Exam (SEE) (50%)
Continuous Internal Evaluation (CIE) (60%)			Practical Sessions (40%)	
I	II	III		
Syllabus Coverage			Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.

- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SEE QUESTION PAPER PATTERN:

1. The question paper will have **TEN** full questions from **FIVE** Modules
2. There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
3. Each full question may have a maximum of four sub-questions covering all the topics under a module.
4. The students will have to answer FIVE full questions, selecting one full question from each module.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", 10th edition, Wiley-India, 2021
2. M. Morris Mano, "Computer System Architecture", PHI, 3rd Edition

REFERENCE BOOKS:

1. Ann McHoes, Ida M Fylnn, "Understanding Operating System", Cengage Learning, 6th Edition
2. D.M Dhamdhere, "Operating Systems: A Concept Based Approach", 3rd Edition, McGraw- Hill, 2013.
3. P.C.P. Bhatt, "An Introduction to Operating Systems: Concepts and Practice", 4th Edition, PHI(EEE), 2014.
4. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson.

REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):

1. https://www.geeksforgeeks.org/operating-systems/
2. https://www.youtube.com/watch?v=RozoeWzT7IM&list=PLdo5W4Nhv31a5ucW_S1K3-x6ztBRD-PNa
3. https://en.wikipedia.org/wiki/Operating_system
4. https://www.youtube.com/watch?v=By6lWjiPpVI&list=PLG9aCp4uE-s17rFjWM8KchGlffXgOzzVP
5. https://www.youtube.com/watch?v=bkSWJJZNgf8&list=PLxCzCOWd7aiGz9donHRrE9I3Mwn6XdP8