Amrita School of Computing, Amritapuri Campus,
Amrita Vishwa Vidyapeetham
Department of Computer Science and Engineering

Course Plan (March- July 2023)

19CSE213 – Operating Systems (3-0-3-4)
S4 B.Tech. CSE

1. Faculty Information

Name: Ms.Vinitha Panicker J, Ms.Prathibamol C P, Dr.Sumi Suresh, Dr.Akshara Byju

2. Course overview

This course aims at introducing the structure and implementation of modern operating systems, virtual machines, and their applications. It summarizes techniques for achieving process synchronization and managing resources like memory, CPU, and files and directories in an operating system. A study of common algorithms used for both pre-emptive and non-pre-emptive scheduling of tasks in operating systems (such as priority, performance comparison, and fair-share schemes) will be done. It gives a broad overview of the memory hierarchy and the schemes used by the operating systems to manage storagerequirements efficiently.

3. Course Syllabus

Unit 1

Operating systems Services: Overview – hardware protection – operating systems services – system calls – system structure – virtual machines. Process and Processor management: Process concepts – process scheduling – operations on process – cooperating process – inter-process communication – multi threading models – threading issues – thread types – CPU scheduling – scheduling algorithms.

Unit 2

Process synchronization: critical section problem – synchronization hardware – semaphores – classical problems of synchronization – critical regions – monitors – deadlocks – deadlock characterization – methods of handling deadlocks – deadlock prevention – avoidance – detection and recovery. Memory management – swapping – contiguous memory allocation. Paging and segmentation – segmentation with paging – virtual memory – demand paging – process creation – page replacement – thrashing.

Unit 3

File management: File systems: directory structure – directory implementation – disk scheduling. **Case study:** threading concepts in operating systems, kernel structures.

TEXTBOOK:

1. Silberschatz and Galvin, "Operating System Concepts", Ninth Edition, John Wiley and Sons, 2018.

REFERENCES:

1. Deitel HM, Deitel PJ, Choffnes DR. Operating systems. Third Edition, Prentice Hall; 2004.
2. Tannenbaum AS. Modern Operating Systems. Fourth Edition, Prentice Hall; 2016.
3. Stevens WR, Rago SA. Advanced programming in the UNIX environment. Second Edition, Addison-Wesley; 2008.
4. Nutt G. Operating systems. Third Edition, Addison Wesley; 2009.

4. Course Outcomes (CO)

	Course Outcome	**Bloom's Taxonomy Level**
CO1	Understand the architecture and functionalities of modern OS	L2
CO2	Understand and apply the algorithms for resource management and scheduling	L3
CO3	Analyze and apply semaphores and monitors for classical and real-world synchronization scenarios	L4
CO4	Engage in independent learning as a team to study characteristic features of modern operating systems	L4

5. CO-PO MAPPING

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1										3	2
CO2	2	2	3	1									3	2
CO3	2	3	3	1				2					3	2
CO4	2	2	1	2				2	2				3	2

6. Lecture Plan

Lecture Week	Topics	Keywords	Objectives	CO
Week 1	Introduction to The operating system.	Overview – hardware protection – operating systems services – system calls – system structure – virtual machines.	Introduction to Operating Systems Understand and study the operating system structures. Study of system calls and implementation of system calls Introduction to Virtual Machines	CO1
Lab 1	Linux Commands	Linux commands	Basic linux command,	CO1
Week 2	Process management	Process concepts, Process scheduling, Operation on processors, inter process communication, cooperating process	Introduction to the concept of processes, operations on processes. Overview of Interprocess Communication and how to implement it.	CO1, CO2
Lab 2	Shell scripting Introduction	SH, Bash	Linux filter commands and shell programming introduction	CO1
Week 3	Threads Process and its states	Overview, Multithreaded models, threading issues, types Process States and State Transitions	Overview of Threads, types and different threading issues. Overview of process and its state transitions	C12
Lab 3	Shell Programming		Programs using shell	
Week 4	CPU scheduling	Concepts, scheduling algorithms- Non preemptive Scheduling FCFS, SJF, priority,	Introduction to CPU scheduling concepts Understand various CPU scheduling algorithms and solve problems and compare the performance of various scheduling algorithms	CO2

Lab 4	System calls	Fork(), create()	Programs using system call	CO1
Week 5	CPU Scheduling	Preemptive Scheduling SRTF,Priority	Understand various CPU scheduling algorithms and solve problems and compare the performance of various scheduling algorithms	CO2
Lab 5	IPC	Parent process, child process	Program using IPC	CO1
Week 6	CPU Scheduling	Round Robin Scheduling Multilevel queue, Multilevel feedback queue	Understand various CPU scheduling algorithms and solve problems and compare the performance of various scheduling algorithms	CO2
Lab 6		Lab Exam		
Week 7	Process synchronization	Critical section problem, Synchronization hardware,	Understand the concurrency concepts, critical-section problem and various solutions for CS problem.	CO3
Lab 7		IPC using Pipes		
Week 8	Process synchronization	Binary and Counting Semaphore,	Understand the concept of Semaphores	CO3
Lab 8		IPC using Shared memory		
Week 9	Process synchronization	classical problems, critical regions, monitors	Solve classical and real- world synchronization scenarios using semaphores and monitor concepts	CO3

Lab 9		Implementation of Semaphores for solving classical problems		
Week 10		Tutorial on CPU scheduling and Semaphores		
Mid-Term Examination				
Week 11	Deadlocks	Characterization, handling deadlocks, prevention,	Overview of deadlock concepts and ways for handling deadlocks Understand and apply Banker's algorithm for handling deadlocks	CO2
Lab 10	Deadlocks	Deadlock avoidance, prevention	Programs on various deadlock algorithms	CO3
Week 12	Deadlocks	avoidance, detection, Recovery	Understand and apply Banker's algorithm for handling deadlocks	CO2
Week 13	Storage management - Memory management	Swapping, continuous memory allocation, paging,	Introduction to memory management concepts Working of paging concepts	CO2
Week 14	Storage management - Memory management	segmentation, segmentation with paging	Working segmentation concepts	CO2
Week 15	Virtual memory	Demand paging, process creation, page replacement,thrashing	Study of Demand paging and various page replacement algorithms for virtual memory management	CO2
Week 16	Secondary Storage management	Directory structure, implementation, disk scheduling	Study of various I/O structure and how to implement it.	CO2
Week 13-16	Case study	Characteristic features of Modern Operating Systems		CO4
END SEMESTER EXAMINATION				

7. Evaluation and Grading

Internal Evaluation - 65 Marks

1. Mid Term Examination: 20 Marks
2. Continuous Evaluation (Theory): 15 Marks
    - Online Test: 5 Marks (2 out of 3 tests)
    - Case Study: 10 Marks
3. Lab Component: 30 Marks
    - Lab Assignment Submission: 5 Marks
    - Lab Viva (1): 10 Marks
    - Lab Exam (1): 15 Marks

External Evaluation - 35 Marks