Semester: 3	
Programme : B.Sc. Computer Science (Hons)	
Course : OPERATING SYSTEM	
Paper code: C2CS230322T / C2CS230322P	**Credits: 4**
Hours/week : Theory: 3 / Practical 2	
Category: Core/MDC/SEC/VAC : Core	
Theory / Practical / Composite : Composite	
No of Modules : 1	

Course Overview: This course provides students with a comprehensive understanding of the fundamental concepts, design principles, and core functionalities of modern operating systems. The course aims to equip learners with knowledge of how operating systems manage hardware resources—including processors, memory, files, and I/O devices—and coordinate concurrent processes while ensuring system protection, security, and efficient performance. Key areas of focus include process management, scheduling, inter-process communication, synchronization, deadlock handling, memory organization (including virtual memory), file systems, and foundational security mechanisms.

Course Outcome:

1. **Recall and explain** fundamental OS concepts and explain the functions, types, and evolution of operating systems—including batch processing, multiprogramming, time-sharing, and interrupt-driven execution—across different machine architectures.
2. **Apply** OS mechanisms such as system calls, process/thread creation, semaphore operations, and memory allocation strategies to implement solutions for resource management and synchronization in simulated environments.
3. **Analyze** trade-offs in OS design decisions by comparing scheduling algorithms (preemptive vs. non-preemptive), memory management techniques (paging vs. segmentation), file allocation methods, and disk scheduling policies based on performance metrics and system constraints.
4. **Design** process synchronization solutions for critical section problems, deadlock-handling strategies, and virtual memory systems by selecting appropriate primitives (semaphores, monitors) and architectural components (page tables, segment tables).
5. **Evaluate** the effectiveness of protection mechanisms, authentication protocols, and security policies in safeguarding system resources; assess deadlock conditions using resource allocation graphs and determine optimal recovery strategies.
6. **Create** a modular OS component (e.g., scheduler simulator, memory manager, or file system prototype) that integrates multiple OS concepts to solve complex resource management challenges in concurrent, multi-user environments.

Prerequisites: Computer Organization

SYLLABUS

UNIT/Module	CONTENT	HOURS	CO Mapping	COGNITIVE LEVEL
I.	Introduction to OS, Functions of OS, Types of Operating systems, OS for different machines, interrupt driven Program, concurrent processing, multiprogramming, batch processing, time sharing.	5	CO1	K1, K2 (Remember/Understand)

II.	Operating System Organization - Processor and user modes, kernels, system calls and introduction to system programs, IPC, RPC.	5	CO2, CO3,CO4	K2,K3, K4 (Understand/Apply/Analyze)
III.	Process - view of the process and resources, process abstraction, process hierarchy, threads. Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms.	8	CO3, CO4	K3, K4 (Apply/Analyze)
IV.	Concurrent processes critical section, semaphores, critical problems, deadlocks.	7	CO3, CO4	K3, K4 (Apply/Analyze)
V.	Memory Management Physical and virtual address space; memory allocation strategies –fixed and variable partitions, virtual memory, Paging, segmentation	7	CO6	K4, K6 (Analyze/Create)
VI.	File and I/O Management Directory structure, file operations, file allocation methods, disk scheduling algorithms	4	CO2	K1, K2 (Remember/Understand)
VII.	Introduction to Protection and Security, Authentication, Internal access Authorization	3	CO5, CO6	K2 (Understand)

Text Books

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publication 2008
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.

Suggested readings

1. W. Stallings, Operating Systems, Internals & Design Principles , 5th Edition, Prentice Hall of India. 2008

Web Resources

1. Introduction to Operating Systems, IIT Madras https://nptel.ac.in/courses/106106144
2. **Operating System Fundamentals, IIT Kharagpur, Prof. Santanu Chattopadhyay https://nptel.ac.in/courses/106105214**

Evaluation	Theory CIA: 12 Attendance: 3 Semester Exam: 45	Practical CA: 38 Attendance: 2

Paper Structure for Theory Semester Exam Module : Answer 3 out of 5 of 15 marks each

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Explain the fundamentals, functions, and types of operating systems	K1, K2 (Remember/Understand)
CO2	Describe operating system organization, system calls, and communication mechanisms	K2,K3, K4 (Understand/Apply/Analyze)
CO3	Analyze process management concepts and CPU scheduling algorithms	K3, K4 (Apply/Analyze)
CO4	Apply synchronization techniques and deadlock handling methods	K4, K6 (Analyze/Create)
CO5	Analyze memory management techniques including paging and virtual memory	K1, K2 (Remember/Understand)
CO6	Explain file system organization and disk scheduling algorithms	K2 (Understand)