

SHORT SYLLABUS

BCSE303L Operating Systems (3-0-0-3)

OS design issues - Structuring methods - System calls, System/Application Call Interface – Protection – Processes Scheduling - CPU Scheduling - Deadlocks - Inter-process communication, Synchronization - Memory Management - File System Management - Device Management - Protection and Security.

BCSE303L	Operating Systems		L	T	P	C
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Pre-requisite	NIL	Syllabus version				
		1.0				
Course Objectives						
1. To introduce the operating system concepts, designs and provide skills required to implement the services.						
2. To describe the trade-offs between conflicting objectives in large scale system design.						
3. To develop the knowledge for application of the various design issues and services.						
Course Outcomes						
On completion of this course, student should be able to:						
1. Interpret the evolution of OS functionality, structures, layers and apply various types of system calls of various process states.						
2. Design scheduling algorithms to compute and compare various scheduling criteria.						
3. Apply and analyze communication between inter process and synchronization techniques.						
4. Implement page replacement algorithms, memory management problems and segmentation.						
5. Differentiate the file systems for applying different allocation, access technique, representing virtualization and providing protection and security to OS.						
Module:1	Introduction		3 hours			
Introduction to OS: Functionality of OS - OS design issues - Structuring methods (monolithic, layered, modular, micro-kernel models) - Abstractions, processes, resources - Influence of security, networking, and multimedia.						
Module:2	OS Principles		4 hours			
System calls, System/Application Call Interface – Protection: User/Kernel modes - Interrupts -Processes - Structures (Process Control Block, Ready List etc.), Process creation, management in Unix – Threads: User level, kernel level threads and thread models.						
Module:3	Scheduling		9 hours			
Processes Scheduling - CPU Scheduling: Pre-emptive, non-pre-emptive - Multiprocessor scheduling – Deadlocks - Resource allocation and management - Deadlock handling mechanisms: prevention, avoidance, detection, recovery.						
Module:4	Concurrency		8 hours			
Inter-process communication, Synchronization - Implementing synchronization primitives (Peterson's solution, Bakery algorithm, synchronization hardware) - Semaphores – Classical synchronization problems, Monitors: Solution to Dining Philosophers problem – IPC in Unix, Multiprocessors and Locking - Scalable Locks - Lock-free coordination.						
Module:5	Memory Management		7 hours			
Main memory management, Memory allocation strategies, Virtual memory: Hardware support for virtual memory (caching, TLB) – Paging - Segmentation - Demand Paging - Page Faults - Page Replacement -Thrashing - Working Set.						
Module:6	Virtualization and File System Management		6 hours			
Virtual Machines - Virtualization (Hardware/Software, Server, Service, Network - Hypervisors - Container virtualization - Cost of virtualization - File system interface (access methods, directory structures) - File system implementation (directory implementation, file allocation methods) - File system recovery - Journaling - Soft updates - Log-structured file system - Distributed file system.						
Module:7	Storage Management, Protection and Security		6 hours			
Disk structure and attachment – Disk scheduling algorithms (seek time, rotational latency based)- System threats and security – Policy vs mechanism - Access vs authentication						

System protection: Access matrix – Capability based systems - OS: performance, scaling, future directions in mobile OS.			
Module:8	Contemporary Issues		2 hours
	Total Lecture hours:		45 hours
Text Book			
1.	Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts”, 2018, 10 th Edition, Wiley, United States.		
Reference Books			
1.	Andrew S. Tanenbaum, “Modern Operating Systems”, 2016, 4 th Edition, Pearson, United Kingdom.		
2.	William Stallings, “Operating Systems: Internals and Design Principles”, 2018, 9th Edition, Pearson, United Kingdom.		
Mode of Evaluation: CAT, Written Assignment, Quiz, FAT			
Recommended by Board of Studies		04-03-2022	
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