

# Operating System

Course Code	18CSC205J	Course Name	OPERATING SYSTEMS	Course Category	C	Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science and Engineering	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)														
CLR-1: Introduce the key role of an Operating system		Level of Thinking Bloom's Taxonomy Expected Proficiency (%) Expected Attainment (%)	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2: Insist the Process Management functions of an Operating system						Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CLR-3: Emphasizing the importance of Memory Management concepts of an Operating system						H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLR-4: Realize the significance of Device Management part of an Operating system						H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLR-5: Comprehend the need of File Management functions of an Operating system						H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
CLR-6: Explore the services offered by the Operating system practically						H	H	H	H	H	M	L	M	H	M	M	H	H	H	M
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																		
CLO-1: Identify the need of an Operating system		1	80	70	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M	
CLO-2: Know the Process management functions of an Operating system		1	85	75	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M	
CLO-3: Understand the need of Memory Management functions of an Operating system		1	75	70	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M	
CLO-4: Find the significance of Device management role of an Operating system		2	85	80	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M	
CLO-5: Recognize the essentials of File Management part of an Operating system		2	85	75	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M	
CLO-6: Gain an insight of Importance of an Operating system through practical		3	80	70	H	H	H	H	H	M	L	M	H	M	M	H	H	H	M	

Duration (hour)	15	15	15	15	15
S-1	SL0-1	Operating System Objectives and functions	PROCESS SYNCHRONIZATION: Peterson's solution, Synchronization Hardware	MEMORY MANAGEMENT: Memory Management: Logical Vs Physical address space, Swapping	VIRTUAL MEMORY- Background
	SL0-2	Gaining the role of Operating systems	Understanding the two-process solution and the benefits of the synchronization hardware	Understanding the basics of Memory management	Understanding the need of demand paging
S-2	SL0-1	The evolution of operating system, Major achievements	Process synchronization: Semaphores, usage, implementation	Contiguous Memory allocation – Fixed and Dynamic partition	VIRTUAL MEMORY – Basic concepts – page fault handling
	SL0-2	Understanding the evolution of Operating systems from early batch processing systems to modern complex systems	Gaining the knowledge of the usage of the semaphores for the Mutual exclusion mechanisms	Getting to know about Partition memory management and issues: Internal fragmentation and external fragmentation problems	Understanding, how an OS handles the page faults
S-3	SL0-1	OS Design considerations for Multiprocessor and Multicore	Classical Problems of synchronization- Readers writers problem, Bounded Buffer problem	Strategies for selecting free holes in Dynamic partition	Performance of Demand paging
	SL0-2	Understanding the key design issues of Multiprocessor Operating systems and Multicore Operating systems	Good understanding of synchronization mechanisms	Understanding the allocation strategies with examples	Understanding the relationship of effective access time and the page fault rate
S-4	SL0-1	LAB 1: Understanding the booting process of Linux	LAB4: System admin commands – Basics	LAB7: Shell Programs – Basic level	LAB10: Overlay concept
	SL0-2	PROCESS CONCEPT- Processes, PCB	Classical Problems of synchronization – Dining Philosophers problem (Monitor	Paged memory management	Copy-on write
S-5	SL0-1				File sharing and Protection

S-7	SL0-2	Understanding the Process concept and Maintenance of PCB by OS	Understanding the synchronization of limited resources among multiple processes	Understanding the Paging technique. PMT hardware mechanism	Understanding the need for Copy-on write	Emphasis the need for the file sharing and its protection
	SL0-1	Threads – Overview and its Benefits	CPU SCHEDULING: FCFS, SJF, Priority	Structure of Page Map Table	Page replacement Mechanisms: FIFO, Optimal, LRU and LRU approximation Techniques	FILE SYSTEM IMPLEMENTATION: File system structure
S-8	SL0-2	Understanding the importance of threads	Understanding the scheduling techniques	Understanding the components of PMT	Understanding the Pros and cons of the page replacement techniques	To get the basic file system structure
	SL0-1	Process Scheduling: Scheduling Queues, Schedulers, Context switch	CPU Scheduling: Round robin, Multilevel queue Scheduling, Multilevel feedback Scheduling	Example: Intel 32 bit and 64-bit Architectures	Counting based page replacement and Page Buffering Algorithms	Directory Implementation
S-9	SL0-2	Understanding basics of Process scheduling	Understanding the scheduling techniques	Understanding the Paging in the Intel architectures	To know on additional Techniques available for page replacement strategies	Understanding the various levels of directory structure
	SL0-1	LAB2: Understanding the Linux file system	LAB5: System admin commands – Simple task automations	LAB 6: Process Creation	LAB11: IPC using Pipes	LAB14: Study of OS161
S-11	SL0-2	Operations on Process – Process creation, Process termination	Real Time scheduling: Rate Monotonic Scheduling and Deadline Scheduling	Example: ARM Architectures	Allocation of Frames - Global Vs Local Allocation	FILE SYSTEM IMPLEMENTATION: Allocation methods
	SL0-1	Understanding the system calls – fork(), wait(), exit()	Understanding the real time scheduling	Understanding the Paging with respect to ARM	Understanding the root cause of the Thrashing	Understanding the pros and Cons of various disk allocation methods
S-12	SL0-2	Inter Process communication: Shared Memory, Message Passing, Pipe()	DEADLOCKS: Necessary conditions, Resource allocation graph, Deadlock prevention methods	Segmented memory management	Thrashing, Causes of Thrashing	FILE SYSTEM IMPLEMENTATION: Free space Management
	SL0-1	Understanding the need for IPC	Understanding the deadlock scenario	Understanding the users view of memory with respect to the primary memory	Understanding the Thrashing	Understanding the methods available for maintaining the free spaces in the disk
S-13	SL0-2	PROCESS SYNCHRONIZATION: Background, Critical section Problem	Deadlocks: Deadlock Avoidance, Detection and Recovery	Paged segmentation Technique	Working set Model	Swap space Management
	SL0-1	Understanding the race conditions and the need for the Process synchronization	Understanding the deadlock avoidance, detection and recovery mechanisms	Understanding the combined scheme for efficient management	Understanding the working set model for controlling the Working set Model	Understanding the Low-level task of the OS
S-14	SL0-2	LAB3: Understanding the various Phases of Compilation of a 'C' Program	LAB6: Linux commands	LAB9: Overlay concept	LAB12: IPC using shared memory and Message queues	LAB15: Understanding the OS161 filesystem and working with test programs

Learning Resources	1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating systems, 9th ed., John Wiley & Sons, 2013 2. William Stallings, Operating Systems-Internals and Design Principles, 7th ed., Prentice Hall, 2012	3. Andrew S. Tanenbaum, Herbert Bos, Modern Operating systems, 4th ed., Pearson, 2015 4. Bryant O'Hallaron, Computer systems-A Programmer's Perspective, Pearson, 2015
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