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 Objectives:	The purpose of learning this course is to:
1	Introduce the key role of an Operating system
2	Insist the Process Management functions of an Operating system
3	Emphasize the importance of Memory Management concepts of an Operating system
4	Realize the significance of Device Management part of an Operating system
5	Comprehend the need of File Management functions of an Operating system
6	Explore the services offered by the Operating system practically

Course Outcomes (CO):	At the end of this course, learners will be able to:	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CO1 :	Express the fundamental concepts in Operating Systems.	2	60	70
CO2 :	Implement synchronization and scheduling in Operating System	3	70	75
CO3 :	Apply fragmentation, paging and segmentation in memory management.	3	70	75
CO4 :	Incorporate page fault handling, demand paging and page buffering techniques in Operating System.	4	60	70
CO5 :	Demonstrate the storage management techniques through various File Management techniques	3	60	70

Program Learning Outcomes (PLO)														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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
3		3										2		
2	1	3											2	
3	2	2										2		
3	2	2											2	
3		2	2									2		

Duration (hour)		15	15	15	15	15
S-1	SLO-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***	***STORAGE MANAGEMENT : Mass storage structure – Overview of Mass storage structure – Magnetic Disks***
	SLO-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***	***Understanding the Basics in storage management***
S-2	SLO-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***	***Disk Scheduling***
	SLO-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***	***Understanding the various scheduling with respect to the disk***
S-3	SLO-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***	***FILE SYSTEM INTERFACE: File concept, File access methods***
	SLO-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***	***Understanding the file basics***
S 4-5	SLO-1 SLO-2	***LAB 1 : Understanding the booting process of Linux***	***LAB4 : System admin commands – Basics***	***LAB7: Shell Programs – Basic level***	***LAB10 : Overlay concept***	***LAB13:Process synchronization***

S-6	SLO-1	***PROCESS CONCEPT– Processes, PCB***	***Classical Problems of synchronization – Dining Philosophers problem (Monitor)***	***Paged memory management***	***Copy-on write***	***File sharing and Protection***
	SLO-2	***Understanding the Process concept and Maintanance 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***
S-7	SLO-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***
	SLO-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***
S-8	SLO-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*
	SLO-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*
S 9-10	SLO-1	*LAB2 : Understanding the Linux file system*	*LAB5: System admin commands – Simple task automations*	*LAB 8:Process Creation*	*LAB11: IPC using Pipes*	*LAB14 : Study of OS161*
	SLO-2					
S-11	SLO-1	*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***
	SLO-2	*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	SLO-1	*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***
	SLO-2	*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	SLO-1	*PROCESS SYNCHRONIZATION: Background, Critical section Problem*	*Deadlocks :Deadlock Avoidance, Detection and Recovery*	*Paged segmentation Technique*	*Working set Model*	*Swap space Management*
	SLO-2	*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 14-15	SLO-1	*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*
	SLO-2					

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'Hallaxn, Computer systems- A Programmer's Perspective,Pearson, 2015*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory (5%)	Practice (5%)	Theory (7.5%)	Practice (7.5%)	Theory (7.5%)	Practice (7.5%)	Theory (5%)	Practice (5%)	Theory (25%)	Practice (25%)
Level 1	Remember	20%		15%		15%				15%	
Level 2	Understand	20%		25%		25%		25%		20%	
Level 3	Apply	45%	30%	40%	35%	40%	40%	20%	20%	45%	30%
Level 4	Analyze	15%	40%	20%	35%	20%	30%	20%	50%	20%	35%

Level 5	Evaluate		30%		30%		30%	25%	30%		35%
Level 6	Create										
	Total	100 %	100 %	100 %	100 %	100 %	100 %	100%	100%	100%	100%

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers			
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts	
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