Course Code	21CSC202J	Course Name	OPERATING SYSTEMS	Course Category		Professional Core	L	T	P	C
							3	0	2	4

Pre-requisite Courses	COA	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department		Data Book / Codes / Standards			

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*
CLR-1 :	Outline the structure of OS and basic architectural components involved in OS design
CLR-2 :	Introduce the concept of deadlock and various memory management mechanism
CLR-3 :	Familiarize the scheduling algorithms, file systems, and I/O schemes
CLR-4 :	Identify and tell the various embedded operating systems and computer security concepts
CLR-5 :	Name the various computer security techniques in windows and Linux

Course Outcomes (CO):	*At the end of this course, learners will be able to:*	Program Outcomes (PO)												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2	PSO-3
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning			
CO-1:	Use the appropriate concepts of operating system for resource utilization	3	3	2		-	-	-	-	-	-	-		-	-	-
CO-2:	Analyze the relevant process and thread concepts for solving synchronization problems	3	3	3		-	-	-	-	-	-	-		-	-	-
CO-3:	Exemplify different types of scheduling algorithms and deadlock mechanism.	3	3	3		-	-	-	-	-	-	-		-	-	-

CO-4:	Experiment the performance of different algorithms used in management of memory, file and I/O and select the appropriate one.	3	3	3		-	-	-	-	-	-	-		-	-	-
CO-5:	Demonstrate different device and resource management techniques for memory utilization with security mechanisms	3	2	3		-	-	-	-	-	-	-		-	-	-

Unit-1 : Introduction, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Kernel Data Structures, Computing Environments, Open-Source Operating Systems, Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Operating-System Debugging, Operating-System Generation, System Boot

Unit-2 : PROCESS MANAGEMENT: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication, Communication in Client– Server Systems, Threads: Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. Process Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors

Unit-3: CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling. Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Unit-4 : MEMORY MANAGEMENT: Main Memory, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. Virtual Memory: Introduction, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory. STORAGE MANAGEMENT: Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. File-System Interface: File

Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. .
Unit-5: PROTECTION AND SECURITY: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of the Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications.
Lab 1: Operating system Installation, Basic Linux commands Lab 2: Process Creation using fork() and Usage of getpid(), getppid(), wait() functions Lab 3: Multithreading Lab 4: Mutual Exclusion using semaphore and monitor Lab 5: Reader-Writer problem Lab 6: Dining Philosopher problem Lab 7: Bankers Algorithm for Deadlock avoidance Lab 8: FCFS and SJF Scheduling Lab 9: Priority and Round robin scheduling Lab 10: FIFO Page Replacement Algorithm Lab 11: LRU and LFU Page Replacement Algorithm Lab 12: Best fit and Worst fit memory management policies Lab 13: Disk Scheduling algorithm Lab 14: Sequential and Indexed file Allocation Lab 15: File organization schemes for single level and two level directory

Learning Resources	1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley & Sons (Asia) Pvt. Ltd, Tenth Edition, 2018 2. RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach ", Tata McGraw Hill Edition, 2010 3. Dhananjay M. Dhamdhere, "Operating Systems – A Concept Based Approach", Third Edition, Tata McGraw Hill Edition, 2019 4. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Global Edition, Pearson, 2015. 5. William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, Sixth Edition, 2018.	https://nptel.ac.in/courses/106/105/106105214/ https://nptel.ac.in/courses/106/106/106106144/ https://nptel.ac.in/courses/106/102/106102132/ https://onlinecourses.nptel.ac.in/noc21_cs44/preview https://nptel.ac.in/courses/106/105/106105172/

	6. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education, 2017.	

Learning Assessment							
	Bloom’s Level of Thinking	*Continuous Learning Assessment (CLA)*				*Summative Final Examination (40% weightage)*	
		Formative CLA-1 Average of unit test (45%)		*Life Long Learning CLA-2 – (15%)*			
		Theory	*Practice*	*Theory*	*Practice*	*Theory*	*Practice*
Level 1	*Remember*	*15%*	-	-	*15%*	*15%*	-
Level 2	*Understand*	*25%*	-	-	*20%*	*25%*	-
Level 3	*Apply*	*30%*	-	-	*25%*	*30%*	-
Level 4	*Analyze*	*30%*	-	-	*25%*	*30%*	-
Level 5	*Evaluate*	-	-	-	*10%*	-	-
Level 6	*Create*	-	-	-	*5%*	-	-
	Total	*100 %*		*100 %*		*100 %*	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Dr. T. Ruso, Senior Project Lead, HCL Technologies,Chennai	*1. Dr.T.Sethukarasi, Professor and Head, Department of CSE, RMK Engineering College*	*1. Dr.M.Eliazer, SRMIST*
	2. Dr.B.Jaison, Professor, Department of CSE, RMK Engineering College	*2. Dr.K.Anitha, SRMIST*