

Course Code	21CSC202J	Course Name	OPERATING SYSTEMS				Course Category	C	Professional Core				L	T	P	C
												3	0	2	4	
Pre-requisite Courses	COA				Co-requisite Courses	Nil				Progressive Courses	Nil					
Course Offering Department		Electrical and Electronics Engineering				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 Learning Outcomes (CLO):		At the end of this course, learners will be able to:														
CLO-1 :	Use the appropriate concepts of operating system for resource utilization															
CLO-2 :	Choose the relevant process and thread concepts for solving synchronization problems															
CLO-3 :	Exemplify different types of scheduling algorithms and deadlock mechanism.															
CLO-4 :	Experiment the performance of different algorithms used in management of memory, file and I/O and select the appropriate one.															
CLO-5 :	Demonstrate different device and resource management techniques for memory utilization with security mechanisms															

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	-	-	-	-	-	-	-	3	-	-	-	
3	3	3	2	-	-	-	-	-	-	-	3	-	-	-	
3	3	3	2	-	-	-	-	-	-	-	3	-	-	-	
3	2	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	<ol style="list-style-type: none"> <li>1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley &amp; Sons (Asia) Pvt. Ltd, Tenth Edition, 2018</li> <li>2. RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach ", Tata McGraw Hill Edition, 2010</li> <li>3. Dhananjay M. Dhamdhere, "Operating Systems – A Concept Based Approach", Third Edition, Tata McGraw Hill Edition, 2019</li> <li>4. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Global Edition, Pearson, 2015.</li> <li>5. William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, Sixth Edition, 2018.</li> <li>6. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 2017.</li> <li>7. <a href="https://nptel.ac.in/courses/106/105/106105214/">https://nptel.ac.in/courses/106/105/106105214/</a></li> <li>8. <a href="https://nptel.ac.in/courses/106/106/106106144/">https://nptel.ac.in/courses/106/106/106106144/</a></li> <li>9. <a href="https://nptel.ac.in/courses/106/102/106102132/">https://nptel.ac.in/courses/106/102/106102132/</a></li> <li>10. <a href="https://onlinecourses.nptel.ac.in/noc21_cs44/preview">https://onlinecourses.nptel.ac.in/noc21_cs44/preview</a></li> <li>11. <a href="https://nptel.ac.in/courses/106/105/106105172/">https://nptel.ac.in/courses/106/105/106105172/</a></li> </ol>
--------------------	--

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) - By the Course Faculty				By The CoE	
		Formative CLA-I Average of unit test (50%)		Life Long* Learning CLA-II- Practice (10%)		Summative Final Examination (40% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	-	-	0%	20%	-
Level 2	Understand	40%	-	-	40%	40%	-
Level 3	Apply	20%	-	-	40%	20%	-
Level 4	Analyze	20%	-	-	10%	10%	-
Level 5	Evaluate	-	-	-	10%	10%	-
Level 6	Create	-	-	-	-	-	-
	Total	100 %		100 %		100 %	