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| 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:* | | | | | | |  | |  | | Program Learning Outcomes (PLO) | | | | | | | | | | | | | | | |
| CLR-1 : | Outline the structure of OS and basic architectural components involved in OS design | | | | | | | | | | |  | |  | 1 | | | 2 | 3 | | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | 12 | 13 | 14 | 15 | |
| CLR-2 : | Introduce the concept of deadlock and various memory management mechanism | | | | | | | | | | |  | |  | 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 : | 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 | | | | | | | | | | |  | |  |
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| 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 | | | | | | | | | | | | |  | 3 | | | 3 | 2 | | | 2 | - | - | - | - | - | - | - | | 3 | - | - | - | |
| CLO-2 : | Choose the relevant process and thread concepts for solving synchronization problems | | | | | | | | | | | | |  | 3 | | | 3 | 3 | | | 2 | - | - | - | - | - | - | - | | 3 | - | - | - | |
| CLO-3 : | Exemplify different types of scheduling algorithms and deadlock mechanism. | | | | | | | | | | | | |  | 3 | | | 3 | 3 | | | 2 | - | - | - | - | - | - | - | | 3 | - | - | - | |
| CLO-4 : | Experiment the performance of different algorithms used in management of memory, file and I/O and select the appropriate one. | | | | | | | | | | | | |  | 3 | | | 3 | 3 | | | 2 | - | - | - | - | - | - | - | | 3 | - | - | - | |
| CLO-5 : | Demonstrate different device and resource management techniques for memory utilization with security mechanisms | | | | | | | | | | | | |  | 3 | | | 2 | 3 | | | 2 | - | - | - | - | - | - | - | | 3 | - | - | - | |

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| 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 |

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| 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.* 6. *Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education, 2017.* | 1. [*https://nptel.ac.in/courses/106/105/106105214/*](https://nptel.ac.in/courses/106/105/106105214/) 2. [*https://nptel.ac.in/courses/106/106/106106144/*](https://nptel.ac.in/courses/106/106/106106144/) 3. <https://nptel.ac.in/courses/106/102/106102132/> 4. <https://onlinecourses.nptel.ac.in/noc21_cs44/preview> 5. *https://nptel.ac.in/courses/106/105/106105172/* |

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|  | 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 % | |

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| Course Designers |  | |  |  |  | |  |  |
| Experts from Industry | | Experts from Higher Technical Institutions | | | | Internal Experts | | |
| *1. Mr.T.Madhan, Team Leader, Tata Consultancy Services, siruseri Campus,* *Chennai,* [*madhan.tk@gmail.com*](mailto:madhan.tk@gmail.com) | | *1. Dr. S. Janakiraman, Associate Professor, Pondicherry University,* *sj.dbt@pondiuni.edu.in* | | | | 1. Dr. N. Prasath, Associate Professor, SRMIST | | |
| *2. Mrs.K.Saranya, IT Analyst, Tata Consultancy Services, siruseri Campus, Chennai,* [*saranya.k6@gmail.com*](mailto:saranya.k6@gmail.com) | | *2. Dr. R.Shyamala, Associate Professor, Anna University College of Engineering* *Tindivanam, vasuchaaru@gmail.com* | | | | 2. Dr. M. Eliazer, Assistant Professor, SRMIST | | |