# *CSE-3249: Design Principles of Operating Systems*

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| | **ITER, SIKSHA 'O' ANUSANDHAN**<br>**(Deemed to be University)** | | **LESSON PLAN** |
| Programme | **B.Tech** | Academic Year | **2024-25** |
| Department | **CSE / CSIT** | Semester | **5th** |
| Credit | **4** | Grading Pattern | **1** |
| Subject Code | **CSE-3249** | | |
| Subject Name | **Design Principles of Operating Systems** | | |
| Weekly Course Format | **3 Class/week, 1 hr/Class; 1 lab/week, 2 hr/Lab** | | |
| Subject Coordinator (s) | **Mr. Rakesh Kumar** | | |

## Text Books(s):

(1) Operating Systems: Internals and Design Principles, by William Stallings, Pearson India( WS).
(2) Unix shell programming by Yashavant Kanetkar, BPB Publications (YK).

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| **Course Outcomes** | Students will be able to | |
| | **CO1** | To understand the different components of operating System and various ways of structuring an operating system. |
| | **CO2** | To differentiate the basic design issues involved in creating process and threads. |
| | **CO3** | To analyze the mechanisms involved in handling, scheduling and synchronizing processes. |
| | **CO4** | To learn the different methods used to prevent and deal with deadlock. |
| | **CO5** | To explore various memory management, file handling and input output schemes, analyzing their effectiveness in a different scenario. |
| | **CO6** | To familiarize with unix programming environment file system, Basic command and able to apply prerequisite facets of shell programming in order to devise a shell script to solve a problem. |

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| Sl.No. | Lessons/Topics to be covered | Book Reference (sections) | Mapping with COs | Home Work/ Assignments/ Quizzes |
|---|---|---|---|---|
| **1** | Computer system overview: Basic element, evolution of microprocessor. | WS_1.1-1.2 (pg.29-32) | **CO1** | |
| **2** | Instruction execution, Interrupt. | WS_1.3-1.4 (pg.32-45) | **CO1** | |
| **3** | Memory Hierarchy, Cache Memory, DMA, Multiprocessor and Multicore Organization. | WS_1.5-1.8 (pg. 46-57) | **CO1** | |
| **4** | Introduction to Unix and Unix file system. | YK (pg.2-17,22-56 | **CO6** | |
| **5** | Operating System objective and functions, Evolution of Operating System, Major Achievement. | WS_2.1-2.3 (pg.69-91) | **CO1** | |
| **6** | Development Leading to Modern Operating System, Fault Tolerance, OS Design Considerations for Multiprocessor and Multicore. | WS_2.4-2.6 (pg.92-100) | **CO1** | |
| **7** | Tradition Unix System, Modern Unix System, Linux. | WS_2.7-2.10 (pg.108-117) | **CO1** | **Quiz 1** |
| **8** | Assignment 1: Essential Unix Command. | YK (pg.78-104) | **CO6** | **Lab Assignment 1** |
| **9** | Process Concept, Process State. | WS_3.1-3.2 (pg.131-147) | **CO2** | |
| **10** | Process Description. | WS_3.3 (pg.148-156) | **CO2** | |
| **11** | Process Control, Execution of Operating System. | WS_3.4-3.5 (pg.156-165) | **CO2** | |
| **12** | Assignment 1 Contd..... | | **CO6** | |
| **13** | Thread Concept Overview, Type of Threads. | WS_4.1-4.2 (pg.177-189) | **CO2** | |

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|---|---|---|---|---|
| **14** | Multicore and Multi-threading, Multi-threading Models. | WS_4.3 (pg.190-195) | **CO2** | |
| **15** | Types of Processor Scheduling, CPU Scheduling Basic concept, Scheduling Criteria. | WS_9.1 (pg.426-429) | **CO3** | |
| **16** | Assignment 2, Familiarization with basic Commands in Unix Operating System and Shell Programming | YK (pg.199-206) | **CO6** | **Lab Assignment 2** |
| **17** | Scheduling Algorithms: FCFS, SJF. | WS_9.2 (pg.430-451) | **CO3** | **Theory Assignment 1** |
| **18** | SRTF, Priority Scheduling. | WS_9.2 (pg.430-451) | **CO3** | |
| **19** | Round Robin , Highest Response Ratio Scheduling. | WS_9.2 (pg.430-451) | **CO3** | **Quiz 2** |
| **20** | Assignment 2 Contd..... | | **CO6** | |
| **21** | Multilevel queue scheduling, Multilevel feedback queue scheduling. | WS_9.2 (pg.430-451) | **CO3** | |
| **22** | Traditional Unix scheduling. | WS_9.3 (pg.450-454) | **CO3** | |
| **23** | Process Synchronization: Background, Critical Section Problem. | WS_5.1-5.2 (pg.224-240) | **CO3** | |
| **24** | Assignment 3, Shell Programming using user defined variables, arithmetic operators, conditional statements. | YK (pg.206-212,216-226,243-264 | **CO6** | **Lab Assignment 3** |

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| **25** | Mutual Exclusion, Software Approach: Dekker's, Peterson's algorithm. | WS_5.1 (pg.224-240) | **CO3** | |
| **26** | Mutual Exclusion: Hardware Support (compare and-swap, Exchange). | WS_5.2 (pg.241-244) | **CO3** | |
| **27** | Semaphore, Types of Semaphore, Semaphore Implementation. | WS_5.4 (pg.244-250) | **CO3** | |
| **28** | Assignment 3 Contd..... | | **CO6** | |
| **29** | The Producer-Consumer Problem, Semaphore Solution to Bounded buffer Producer-Consumer Problem. | WS_5.4 (pg.250-257) | **CO3** | |
| **30** | Semaphore Solution to Reader Writers Problem(Readers have priority. | WS_5.7 (pg.270-272) | **CO3** | |
| **31** | Monitor, Monitor Solution to Bounded Buffer Producer-Consumer Problem. | WS_5.5 (pg.257-261) | **CO3** | |
| **32** | Assignment 4, Vi king of all editor and Familiarization with Process Management in Unix environment. | Yk (pg.124-133, 158-167 ) | **CO6** | **Lab Assignment 4** |
| **33** | Message Passing, Solution to Reader Writer problem using Message Passing. | WS_5.6-5.7 (pg.263-270, 273-274) | **CO3** | |
| **34** | Dining Philosopher Problem, Semaphore and Monitor Solution. | WS_6.6 (pg.309-313) | **CO3** | |
| **35** | Principles of Deadlocks: Resource Allocation Graph, Condition of Deadlock. | WS_6.1 (pg.290-299) | **CO5** | |
| **36** | Assignment 4 Contd..... | | **CO6** | |

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|---|---|---|---|---|
| **37** | Deadlock prevention, Deadlock Avoidance. | WS_6.2-6.3 (pg.299-306) | **CO4** | |
| **38** | Deadlock Avoidance Contd..... | WS_6.3 (pg.300-306) | **CO4** | **Quiz 3** |
| **39** | Deadlock Detection and Recovery. | WS_6.4 (pg.306-308) | **CO4** | |
| **40** | Assignment 5, Process in Unix and Shell Programming using Loop Control Structure, File test options and string test options. | YK (pg.248-253, pg.282-306) | **CO6** | **Lab Assignment 5** |
| **41** | Memory Management requirements, Memory Partition. | WS_7.1-7.2 (pg.340-345) | **CO5** | **Theory Assignment 2** |
| **42** | Memory Partition Contd..... | WS_7.2 (pg.346-354) | **CO5** | |
| **43** | Paging. | WS_7.3 (pg.355-358) | **CO5** | |
| **44** | Assignment 5 Contd..... | | **CO6** | **End Term Project** |
| **45** | Segmentation. | S_7.4 (pg.358-359) | **CO5** | |
| **46** | Virtual Memory: Hardware and Control Structures. | WS_8.1 (pg.371-380) | **CO5** | **Quiz 4** |

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| **47** | Operating System Policy for Virtual Memory: Basic Algorithms. | WS_8.2 (pg.388-393) | **CO5** | |
| **48** | Disk scheduling: FIFO, SSTF, SCAN,C-SCAN. | WS_11.5 (pg.517-523) | **CO5** | |