OPERATING SYSTEMS

(Common to CSE, IT, CSE(AI&ML) & CSE(DS))

Course Code: 22CT1110

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COURSE OUTCOMES:

At the end of the Course the student shall be able to

CO 1: understand functional architecture of an operating system. (L2)

CO 2: distinguish CPU scheduling algorithms. (L4)

CO 3: analyze process coordination. (L4)

CO 4: classify File System and directory implementations. (L4)

CO 5: analyze different disk scheduling algorithms.(L4)

UNIT-I — 10 Lectures

INTRODUCTION AND SYSTEM STRUCTURE

Introduction: Operating system, functions of operating system, types of operating system, computer system organization, computer system architecture, operating system structure, operating system operations, computing environments, open source operating systems.

Operating System Structures: operating system services, system calls, types of system calls, system programs, operating system structure, operating system debugging and system boot.

Learning Outcomes: At the end of the module, students will be able to

1. summarize Operating system services, organization and architecture. (L2)
2. understand the concept of system calls. (L2)
3. describe various Computing systems. (L2)

UNIT-II — 10 Lectures

PROCESS MANAGEMENT

Process Concept: Process, Process Control Blocks, Operations on Processes, Inter process Communication

Multithreaded Programming: Multicore programming, Multithreading Models, Thread Libraries, Threading Issues

Process Scheduling: Scheduling Criteria, scheduling algorithms (FCFS, SJF, Round Robin, and Priority) and their evaluation, Multiprocessor scheduling. Case Study: Linux.

Learning Outcomes: At the end of the unit, the student will be able to

1. explain Process concepts and identify the operations on process(L2)
2. analyze Inter Process Communication(L4)
3. understand Multithreading(L2)
4. analyze,differentiate and apply Scheduling Algorithms(L4)

UNIT-III 10 Lectures

PROCESS COORDINATION

Synchronization: The Critical- section problem, Peterson's Solution, Synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples, atomic transactions. Case Study: Linux

Deadlocks: System model, deadlock characterization, Methods for Handling Deadlock, deadlock prevention, detection and Avoidance, recovery from deadlock.

Learning Outcomes: At the end of the unit, the student will be able to

1. explain the synchronization problems(L2)
2. illustrate the problems of Deadlocks(L4)
3. understand the methods of handling deadlocks(L2)

UNIT-IV 12 Lectures

Memory management strategies: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation.

Virtual-memory management: Demand paging, Copy on write, page-Replacement algorithms (FIFO, LRU, LFU, Optimal Page Replacement)

File systems and implementation: File Concept, Access Methods, Directory Structure, File System Mounting. File system structure, File System Implementation, Directory Implementation, Allocation Methods, Free-space Management

Learning Outcomes: At the end of the unit, the student will be able to

1. explain the memory management strategies. (L2)
2. differentiate paging and segmentation. (L2)
3. understand the File concepts and directory structure. (L2)
4. analyze Virtual memory. (L4)

UNIT-V 8 Lectures

STORAGE MANAGEMENT

Secondary-storage structure: Overview of Mass-storage structure, disk structure, disk attachment, disk scheduling, swap-space management,RAID

Protection

Goals and Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights

Learning Outcomes: At the end of the unit, the student will be able to

1. understand disk scheduling concepts(L2)
2. illustrate swap space management(L4)
3. explain goals and principles of protection (L2)
4. analyse revocation of access rights (L4)

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Principles*, 9th Edition, John Wiley &Sons,2018.

REFERENCES:

1. William Stallings, *Operating Systems – Internal and Design Principle*", 9thEdition, Pearson education/PHI,2018.
2. D.M. Dhamdhere, *Operating systems - A Concept based Approach*, 3rd Edition, TMH,2017.
3. Charles Crowley*, Operating Systems - A Design Approach*, 1st Edition, TMH,2017.
4. Andrew S Tanenbaum, *Modern Operating Systems*, 3rd Edition, Pearson/PHI,2014.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/lecture-notes-and-readings/