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Course Code: CSE308
Semester: V

OPERATING SYSTEMS

Course Objectives

This course will help the learner to understand the modules of an operating system, their functions, process management techniques, scheduling algorithms, problems of concurrent processes and possible solutions, memory management strategies, file and IO system concepts.

UNIT - I 11 Periods

Introduction: What Operating systems do - Structure - Operations - Process management - **Operating system Structure:** Services - User Interfaces - Systems calls and types - Systems programs - Design and implementation - Operating System Structure - System boot

UNIT - II 11 Periods

Process management: Process concept - Scheduling - Operations on processes - Interprocess communication - **Threads:** Overview - Multi-core programming - Multithreading models - **Process scheduling:** Basic concepts - Scheduling criteria - Algorithms: FCFS - SJFS - Priority - RR - Multilevel queue - Multilevel feedback - Thread scheduling: Contention scope - Pthread scheduling - Multiple-processor scheduling - **Process synchronization:** Background - Critical section problem - Peterson's solution - Synchronization hardware - Mutex locks - Semaphore - Classic problems of synchronization

UNIT – III 11 Periods

Deadlocks : System model - Characterization - Methods for handling deadlock - Prevention - Avoidance - Detection - Recovery from deadlocks - **Memory management:** Background - Swapping - Contiguous memory allocation - Paging - Structure of page tables - Segmentation - **Virtual memory:** Background - Demand paging - Copy-on-write - Page replacement - Allocation of frames - Thrashing

UNIT - IV 12 Periods

File system: File concept - Access methods - Directory and disk structure - File system mounting - Protection - File allocation methods - **Mass Storage:** Magnetic disks - Disk structure - Disk scheduling: FCFS - SSTF - SCAN - C-SCAN - LOOK - Selection of an algorithm - **I/O systems:** Overview - I/O hardware - Application I/O interface - Kernel I/O subsystem

TEXTBOOK

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne. *Operating System Concepts,* Ninth Edition, Wiley, 2013.

REFERENCES

1. William Stallings. *Operating Systems: Internals and Design Principles,* Ninth Edition, Pearson, 2017
2. Russ Cox, Frans Kaasshoek, and Robert Morris. *X v6: A simple, Unix-like Teaching Operating System*, MIT, 2014
3. Achyut Godbole and Atul Kahate. *Operating System,* Third Edition, Tata McGraw, 2011

ONLINE MATERIALS

1. https://nptel.ac.in/courses/106106144/2
2. https://www.youtube.com/user/MrKeerthikiran/search?query=operating+systems

UNITWISE LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	• Discuss the concept of process and process management • Illustrate the IPC techniques and multithreading • Summarize the operations of operating systems
Unit II	• Distinguish threads from processes and point out the advantages of threads over processes • Demonstrate CPU scheduling algorithms • Compare thread scheduling approaches • Explain the synchronization problems and implement solutions for the classic problems of synchronization
Unit III	• Describe the causes of deadlocks. • Differentiate the three solutions for deadlock handling. • Implement banker's algorithm for deadlock avoidance. • Demonstrate the memory management schemes and compare them.
Unit IV	• Analyze the performance of disk scheduling algorithms • Appraise the concepts of file systems • Summarize the concepts related to I/O systems

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to

- Understand the modules of an operating system and to recognize the services of operating systems
- Experiment with different CPU scheduling algorithms in order to compare and analyzes their performances
- Comprehend the causes and consequences of deadlocks and the possible options to tackle them
- Learn the concepts of memory management and different memory partitioning techniques with their merits and demerits
- Implement various and compare disk scheduling algorithms
- Appraise the file organization and I/O techniques