# CSE316:OPERATING SYSTEMS

L:3 T:0 P:0 Credits:3

**Course Outcomes:** Through this course students should be able to

CO1 :: understand the role, functionality and layering of the system software components.

CO2 :: use system calls for managing processes, memory and the file system.

CO3 :: Analyze important algorithms eg. process scheduling and memory management algorithms

CO4 :: use and outline the various security measures that ensure threat free operation of a system

CO5 :: apply various operations on processes, threads and analyze methods to synchronize their execution

CO6 :: simulate inter-process communication techniques like message passing and shared memory

**Unit I**

**Introduction to Operating System** : Operating System Meaning, Supervisor & User Mode, review of computer organization, introduction to popular operating systems like UNIX, Windows, etc., OS structure, system calls, functions of OS, evolution of OSs

**Process Management** : PCB, Operations on Processes, Co-operating and Independent Processes, Inter-Process Communication, Process states, Operations on processes, Process management in UNIX, Process concept, Life cycle, Process and threads

**Unit II**

**CPU Scheduling** : Types of Scheduling, Scheduling Algorithms, Scheduling criteria, CPU scheduler - preemptive and non preemptive, Dispatcher, First come first serve, Shortest job first, Round robin, Priority, Multi level feedback queue, multiprocessor scheduling, real time scheduling, thread scheduling

**Unit III**

**Process Synchronization** : Critical Section Problem, Semaphores, Concurrent processes, Co-operating processes, Precedence graph, Hierarchy of processes, Monitors, Dining Philosopher Problem, Reader-writer Problem, Producer consumer problem, classical two process and n-process solutions, hardware primitives for synchronization

**Threads** : Overview, Multithreading Models, scheduler activations, examples of threaded programs

**Unit IV**

**Deadlock** : Deadlock Characterization, Handling of deadlocks- Deadlock Prevention, Deadlock Avoidance & Detection, Deadlock Recovery, Starvation

**Protection and Security** : Need for Security, Security Vulnerability like Buffer overflow, Trapdoors, Backdoors, cache poisoning etc, Authentication-Password based Authentication, Password Maintenance & Secure Communication, Application Security - Virus, Program Threats, Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, System and network threats, Examples of attacks

**Unit V**

**Memory Management** : Logical & Physical Address Space, Swapping, Contiguous Memory allocation, Paging, Segmentation, Page replacement algorithms, Segmentation - simple, multi-level and with paging, Page interrupt fault, Fragmentation - internal and external, Schemes - Paging - simple and multi level, Overlays - swapping, Virtual memory concept, Demand paging

**Unit VI**

**File Management** : File Concepts, Access methods, Directory Structure, File System Mounting and Sharing, Protection, Allocation methods, Free-Space Management, Directory Implementation

**Device management** : Dedicated, shared and virtual devices, Serial access and direct access devices, Disk scheduling methods, Direct Access Storage Devices – Channels and Control Units

**Inter process communication** : Introduction to IPC (Inter process communication) Methods, Pipes - popen and pclose functions, Co-processes, Shared memory, Stream pipes, FIFOs, Message queues, Passing File descriptors, Semaphores

**Text Books:**

1. OPERATING SYSTEM CONCEPTS by ABRAHAM SILBERSCHATZ, PETER B. GALVIN, GERG GAGNE, WILEY

**References:**

1. DESIGN OF THE UNIX OPERATING SYSTEM by MAURICE J. BACH, Pearson Education India

2. REAL-TIME SYSTEMS by JANE W. S. LIU, Pearson Education India