

<b>MCA- C106 Operating Systems</b>				
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<b>Course objective:</b>				
<ol style="list-style-type: none"> <li>1. To learn the mechanisms of OS to handle processes and threads and their communication</li> <li>2. To learn the mechanisms involved in memory management in contemporary OS</li> <li>3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols</li> <li>4. To know the components and management aspects of concurrency management</li> <li>5. To learn to implement simple OS mechanisms</li> </ol>				
<b>Course Outcomes:</b>				
<ol style="list-style-type: none"> <li>1. Create processes and threads.</li> <li>2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.</li> <li>3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.</li> <li>4. Design and implement file management system.</li> <li>5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers</li> </ol>				
<b>Introduction:</b> Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine				
<b>Processes:</b> Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching				
<b>Thread:</b> Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads				
<b>Process Scheduling:</b> Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.				
<b>Inter-process Communication:</b> Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc.				
<b>Deadlocks:</b> Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.				
<b>Memory Management:</b> Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.				
<b>Virtual Memory:</b> Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging,				



Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

**I/O Hardware:** I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

**Disk Management:** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Case study on UNIX and WINDOWS Operating System.

**Recommended Books:**

1. Silberschatz, A. and Galvin, P. B., Operating System Concepts, Addison Wesley,
2. William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall of India.



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