**Amended Course as passed by the Subject Committee Meeting held on Feb. 29, 2004.**

**CMP. 332.3 Operating System (3-0-3)**

| | Theory | Practical | Total |
|---|---|---|---|
| Sessional | 30 | 20 | 50 |
| Final | 50 | - | 50 |
| Total | 80 | 20 | 100 |

**Course objectives:**

1. To provide the basics of operating systems.
2. To familiarize with the feature controlling of modern operating system.

**Course Contents:**

**1. Principles of Operations Systems (4 hrs)**

Introduction, Operations System Concepts: Processes, files, shell, system calls, security and Operating System structure: Monolithic systems, Layered, Virtual Machines, Client – Server and Evolution of Operating Systems: User driven, operator driven, simple batch system, off – line batch system, directly coupled off – line system, multi- programmed spooling system, online timesharing system, multiprocessor systems, multi-computer/ distributed systems, Real time Operating Systems.

**2. Processes and Threads (12 hrs)**

Process Concepts: Introduction, Definition of Process, Process states and transition, PCB (Process Control Block), Concurrent Process: Introduction, Parallel Processing, IPC (Inter-process Communication), Critical Regions and conditions, Mutual Exclusion, Mutual Exclusion Primitives and Implementation, Dekker's Algorithm, Peterson's Algorithm, TSL (test and set lock), Locks, Producer and consumer problem, monitors, Message Passing, Classical IPC problems, Deadlock and Indefinite Postponement: Introduction, Preemptable and Nonpreemptable Resources, Conditions for deadlock, deadlock modeling, deadlock prevention, deadlock avoidance, dadlock detection and recovery, Starvation, Threads: Introduction, thread model, thread usage, advantages of threads.

**3. Kernel (2 hrs)**

Introduction, Context switching (Kernel mode and User mode), First level interrupt handing, Kernel implementation of processes.

**4. Scheduling (4 hrs)**

Introduction: Scheduling levels, Scheduling objectives and criteria, Quantum size, Policy versus Mechanism in Scheduling, Preemptive versus No preemptive Scheduling, Scheduling techniques: Priority scheduling, deadline scheduling, First-In – First – Out scheduling, Round Robin Scheduling, Shortest – Job – First (SJF) Scheduling, Shortest – Remaining – Time (SRT) scheduling, Highest – Response – Ration – Next (HRN) scheduling Multilevel Feedback Queues.

**5. Memory Management (6 hrs)**

Introduction, storage organization and hierarchy, contiguous versus noncontiguous storage allocation, Logical and physical memory, fragmentation, fixed partition multiprogramming, variable partition multiprogramming, relocation and protection, Coalescing and Compaction, Virtual Memory: Introduction, Paging, , Page tables, Block mapping, Direct mapping, TLB ( Translation Look aside Buffers), Page Fault, Page Replacement algorithms, Optimal Page Replacement algorithm, Not Recently Used Page Replacement algorithm, First- In- First Out algorithm, Second Chance Page Replacement algorithm, Working Set Page Replacement algorithm, WS Clock Page Replacement algorithm, Segmentation, implementation of pure segmentation, Segmentation with Paging.

**6. Input/ Output (3 hrs)**

Introduction, Principals of I/O hardware: I/O devices, device controllers, memory – mapped I/O, DMA (Direct Memory Access), Principles of I/O software: Polled I/O versus Interrupt driven I/O, Character User Interface and Graphical User Interface, Goals of I/O software, device drivers, device independent I/O software, Disk, disk hardware arm scheduling algorithms, RAID (Redundant Array of Inexpensive Disks)

**7. File Systems (3 hrs)**

File naming , file structure, file types, file access, file attributes, file operations, File descriptor, Access Control Matrix, sharing, ACL (Access Control List), Directories and directory hierarchy, File system implementation, contiguous allocation, linked list allocation, I-nodes, security and Multi – media files.

**8. Distributed Operating Systems (5 hrs)**

Introduction, Goals Network architecture hardware and software concepts, Communication in distributed systems, ATM (Asynchronous Transfer Mode, Client- Server Model, RPC (Remote Procedure Call), Group communication, Processes and Processors in distributed System, taxonomy of MIMD computer system, Clock synchronization, scheduling in distributed system.

**9. Case Studies (6 hrs)**

DOS Operating System: System configurations, Filing and disk management, Graphical capabilities, Memory management.

**Unix/Linux Operating System:** File systems and disk management, Filters, Pipelining, Sockets, Shell, Memory management, Networking feature, multiprocessing feature.

**Window 2000:** File System and disk management, Networking, Security.

**Laboratory:**

1. Housekeeping in DOS and Windows.
2. Memory and I/O management in DOS and Windows.
3. Housekeeping in UNIX/LINUX.
4. Inter-Process Communication.
5. Shell management in UNIX/ LIUX and Shell Programming
6. Memory management in UNIX/LINUX
7. Resource management
8. Device Programming.

**Text Books:**

1. A.S. Tanenbaum, Operating systems, Design and Implementation, Prentice hall India.
2. H.M. Dietel, An Introduction to Operating System, Addison Wesley.

**Reference Books**

1. A.S. Tanenbaum, Modern Operating System, Second Edition, Prentice hall India.
2. W. Stallings, Operating Systems, Prentice hall India.