

Operating Systems

Course Title: Operating Systems
Course No: BIT204
Nature of the Course: Theory + Lab
Semester: III

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:

The course covers fundamental concepts of operating system as well as, Process management, Memory management, File systems, and I/O Managements and Disk Managements.

Course Objectives:

The main objective of this course is to introduce fundamental concepts of operating system and its components and functions.

Course contents:

Unit 1: Introduction and Evolution (6 Hrs.)

- 1.1. Background of Operating system, Operating System as an Extended Machine and Resource Manager, hardware review.
- 1.2. Evolution of Operating System: batch system, multiprogramming, time-sharing, real-time, mainframe operating systems, handheld, embedded, smart-card, distributed and personal computer operating systems.
- 1.3. Operating system Concepts: Hardware Review, Booting Computer, System Calls, Address Spaces, Files, Client-Server Model.

Unit 2: System Structures (4 Hrs.)

- 2.1 Operating system Components: Process Managements, Memory Managements, I/O managements, Operating system services and system calls
- 2.2 Operating system structures: Monolithic system, Layered system, Micro Kernels, Exo Kernels, Virtual Machines, Storage Structures, I/O structures, Files structures, and system Protections:

Unit 3: Process Management and Synchronization (10 Hrs.)

- 2.1. Process management: Process Model, Process creation, process termination, process states, attributes; Thread Model: thread creation, termination, User Thread and Kernel Thread., Process scheduling and Context Switch, Scheduling Algorithms: First Come First Serve, Shortest Job First, Priority, Round Robin and Shortest time Remaining First.
- 2.2. Inter-process communication and synchronization: race conditions, critical regions, mutual exclusion, busy waiting, sleep and wakeup, semaphores, monitors, message passing, classical IPC problems and Deadlock Modelling, Deadlock Handling: Prevention, detection and Recovery.

Unit 4: Memory Management and File system (13 Hrs.)

3.1. Memory management: address spaces, multiprogramming, swapping, overlays, Memory allocations, Fragmentations, virtual memory, paging, page replacements algorithms: Principle of optimality, First in First out, LRU, LFU, NRU, Clock, Second Chance Page replacement, Working set, segmentation, and segmentation with paging.

3.2. File systems: File operations, Access Methods, Directories and Levels, Directories Operations, file system mounting and sharing, protection, access Control, File system layout, File system Implementation, File system Examples.

Unit 4: Input/output Management (12 Hrs.)

4.1. Input Output management: I/O devices, Devices Controller, Memory Mapped I/O, Direct Memory Access (DMA), I/O software Principles: programmed I/O, Interrupt driven I/O, DMA based I/O, I/O Software Layers.

4.2. Disk management: Disk structure, Disk scheduling, error handling and formatting, stable storage management.

Text / Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition, Prentice-Hall.
2. Silberschatz, Galvin and Gagne, Operating System Concepts, 6th Edition, Addition Wesley.