

Operating System(OS)

BCA IV SEM OS

SYLLABUS AND COURSE OVERVIEW

Contains Syllabus of Operating System of BCA

Title	Operating System
Short Name	OS
Course code	BCA-402
Nature of course	Theory + Practical
Semester	Fourth Semester
Full marks	60 + 20 + 20
Pass marks	24 + 8 + 8
Credit Hrs	3
Elective/Compulsory	Compulsory

Course Description

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- This course includes the topics that help students understand operating system and its functionality along with its types.

Course Objectives

- The general objectives of this subject are to provide the basic feature, function and interface with the hardware and application software to run the computer smoothly.



Units and Unit Content

FOR OS

Introduction to Operating System

Teaching Hours: 2 hrs

- History, Introduction and Generation of Operating System, Objectives(Resource Manager and Extended Machine), Types of Operating system, Function of Operating system.

Operating System Structure

Teaching hours: 2 hrs

- Introduction, Layered System, Kernel, Types of Kernel (Monolithic/Macro Kernel and Micro / Exo-Kernel), Client-Server Model, Virtual Machines, Shell.

Process Management

Teaching Hours: 15 Hrs

Process Concepts:

- Definitions of Process, The Process Model, Process States, Process State Transition, The Process Control Block, Operations on Processes (Creation, Termination, Hierarchies, Implementation), Cooperating Processes, System Calls (Process Management, File Management, Directory Management).

Threads:

- Definitions of Threads, Types Of Thread Process (Single and Multithreaded Process), Benefits of Multithread, Multithreading Models (Many-to-One-Model, One-to-One Model, Many-to-Many Model).

Inter-Process Communication & Synchronization:

- Introduction, Race Condition, Critical Regions, Avoiding Critical Region: Mutual Exclusion And Serializability; Mutual Exclusion Conditions, Proposals for Achieving Mutual Exclusion: Disabling Interrupts, Lock Variable, Strict Alteration (Peterson's Solution), The TSL Instruction, Sleep and Wakeup, Types of Mutual Exclusion (Semaphore, Monitors, Mutexes, Message Passing, Bounded Buffer), Serializability: Locking Protocols and Time Stamp Protocols; Classical IPC Problems (Dinning Philosophers Problems, The Readers and Writers Problem, The Sleeping Barber's Problem).

Process Scheduling:

- Basic Concept, Type of Scheduling (Preemptive Scheduling, Nonpreemptive Scheduling, Batch, Interactive, Real Time Scheduling), Scheduling Criteria or Performance Analysis, Scheduling Algorithm (Round-Robin, First Come First Served, Shortest-Job- First, Shortest Process Next, Shortest Remaining Time Next, Real Time, Priority Fair Share, Guaranteed, Lottery Scheduling, HRN, Multiple Queue, Multilevel Feedback Queue); Some Numerical Examples on Scheduling.

Deadlocks

Teaching Hours: 4 Hrs

- System Model, System Resources: Preemptable and Non-Preemptable; Conditions for Resource Deadlocks, Deadlock Modeling, The OSTRICH Algorithm, Method of Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance: Banker's Algorithm, Deadlock Detection: Resource Allocation Graph, Recovery from Deadlock.

Memory Management

Teaching Hours: 7 Hrs

Basic Memory Management:

Introduction, Memory Hierarchy, Logical Versus Physical Address Space, Memory Management with Swapping: Memory Management with Bitmaps and with Linked List; Memory Management without Swapping, Contiguous-Memory Allocation: Memory Protection, Memory Allocation, Fragmentation (Internal Fragmentation and External Fragmentation); Non-Contiguous Memory Allocation, Fixed Partitioning Vs. Variable Partitioning, Relocation and Protection, Coalescing and Compaction.

Virtual Memory:

Background, Paging, Structure of Page Table: Hierarchical Page Table, Hashed Page Table, Inverted Page Table, Shared Page Table, Block Mapping Vs. Direct Mapping, Demand Paging, Page Replacement and Page Faults, Page Replacement Algorithms: FIFO, OPR, LRU, SCP; Some Numerical Examples on Page Replacement, Thrashing, Segmentation, Segmentation With Paging.

INPUT/OUTPUT DEVICE MANAGEMENT

TEACHING HOURS: 4 HRS.

- Principle of I/O Devices, Device Controllers, Memory Mapped I/O, Direct Memory Access; Principle of I/O Software: Goals of I/O Software, Program I/O, Interrupt - Driven I/O, I/O Using DMA; I/O Software Layers: Interrupts Handler, Device Drivers, Device Independent I/O Software, User-Space I/O Software; Disk Hardware; Disk Scheduling: Seek Time, Rotational Delay, Transfer Time; Disk Scheduling Algorithms: FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, Lock Scheduling

FILE SYSTEM INTERFACE MANAGEMENT

TEACHING HOURS: 2 HRS

- File Concept: File Naming, File Type, File Access, File Attributes, File Operation and File Operation and File Descriptors: Directories: Single-Level Directory Systems, Hierarchical Directory Systems, Path Names, Directory Operation; Access Methods: Sequential, Directory Operation; Access methods: Sequential, Direct; Protection: Types of Access Control List, Access Control Matrix.

SECURITY MANAGEMENT

TEACHING HOURS: 3 HRS

- Introduction, Security Problems, User Authentication: Passwords, password Vulnerabilities, Encrypted password, One Time Password and Biometrics password; User Authorization, Program Threats: Trojan Horse, Trap Door, Stack and Buffer Overflow; System Threats: Worms, Viruses, Denial of Services.

DISTRIBUTED OPERATING SYSTEM

TEACHING HOURS: 4 HRS

- Introduction. Advantages of Distributed System over Centralized System. Advantages of Distributed System over Independent PCs, Disadvantages of Distributed System, Hardware and Software Concepts, Communication in Distributed Systems, Message Passing, Remote Procedure Call, Process in Distribution System, Clock Synchronization.

Case Study

Teaching hours: 2 hrs

- DOS and Windows Operating System, Unix Operating System, Linux Operating System



Thanks