**COURSE MODULE FOR THE SESSION 2025-26(ODD SEMESTER)**

## Course Syllabi with CO's

**Academic Year**: 2025 - 26

**Department**: Computer Science & Engineering

| Course | Course Title | Core/Elective | Prerequisite | Contact Hours | | | Total Hrs / Sessions |
|---|---|---|---|---|---|---|---|
| | | | | L | T | P | |
| **BCS303** | **Operating Systems** | Core | **Fundamentals of computer hardware and software** | 3 | - | 2 | 40T + 20P |

**Objectives:**

- To Demonstrate the need for OS and different types of OS
- To discuss suitable techniques for management of different resources
- To demonstrate different APIs/Commands related to processor, memory,

**Topics Covered as per Syllabus**

**Module -1**

Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments.

Operating System Services: User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System debugging, Operating System generation; System boot.

**Module -2**

Process Management: Process concept; Process scheduling; Operations on processes; Inter process communication Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Thread scheduling; Multiple-processor scheduling,

**Module -3**

Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlocks

**Module -4**

Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.

**Module - 5**

File System, Implementation of File System: File system: File concept; Access methods; Directory and Disk structure; File system mounting; File sharing; Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. Secondary Storage Structure, Protection: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix.

**Text Books:**

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 9th Edition, Wiley-India, 2009

**Reference Books**

1. Ann Mc Hoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6thEdition
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill,2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI (EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6thEdition,Pearson.

List of URL's

1. http://nptel.ac.in/courses/106106144
2. https://en.wikipedia.org/wiki/Operating_system
3. https://www.tutorialspoint.com/operating_system

**Course outcomes:** The students should be able to:

- Course outcomes (Course Skill Set): At the end of the course, the student will be able to:
- CO 1. Explain the structure and functionality of operating system
- CO 2. Apply appropriate CPU scheduling algorithms for the given problem.
- CO 3. Analyze the various techniques for process synchronization and deadlock handling.
- CO 4. Apply the various techniques for memory management
- CO 5. Explain file and secondary storage management strategies.
- CO 6. Describe the need for information protection mechanisms

**Internal Assessment Marks: 40 (3 Session Tests are conducted during the semester and Marks allotted based on average of all performances).**

PRACTICAL COMPONENT OF IPCC(May cover all / major modules) Sl.N O Experiments

1 Develop a c program to implement the Process system calls (fork (), exec(), wait(), create process, terminate process)
2 Simulate the following CPU scheduling algorithms to find turnaround time and waiting time a) FCFS b) SJF c) Round Robin d) Priority.
3 Develop a C program to simulate producer-consumer problem using semaphores.
4 Develop a C program which demonstrates inter process communication between a reader process and a writer process. Use mk fifo, open, read, write and close APIs in your program.
5 Develop a C program to simulate Bankers Algorithm for Dead Lock Avoidance.
6 Develop a C program to simulate the following contiguous memory allocation Techniques: a) Worst fit b) Best fit c) First fit.
7 Develop a C program to simulate page replacement algorithms: a) FIFO b) LRU
8 Simulate following File Organization Techniques a) Single level directory b) Two level directory 9 Develop a C program to simulate the Linked file allocation strategies. 10 Develop a C program to simulate SCAN disk scheduling algorithm.

**The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)**

| Subject Code | BCS303 | | | Title: Operating Systems | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| List of Course Outcomes | PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | Total |
| CO-1 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 7 |
| CO-2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 7 |
| CO-3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 7 |
| CO-4 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 7 |
| CO-5 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 7 |
| CO-6 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | 7 |
| Total | 18 | 12 | 12 | - | - | - | - | - | - | - | - | 42 |

**The Correlation of Program Specific Outcome's (PS0's) and Course Outcome (CO's)**

| Subject Code | BCS302 | Title: Operating Systems | |
|---|---|---|---|
| List of Course Outcome's | PSO1 | PSO2 | Total |
| CO-1 | - | - | - |
| CO-2 | - | - | - |
| CO-3 | - | - | - |
| CO-4 | - | - | - |
| CO-5 | - | - | - |
| CO-6 | - | - | - |
| Total | - | - | - |

**Note:** 3 = Strong Contribution 2 = Average Contribution 1= Weak Contribution - = No Contribution