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

Course Syllabi with CO's

Academic Year: 2023 - 2024

Department: Computer Science & Engineering - Data Science

Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BCS303	**Operating Systems**	Core	**Fundamentals of computer hardwareand 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, storage and file system management.

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 deadlock.

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.

TextBooks:	
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 9th Edition, Wiley-India, 2009	
Reference Books	
1. Ann McHoes 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. Analyse 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 interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.
5 Develop a C program to simulate Bankers Algorithm for DeadLock 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	PO12	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	21CS44	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