Code: BCA-2003T (For theory) BCA-2003P (For practical)	CC-V	Operating Systems	3L+T: 2P	4 Credits (45 hour theory an 30 hours practical

Max Marks; Theory: 100 (Int: 25; Ext: 75); Practical: 100

Course Outcomes: Upon competition of the course, students will be able to
CO1: Understand the components, services, and structures of operating systems and different types of O
CO2: Analyze process scheduling, multithreading, and CPU scheduling algorithms.
CO3: Apply concepts of process synchronization and solve deadlock problems using appropriate technique
CO4: Implement memory management techniques, file systems, and disk scheduling algorithms

LAB Outcomes:
CO1: Implement CPU scheduling algorithms.
CO2: Understand and solve critical section problems.
CO3: Apply file allocation and frame management techniques.
CO4: Implement page replacement algorithms.

Unit	Topics	Purposed lectures
I	**Operating Systems (OS) Overview** Definition, Evaluation of OS, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed, and real-time Systems. **Operating Systems Structures:** Operating system services and system calls, system programs, operating system structure, operating systems generations.	11
II	**Process Management** Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads. **Process Scheduling:** Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Preemptive and Non-preemptive Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms.	11
III	**Process Synchronization** Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, problems of synchronization, readers and writers problem, dining philosophers problem, Monitors. **Deadlocks:** System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks.	11
IV	**Memory Management** Logical and Physical address map, Swapping, Memory allocation, MFT, MVT, Internal and External fragmentation and Compaction, Paging, and Segmentation. **Virtual Memory:** Demand paging, Page Replacement algorithms, Allocation of frames, thrashing.	12

	I/O Management: Principles of I/O Hardware: Disk structure, Disk scheduling algorithms. **File system interface:** File Concept, Access Methods, Directory Structure, File System Structure, Allocation Methods, and Free-Space Management. **System Protection:** Goals, Principles, Domain of Protection, Access Matrix, Access Control.	
Lab Programs	1. Write a C program to simulate the FCFS CPU Scheduling algorithm. 2. Write a C program to simulate the SJF CPU Scheduling algorithm. 3. Write a C program to simulate the Round Robin CPU Scheduling algorithm. 4. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance. 5. Write a C program to implement the Producer – Consumer problem using semaphores. 6. Write a C program to illustrate the IPC mechanism using Pipes. 7. Write a C program to illustrate the IPC mechanism using FIFOs. 8. Write a C program to simulate Paging memory management technique. 9. Write a C program to simulate Segmentation memory management technique. 10. Write a C program to simulate the Best Fit contiguous memory allocation technique. 11. Write a C program to simulate the First Fit contiguous memory allocation technique. 12. Write a C program to simulate the concept of Dining-Philosophers problem. 13. Write a C program to simulate the MVT algorithm. 14. Write a C program to implement FIFO page replacement technique. 15. Write a C program for implementing sequential file allocation method.	

Text Books:

1. Silberschatz, Abraham, et al. *Operating System Principles*. 7th ed., Wiley India, 2006.
2. Stallings, William. *Operating Systems: Internals and Design Principles*. 5th ed., Pearson Education, 2006.
3. Silberschatz and Galvin, "Operating System Concepts ", Wiley
4. Operating Systems: A Concept-based Approach, Dhananjay M. Dhamdhere,McGrawHill

Reference Books:

1. Tanenbaum, Andrew S. *Modern Operating Systems*. 3rd ed., Prentice Hall India, 2007.
2. Das, Sumitabha. *UNIX Concepts and Applications*. 4th ed., Tata McGraw-Hill, 2014.