

## Core VII

## Operating Systems

### Course Objectives:

- To understand Operating system structure and services.
- To understand the concepts of Process, memory, storage, and I/O management.
- To explore different applications of data structures.

### Learning Outcomes:

Upon completion of this course, students will be able to:

1. Understand various services offered by an OS as a resource manager
2. Understand the concept of a process and various CPU scheduling techniques
3. Learn the concepts on effective memory management and virtual memory
4. Learn various approaches to disk scheduling & file management techniques

### Unit-I:

Introduction to Operating System, Computer System Architecture, System Structures: Operating system services, User and Operating-System Interface, system calls, system programs, Operating system design and implementation, Operating system structure, Batch processing, multi-programming, time-sharing and real-time systems

### Unit-II:

Process Management: Process Concept, Operations on processes, Process scheduling, Inter-process Communication, Threads, Multithreading Models. CPU Scheduling algorithms: Scheduling Criteria, FCFS, SJF, Priority, Round Robin, Multilevel Queue, Multilevel Feedback Queue. Deadlocks: Deadlock detection, deadlock prevention, and deadlock avoidance fundamentals.

### Unit-III:

Memory Management Strategies: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Virtual Memory Management: Concepts, Demand Paging, Page Replacement techniques: FIFO, LRU, Optimal, Thrashing.

### Unit-IV:

Storage Management: Overview of Mass-Storage Structure, Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK, RAID technology.  
File System concept, Access Methods, Directory and Disk Structure, File System systems, File, Sharing and File Protection.

### Text Books:

- ✓ *Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Eighth Edition, Wiley Student Edition 2009*

✓ *Operating Systems, Rajiv Chopra, S. Chand Pubs.*

### Reference Books:

- ✓ *Modern Operating System, Tanenbaum, Pearson, 4/ed. 2014*
- ✓ *Operating Systems 5th Edition, William Stallings, Pearson Education India*
- ✓ *Richard Blum, Linux Command Line and Shell Scripting Bible, O' Reilly*

## Core VII- Lab: Operating Systems

1. Basic Linux Commands and Overview (date, cal, who, tty, echo, bc, pwd, mkdir, rmdir, cd, cat, cp, mv, rm, ls, wc)
2. Shell Programming
  - i. Write a shell script to perform the tasks of basic calculator.
  - ii. Write a shell script to find the greatest number among the three numbers.
3. Shell Programming
  - i. Write a shell script to check if the number entered at the command line is prime or not.
  - ii. Write a shell script to display the multiplication table of any number.
4. Shell Programming
  - i. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
  - ii. Write a shell script to find the sum of digits of a given number.
  - iii. Write a shell script to find the factorial of a given number.
5. Write a program (using fork() and/or exec() commands) where parent and child execute:
  - i. Same program, same code.
  - ii. Same program, different code.
  - iii. Before terminating, the parent waits for the child to finish its task.
6. Write a program to copy files using system calls.
7. Write a program using C to implement FCFS scheduling algorithm.
8. Write a program using C to implement Round Robin scheduling algorithm.
9. Write a program using C to implement SJF scheduling algorithm.
10. Write a program using C to implement first-fit, best-fit, and worst-fit allocation strategies.