

Operating Systems

1.1 Course Number: CS311

1.2 Contact Hours 3-0-2 Credits: 11

1.3 Semester-offered: 3rd Year-Odd

1.4 Prerequisite: Data Structure and Algorithm, Computer System Organization

1.5 Syllabus Committee Member: Dr. Sushum Biswas, Dr. Daya Sagar Gupta & Dr. Gargi Srivastava

2. **Objective:** To give knowledge about fundamentals of operating system

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Introduction	Computer System Structures. Operating System Structure- System Components, System Calls.	2
2	Process Concept and Scheduling	Process Scheduling, Operation on Processes, Cooperating Processes. Threads. Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling. Real-Time Scheduling.	10
3	Process Synchronization and Deadlocks	The Critical-Section Problem, Semaphores, Classic Problems of Synchronization, Monitors. System Model, Deadlock Characterization, Methods for Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Starvation.	10
4	Memory Management	Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging. Virtual Memory- Demand Paging, Page Replacement, Allocation of Frames, thrashing	10
5	File-System and Mass Storage Structure	File Concept, Directory Structure, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. I/O Systems- I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations, STREAMS, Performance. Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure, Disk Attachment, Stable-	10

		Storage Implementation, Tertiary- Storage Structure. Protection and Security. A case study of modern operating systems	
			Total
			42

4. **Readings**

4.1 Textbook: *“Operating System Concepts”, 6th ed., Silberschatz-Galvin-Gagne, John Wiley & Sons.*

4.2 Reference books: *“Operating System: A Modern Perspective”, 2nd ed., Garry Nutt, Pearson Education.*

5 **Outcome of the Course:**

Upon successful completion of this course, students will:

- i. Identify the basic concept and describe the main responsibilities of a contemporary operating system (OS) and to explain the history leading to their current form.
- ii. recognize and give examples of conflicting goals and compromises necessary in implementing an OS and configuring its run-time parameters
- iii. identify and list application scenarios in which it is useful to use multiple threads of execution (including the fundamental need for multitasking in an OS)
- iv. explain the concept of a process and the process control block (PCB) in a typical OS; recognize a PCB upon seeing the C code of such, and assess whether such a data structure contains everything that is necessary to handle the main tasks of a modern OS