Course Description

Title: Operating Systems   Code: 18B11CI413

L-T-P scheme: 3-0-0   **Credit: 3**

Prerequisite: Students must have knowledge of C programming and working of the computer systems.

Objective:

1. To familiarize with the basic functionality and the evolution of different types of operating systems.
2. To Learn and understand various algorithms related to CPU scheduling, deadlocks, memory management, and storage management.
3. To learn basic aspects of real time operating systems.

Learning Outcomes:

Course Outcome	Description
CO1	Gain knowledge of OS fundamentals along with process management concepts
CO2	Apply various process management concepts including scheduling, synchronization, dead-lock to solve given problem.
CO3	Explain various memory management techniques including virtual memory.
CO4	Analyse issues related to memory management.
CO5	Understand file system including disk structure by applying disk scheduling algorithm.
CO6	Work as a team on a project.

Course Content:

Unit-1: Introduction: Operating system structure, Operating system operations, Distributed systems, Special purpose systems, Computing environments, Open source operating systems.

Unit-2: CPU Scheduling: Process concepts: Process states, Process control block, Scheduling queues, Schedulers, Context switch, multi-threaded programming: Overview, Multithreading models, Threading issues, Process scheduling: Basic concepts, Scheduling criteria, scheduling algorithms.

Unit-3: Synchronization: The Critical section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, monitors.

Unit-4: Deadlocks: Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

Unit-5: Memory management: Memory management strategies, Swapping, Contiguous memory allocation, Paging, Structure of the page table, Segmentation.

Unit-6: Virtual Memory: Demand paging, copy on write, page replacement, allocation of frames, thrashing.

Unit-7: Storage Management: File concept, Access methods, directory structure, file system structure, directory implementation, allocation methods, free space management, disk structure, and disk-scheduling.

Unit-8: Case study on UNIX based Operating system: Design principles, Kernel modules, Process management, Memory management, Project in Robot Operating System (ROS).

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1, Unit-2 & Unit-3
Test-2	25 Marks	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-9 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Tutorials and lecture slides on Operating Systems (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

[1] "Operating System Concepts"; A. Silberschatz , P. B. Galvin & G. Gagne , Wiley 10e 2018.
[2] "Operating Systems: Internals and Design Principles"; W. Stallings, Pearson 9e, 2017.

Reference Books/Material:
[1] "Real time systems design and analysis"; P. A. Laplante & S. J. Ovaska, Wiley, 2013.
[2] "Real time systems: Theory and Practice"; Mall R., Pearson, 2e, 2009.