Department: Mathematics and Computer Sciences
Division: Applied Mathematics
Level and Major: Undergraduate

Course Title: Principles of Operating systems
Number of Credits: 4
Prerequisite: Data Structures and Algorithms
Lecturer:

Course Description:

Different part of a computer system description, User and hardware interaction, Interrupt, How operating system works, Methods of operating system design, Process, strings and their operations, Concurrency, CPU scheduling algorithms, Critical section, Synchronicity, Semaphore and Monitor, Deadlock, Memory management and assignment, Virtual memory, File structure, Protection and Security, task scheduling algorithms, Prevention algorithms, Deadlock detection and resolve, Resource allocation algorithms.

Course Goals and Objectives: Students are familiar with operating systems and work with its concepts.

Course Topics:

- Overview of operating systems, functionalities and characteristics of OS.
- Hardware concepts related to OS, CPU states, I/O channels, memory hierarchy, microprogramming
- The concept of a process, operations on processes, process states, concurrent processes, process control block, process context.
- UNIX process control and management, PCB, signals, forks and pipes.
- Interrupt processing, operating system organization, OS kernel FLIH, dispatcher.
- Job and processor scheduling, scheduling algorithms, process hierarchies.
- Problems of concurrent processes, critical sections, mutual exclusion, synchronization, deadlock.
- Mutual exclusion, process co-operation, producer and consumer processes.
- Semaphores: definition, init, wait, signal operations.
- Use of semaphores to implement mutex, process synchronization etc., implementation of semaphores.
- Critical regions, Conditional Critical Regions, Monitors, Ada Tasks.
- Interprocess Communication (IPC), Message Passing, Direct and Indirect
- Deadlock: prevention, detection, avoidance, banker's algorithm.
- Memory organization and management, storage allocation.
- Virtual memory concepts, paging and segmentation, address mapping.
- Virtual storage management, page replacement strategies.
- File organization: blocking and buffering, file descriptor, directory structure
- File and Directory structures, blocks and fragments, directory tree, nodes, file descriptors, UNIX file structure.

The Course aims to: Introduction to the principles of operating system design and their evaluation

Reading Resources:

- Avi Silberschatz , Peter Baer Galvin, Greg Gagne , Operating System Concepts, Ninth Edition, 2013, John Wiley & Sons, Inc. ISBN 978-1-118-06333-0.
- Silberschatz, Abraham, Peter B. Galvin, and Greg Gagne. Operating system concepts with Java. Wiley Publishing, 2009.
- Tanenbaum**,** A**.** Woodhull**,** Operating Systems**:** Design and Implementation**,** Pearson**,** 2009**.**

Evaluation: