Capital University of Science and Technology

Department of Computer Science

CS3413 - Operating Systems

Course Title:	Operating Systems (CS3413)
Pre-requisite(s):	Data Structures (CS2143)
Credit Hours:	3
Instructor(s):	
Text Book(s):	Operating System Concepts, Author Silberschatz/Galvin, 9th Edition, published by John Wiley & Sons.
Reference Book(s):	• Operating Systems, Author Gary Nutt, 3rd edition, published by *Addison-Wesley.* • Introduction to operating systems, Author Harvey M. Deitel, 3rd edition
Web Reference:	• https://www.os-book.com/OS9/slide-dir/index.html

Course Introduction:

This course has two components: a theory component to teach you the concepts and principles that underlie modern operating systems, and a practice component to relate theoretical principles with operating system implementation. In the theory component, you will learn about processes and processor management, concurrency and synchronization, memory management schemes, file system and secondary storage management, security and protection, etc. The practice component will complement the theory component through programming assignments illustrating the use and implementation of these concepts.

Course Objectives:

The course objectives are as follows:

- Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
- Understand how the operating system abstractions can be implemented,
- Understand the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software,

- Understand basic resource management techniques (scheduling or time management, space management) and principles and how they can be implemented. These also include issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection.

Course Learning Outcomes (CLOs):

At the end of this course, the students should be able to:

CLO1: Explain fundamental operating system concepts such as processes, threads, files etc. [C1-Knowledge].

CLO2: Apply operating system concepts to explain a given scenario or program [C-1Knowledge].

CLO3: Analyze the working of important operating system algorithms [C4-Problem Analysis].

CLOs – PLOs Mapping:

	CLO:1	CLO:2	CLO:3
PLO:1 (Academic Education)			
PLO:2 (Knowledge for Solving Computing Problems)	√		
PLO:3 (Problem Analysis)		√	
PLO:4 (Design/Development of Solutions)			√
PLO:5 (Modern Tool Usage)			

Course Contents:

Week	Contents
1	Introduction to Operating systems, What Operating Systems Do, Computer-System Organization, Computer-System Architecture, Operating-System Structure
2	Virtual machines Polling and interrupt-based device scheduling, Multitasking / Multiprogramming.

3	Operating System Services, User Operating System Interface, System Calls, Types of System Calls
4	System Programs, Operating System Design and Implementation, Operating System Structure
5	Process concepts. Processor States, Interrupt, Context Switching, Process Creation, Fork, exec, wait on child
6	Inter process communication, direct and indirect communication, message passing
7	Introduction to threads, Multicore Programming, Multithreading Models
8	Thread Libraries, Implicit Threading, Threading Issues
Mid-Term Exam	
9	Process scheduling, scheduling criteria, scheduling algorithms
10	Process synchronization, Introduction to the critical section, solution to the critical section (two process, n process)
11	Continuation of n-process solution, Hardware approached for critical section, Introduction to semaphores and OS solution for critical section problem, binary and counting semaphores
12	Deadlock management, deadlock characterization, preventive approaches for dead lock detection
13	Deadlock avoidance approaches, deadlock detection approaches
14	Introduction to memory management, introduction to paging
15	Page tables mapping, logical address to physical address, multilevel paging with examples, segmentation and paged segmentation with examples.
16	Virtual memory, demand paging, page replacement algorithms

Grading Policy:

S.No	Grading	% of Total Marks
1	Assignments	20
2	Quizzes	20
3	Mid-term Exam	20
4	Final Exam	40
	Total	**100**