

# COMSATS University Islamabad

## Department of Computer Science

### Course Syllabus

#### Course Information

Course Code	CSC323	Course Title	Operating Systems
Credit Hours	3(2,1)	Lecture Hours/Week	3
Lab Hours/Week	3	Pre-Requisites	CSC211 - Data Structures and Algorithms

#### Catalogue Description:

This course introduces the services and functions performed by operating system for smooth and accurate system operations. Topics include: Operating Systems Overview, Device Organization & System Operations, Operating Systems Principles; Process Management, Process Synchronization; Deadlocks; Multiprocessor Issues; Memory Management; Storage Management; and Security & Protection.

#### Text and Reference Books

##### Textbooks

1. Operating System Concepts, Silberschatz & Galvin, Addison Wesley, 2021.
2. Modern Operating Systems, Tanenbaum, A. S., Prentice Hall, 2014.

##### Reference Book:

1. Operating Systems: Internals and Design Principles, Stallings, W., Pearson, 2017.

#### Week wise Plan:

Lecture #	CDF Unit #	Topics Covered	Reading Material
1.	1	Operating Systems: Overview, Purpose & Functionality, Evolution, Needs, Principles, and Computing Environments.	Silberschatz: Ch1
2.	1	Device Organization & System Operations: Interrupts, Dual Mode Execution, Single & Multi User; and Computer System Architecture.	Silberschatz: Ch1
3.	1	Operating System Structure; and Resource Management Services.	Silberschatz: Ch1
4.	1	Operating Systems Services; User Interfaces; and System Calls.	Silberschatz: Ch2
5.	1	OS Design Issues; OS Structuring Approaches: Monolithic, Layered, Modular, Microkernel, and Hybrid Models.	Silberschatz: Ch2
6.	2	Process Management: Overview, Process Concept, Process States, Context Switch, and Process Scheduling & Scheduling Queues.	Silberschatz: Ch3
7.	2	Operations on Processes: Process Creation (Fork, Exec & Wait System Calls), Process Termination (Exit & Abort System Calls), Cascade Termination, and Zombie & Orphan Processes.	Silberschatz: Ch3
8.	2	Inter-Process Communication: Shared Memory and Message Passing.	Silberschatz: Ch3
9.	2	Threads: Overview, Processes vs. Threads, Multiple Simultaneous & R P S X W D W L R Q V D Q G \$ O K D P D G T V / D Z	Silberschatz: Ch4
10.	2	Multithreading Models; and Multithreading Libraries.	Silberschatz: Ch4
11.	2	CPU Scheduling: CPU I/O Burst Life Cycle, Scheduling Points, Scheduling Criteria; Scheduling Types, Scheduling Algorithms: FCFS Scheduling.	Silberschatz: Ch5
12.	2	Scheduling Algorithms SJF Scheduling, Predicting Next CPU Burst, SF	Silberschatz:

		Scheduling, and Priority Scheduling.	Ch5
13.	2	Scheduling Algorithms Round Robin Scheduling, Multi-Level Queue, and Multi-Level Feedback Queue Scheduling.	Silberschatz: Ch5
14.	3	Process Synchronization: Overview, Need; Critical Section Problem Definition, Solution Overview, Conditions for Correct Solution, and TV Process Solution to CS Problem.	Silberschatz: Ch6
15.	3	Hardware based Solutions to CS Problem: Enabling & Disabling Interrupts; Test & Set, Compare & Swap; and Software based Solutions: Monitors.	Silberschatz: Ch6
16.	3	Software based Solutions: Semaphore; and Classical Synchronization Problems.	Silberschatz: Ch7
17.	Mid Term Exam		
18.			
19.	3	Deadlocks Overview; Characterization: Conditions & Resource Allocation Graph; and Deadlock Handling Techniques Deadlock Prevention.	Silberschatz: Ch8
20.	3	Deadlock Avoidance: Resource Allocation Graph, and Bankers Algorithm.	Silberschatz: Ch8
21.	3	Deadlock Detection & Recovery.	Silberschatz: Ch8
22.	4	Memory Management: Review of Physical Memory & Memory Management Hardware Address Binding, Address Space Types, and Dynamic Loading/Linking & Shared Libraries.	Silberschatz: Ch9
23.	4	Contiguous Memory Allocation: Fixed Partitioning & Dynamic Partitioning; and NonContiguous Memory Allocation: Segmentation.	Silberschatz: Ch9
24.	4	Paging: Basic Method, HW Support, and Protection.	Silberschatz: Ch9
25.	4	Virtual Memory: Background, Benefits; Demand Paging: Basic Concept, Performance and Copy-on-Write.	Silberschatz: Ch10
26.	4	Page Replacement Algorithms: Overview, FIFO, Optimal, LRU, and Chance Algorithm, MFU & LFU, and Thrashing.	Silberschatz: Ch10
27.	5	Mass Storage Management Hard-disks, Volatile & Non-Volatile Memory; Disk Scheduling; and NVM Scheduling.	Silberschatz: Ch11
28.	5	Storage Device Management: Formatting, Boot Block, Bad Blocks; Swap Space Management.	Silberschatz: Ch11
29.	5	File System File concept Access Methods, and Directory Structure.	Silberschatz: Ch13
30.	5	File Protection; and Memory Mapped Files.	Silberschatz: Ch13
31.	6	OS Security: Overview, Program Threats, Network Threats, Cryptography, and Security Implementation.	Silberschatz: Ch16
32.	6	Protection: Overview, Goals, Principles, and Access Control.	Silberschatz: Ch16
Final Term Exam			
Student Outcomes (SOs)			
S.#	Description		
1	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, and domain knowledge appropriate for the computing specialization to the abstraction & conceptualization of computing models from defined problems and requirements		