U23CSTT43 OPERATING SYSTEMS

COURSE PLAN (2024-2025 Even Semesters)

Course Code/Name	U23CST43/OPERATING SYSTEMS			
Year/Section/Department	II/A, II /B, II/C AI&DS			
Credits Details	L: 3	T: 0	P:0	C:3
Total Contact Hours Required	45			

Syllabus:

UNIT I – INTRODUCTION	**No. of Periods: 9**
Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures Operating System Services - User Operating System Interface System Calls System Programs Design and Implementation Structuring methods.	
UNIT II PROCESS MANAGEMENT	**No. of Periods: 9**
Processes Process Concept Process Scheduling Operations on Processes Inter-process Communication; CPU Scheduling Scheduling criteria Scheduling algorithms: Threads Multithread Models Threading issues; Process Synchronization the Critical-Section problem Synchronization hardware Semaphores Mutex Classical problems of synchronization Monitors; Deadlock Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	
UNIT III MEMORY MANAGEMENT	**No. of Periods: 9**
Main Memory - Swapping - Contiguous Memory Allocation Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory Demand Paging Copy on Write Page Replacement Allocation of Frames Thrashing	
UNIT IV STORAGE MANAGEMENT	**No. of Periods: 9**
Mass Storage system Disk Structure Disk Scheduling and Management; File-System Interface File concept Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation File System Structure Directory implementation Allocation Methods Free Space Management; I/O Systems I/O Hardware, Application I/O interface, Kernel I/O subsystem	
UNIT V VIRTUAL MACHINES AND MOBILE OS	**No. of Periods: 9**
Virtual Machines History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS iOS and Android. **PERIODS** **TOTAL: 45**	

Objectives:

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1. To understand the basic concepts and functions of operating systems.
2. To understand processes and threads.
3. To analyze scheduling algorithms and process synchronization.
4. To understand the concept of deadlocks.
5. To analyze various memory management schemes.
6. To understand I/O management and file systems.
7. To explore virtual machines and mobile OS like iOS and Android.

Text Book:

T1: Abraham Silberschatz, Peter Baer Galvin, and Greg Gagne, "Operating System Concepts," 9th Edition, Wiley, 2012.

T2: William Stallings, "Operating Systems: Internals and Design Principles," 9th Edition, Pearson, 2018.

Reference Book:

R1: Ramez Elmasri, A Gil Carrick, David Levine, “Operating Systems A Spiral Approach”, Tata
McGraw Hill Edition, 2010.
R2: Achyut S Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.
R3: Andrew S Tanenbaum, “Modern Operating Systems”, 2nd Edition, Pearson Education, 2004.

Website:

W1: https://www.brainkart.com/subject/Operating-Systems_159/
W2:https://www.poriyaan.in/paper/introduction-to-operating-systems-81/

Course Plan:

UNIT I

Topic	Book/Page No.	Teaching Methodology	Periods	Cumulative Periods
Basic elements of Computer System	T1/4	BB	1	1
Instruction execution, Interrupts	T1/8	BB	1	2
Memory hierarchy, Cache	T1/11	BB	1	3

memory, Direct memory access				
Multiprocessor and multicore organization	T1/14	BB	1	4
Operating System Overview: Objectives and functions	T1/5	BB	1	5
Evolution of Operating Systems	T1/7	BB	1	6
Operating System Structure and Operations	T1/78-86	BB	1	7
System Calls, System Programs	T1/66-74	BB	1	8
OS design and implementation	T1/91-92	BB	1	9

Outcome of Unit I:

- Understand the fundamentals of operating systems, including their objectives and functions.
- Explain the architecture of computer systems, including instruction execution, memory hierarchy, and multiprocessor systems.
- Identify the evolution of operating systems and describe their structure and operations.
- Demonstrate the use of system calls and system programs in operating systems.
- Analyze the process of operating system generation and system boot mechanisms.

UNIT II

Topic	**Book/Page No.**	**Teaching Methodology**	**Periods**	**Cumulative Periods**
Process Concept, Process Scheduling	T1/105-110	BB	1	10
Operations on Processes, Inter-process Communication	T1/115-122	BB	1	11
CPU Scheduling: Criteria, Algorithms, Multiple-processor Scheduling	T1/261-283	BB	1	12
Threads: Overview, Multithreading Models, Threading Issues	T1/163-183	BB	1	13

Process Synchronization: Critical-section problem, Mutex locks	T1/203-212	BB	1	14
Semaphores, Classic problems of synchronization	T1/213-223	BB	1	15
Deadlock: System Model, Deadlock Characterization	T1/315-317	BB	1	16
Methods for Handling Deadlocks	T1/322-327	BB	1	17
Deadlock Detection, Recovery	T1/333-337	BB	1	18

Outcome of Unit II:

- Understand the concepts of processes, threads, and their lifecycle in an operating system.
- Analyze CPU scheduling criteria and apply various scheduling algorithms.
- Explain the mechanisms of inter-process communication (IPC) and evaluate their use in synchronization.
- Demonstrate multithreading models and threading issues in modern systems.

UNIT III

Topic	Book/Page No.	Teaching Methodology	Periods	Cumulative Periods
Main Memory: Background, Swapping	T1/351-357	BB	1	19
Contiguous Memory Allocation, Paging, Segmentation	T1/358-377	BB	1	20
Segmentation with Paging	T1/383-387	BB	1	21
Virtual Memory: Background, Demand Paging	T1/397-400	BB	1	22
Page Replacement, Allocation, Thrashing	T1/401-420	BB	1	23
Allocating Kernel Memory	T1/436-445	BB	1	24

Outcome of Unit III:

• Understand the fundamentals of memory management, including swapping, contiguous memory allocation, and paging. • Explain segmentation and segmentation with paging, including examples of 32-bit and 64-bit architectures. • Analyze the principles of virtual memory and its implementation using demand paging and page replacement algorithms. • Evaluate issues related to memory allocation and thrashing in operating systems..				
UNIT IV				
Mass Storage System Overview, Disk Structure, Disk Scheduling	T1/467-478	BB	1	25
Swap Space Management	T1/482-483	BB	1	26
File System Interface: File Concept, Access Methods, Directory	T1/503-515	BB	1	27
Directory Organization, File System Mounting, Protection	T1/526-533	BB	1	28
File System Implementation: Allocation Methods, Free Space Mgmt.	T1/543-568	BB	1	29
I/O Systems: Hardware, Application Interface, Kernel Subsystem	T1/587-617	BB	1	30
Outcome of Unit IV: • Understand the structure and functionality of mass storage systems, including disk scheduling and management. • Explain the concepts of file systems, including file organization, directory structures, and file system mounting. • Analyze file system implementation techniques, including allocation methods, free space management, and recovery mechanisms. • Understand the architecture and functionality of I/O systems, including hardware interfaces and kernel subsystems.				
UNIT V				
Linux System Design Principles, Kernel Modules	T1/781-791	BB	1	31

Process Management, Scheduling in Linux	T1/792-799	BB	1	32
Memory and I/O Management in Linux	T1/800-817	BB	1	33
File System, Inter-process Communication in Linux	T1/809-818	BB	1	34
Mobile OS: iOS and Android Architecture	W1	1	1	35
SDK Frameworks, Media Layer, Services Layer, Core OS Layer	W2	1	1	36

Outcome of Unit V:

- Understand the design principles and core components of the Linux operating system, including kernel modules, process management, scheduling, and memory management.
- Explain the architecture and functionality of file systems and inter-process communication in Linux.
- Analyze the architecture of mobile operating systems like iOS and Android, focusing on their layers and SDK frameworks.
- Demonstrate the implementation of file systems and data management in mobile operating systems..

Course Outcome:

At the end of the course the students would be able to
CO1 : Analyse various scheduling algorithms, and understand the different deadlock, prevention and avoidance schemes
CO2 : Illustrate the different memory management schemes
CO3: Outline the functionality of file systems
CO4: Compare and contrast Linux, Windows and mobile operating systems
CO5: Analyse the Design principles of different operating systems.
CO6: Apply the same concept in Mobile Operating System.

Course Outcome Vs Program Outcome Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	2	1	1	-	-	-	-	-	-	-	1
CO3	3	2	1	1	-	-	-	-	-	-	-	1
CO4	3	3	1	1	-	-	-	-	-	-	-	1
CO5	3	3	-	1	-	-	-	-	-	-	-	1

CO6	3	3	-	1	-	-	-	-	-	-	-	1
AVG	**3.00**	**2.89**	**1.56**	**1.00**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.00**

Assignment:

Register Number	**Total Number**	**Mode of Assignment MCQ/ Seminar/ PPT**	**Topics**
Assignment: 1			
REG NO 01-189	189	Written	• System Calls, • Scheduling Algorithms
Assignment: 2			
REG NO 01-189	189	Poster /PPT	• Memory Management, • File Systems
Assignment: 3			
REG NO 01-189	189	Seminar	• Paging, Segmentation, Thrashing
Assignment: 4			
REG NO 01-189	189	Case study	• Case Study on Linux vs Windows, iOS vs Android
Assignment: 5			
REG NO 01-189	189	MCQ	**Unit I to V**

Submission Details:

Phase 1 (Before AT 1)	**Phase 2 (Before AT 2)**	**Phase 3 (Before Model Exam)**
Assignment 1	**Assignment 2**	**Assignment 3**

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