OPERATING SYSTEMS	
CSE 223	**Credits : 3**
Instruction **:** 3 Periods & 1 Tut/Week	Sessional Marks : 40
End Exam : 3 Hours	End Exam Marks : 60

Prerequisites: Basic programming language and Computer Organization.

Course Objectives:

1. To understand the main components of operating system and their functions.
2. To understand the basic concept of shell programming.
3. To learn the mechanism of an operating system as process manager, memory manager, device manager and file manager.
4. To understand the concept of protection related to operating system.

Course Outcomes:

1. Illustrate the structure of OS, Functionality and services provided by the OS. Analyse the concept of shell programming, process state and state transitions.
2. Implement the CPU Scheduling algorithms (Pre-emptive and Non Pre-emptive). Demonstrate the concept of Process synchronization.
3. Demonstrate the concept of resource allocation. Apply and analyze the various memory management mechanisms for contiguous and non contiguous memory.
4. Demonstrate the structure and organization of file systems and analyze the implementation of file systems.
5. Analyse the secondary storage structure, protection of the system.

Mapping of Course Outcomes with Program Outcomes:

Mapping		**PO**												**PSO**	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO	1	1	1	1		2				1	1		2		
	2	2	2	2	2	2	2	2		2	1	2	2	1	1
	3	2	2	2	2	2	2	2		2	1	2	2	1	1
	4	2	2	2	1	2	1	1		2	1	1	2	1	1
	5	2	2	2	1	2	1	1		2	1	1	2	1	1

COURSE CONTENTS

UNIT I **(12 Periods)**

Introduction to OS: Operating system Definition, Operating system Functionalities, Types of Operating system, operating system structures, system calls, system programs.-

Introduction to Shell Programming: Commands and Shell script.

Processes: Process concept, Process scheduling, Operations on processes, Inter process communication, Communication in client-server systems.

Threads: Overview, Multithreading models.

Learning outcomes: At the end of this Unit, Students are able to

1. Define the responsibilities of an operating system and implement the basic shell programs.
2. Demonstrate the different modes of communication among processes and multi threading models.

UNIT II (12 Periods)

CPU Scheduling: Scheduling criteria, Scheduling algorithms, Algorithm Evaluation.

Process Synchronization: The critical-section problem, Peterson's solution, Synchronization hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors.

Case Study: Linux operating system: Process Management.

Learning outcomes: At the end of this Unit, Students are able to

1. Analyze the CPU scheduling algorithms and their performance evaluation.
2. Implement the different solutions for process synchronization.

UNIT III (12 Periods)

Deadlock: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

Memory Management: Background, Swapping, Contiguous memory allocation, Segmentation, Paging, Structure of the page table.

Virtual Memory: Background, Demand paging, Page replacement, Allocation of frames, Thrashing.

Case Study: Linux operating system: Memory Management.

Learning outcomes: At the end of this Unit, Students are able to

1. Define the concept of deadlock and Identify the different ways to handle deadlock like prevention, detection, avoiding and recovery.
2. Distinguish between contiguous and non-contiguous memory allocation methods in memory management.

UNIT IV (12 Periods)

File Systems Interface: File concept, Access methods, Directory structure, File system mounting, File Sharing, Protection.

Implementing File-Systems: File system structure, File system implementation, Directory implementation, Allocation methods, Free-space management, Efficiency and performance,
Recovery.

Learning outcomes: At the end of this unit, students are able to

1. Demonstrate the concept of file system, various file access methods and Protection in files.
2. Identify and implement the file system and recovery.

UNIT V (12 Periods)

Secondary Storage Structure: Mass storage structures, Disk structure, Disk attachment, Disk scheduling, Disk management, Swap space management.

Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights.

Learning outcomes: At the end of this unit, students are able to

1. Demonstrate the concept of mass storage structures and Analyze the various disk scheduling algorithms
2. State the goal and principles of protection and implement the access matrix.

TEXT BOOKS

1. Silberschatz, Galvin and Gagne, “Operating System Principles”, 9th Edition, Wiley India Pvt Ltd, 2015.
2. Sumitabha Das, “Unix Concepts and Applications”, 4th Edition. TMH, 2006.
3. Yashwanth Kanitkar, “Unix Shell programming”, 1st Edition, BPB Publisher, 2010.

REFERENCES

1. Andrew S. Tanenbaum, “Modern Operating Systems”, 4th Edition, Pearson Education, 2015.
2. William Stalling, “Operating Systems: Internals and Design Principles”, 9th edition, PHI, 2018.
3. Harvey M. Deitel, “Operating Systems”, 3rd Edition, Pearson Education, 2004.
4. M.G.Venkateshmurthy, “Introduction to Unix and Shell Programming”, 5th Edition, Pearson Education India, 2009.
5. N.B Venkateswarlu, “Advanced Unix programming”, 2nd Edition, BS Publications, 2010.

WEB REFERENCES:

1. https://opensource.com/resources/linux
2. https://nptel.ac.in/courses/106/106/106106144/
3. http://openbookproject.net/courses/intro2ict/system/os_intro.html
4. https://en.wikipedia.org/wiki/Xv6.
5. https://nptel.ac.in/content/storage2/courses/106108101/pdf/PPTs/Mod_13.pdf

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Prepared By: Dr.K.S.Deepthi, Mr.K.Chandra Sekhar