SEMESTER S4

OPERATING SYSTEMS

Course Code	PCITT403	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	ESE Marks	60
Credits	4	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	PCITT302: Computer Organisation and Architecture	Course Type	Theory

Course Objectives:

1. To understand the mechanisms like process management in the Operating System.
2. To understand the mechanisms of process synchronization and dead lock.
3. To understand the functions of memory management, file system implementation and storage structures used in OS.
4. To understand the concepts of Virtual Machines.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Introduction**: Functions of OS, Types of OS - Batch, Multi programmed, Time-sharing and Real time systems, System calls, System structure - Simple structure, Layered approach, Microkernel system structure, Monolithic, Modules, Hybrid Systems, System Boot. **Process Management:** Process concept, Process State, PCB-Multithreading - Benefits. Case study: Linux system - process management. **Process Scheduling:** Basic concepts, Non Pre-emptive Scheduling, Pre-emptive Scheduling, Dispatcher, Scheduling criteria, Scheduling Algorithms - FCFS, SJF, Priority scheduling, Round Robin Scheduling.	11
2	**Process Synchronization:** Race Conditions - Critical Sections – Peterson's Solution-Mutual Exclusion - Busy Waiting- Sleep and Wakeup – Bakery Algorithm-Semaphores. **Deadlocks:** Deadlock characteristics - conditions for deadlock - Prevention – Avoidance -Safe state, Resource Allocation Graph, Banker's algorithm, Deadlock Detection, Recovery from dead lock.	11

3	**Memory Management:** Basics, Swapping, Memory Allocation - fixed partitions, variable partitions, Fragmentation, Paging, Segmentation, Virtual memory concepts, Demand paging, Page replacement algorithms - FIFO, Optimal, LRU, Allocation of frames, Thrashing.	**11**
4	**File System:** File concept - Attributes, Operations, File Types - File structure - File access methods (Sequential Access, Direct Access, Indexed Access)– File allocation methods (Contiguous, linked, and indexed allocation), Directory structure (Single-Level, Two-Level, Tree-Structured, Acyclic Graph, General Graph), Case Study: Linux file systems **Disk Management:** Introduction, Disk Scheduling algorithms (FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK) **Virtual Machines:** Benefits & Features- Building Blocks- Types of VMs- Virtualization & Operating System Components.	**11**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

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Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE):

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

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

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Describe the concepts of operating systems and apply process management and process scheduling concepts to solve problems.	**K2**
CO2	Illustrate process synchronization, deadlock, and deadlock – prevention and avoidance techniques.	**K2**
CO3	Illustrate the memory management techniques	**K2**
CO4	Illustrate disk scheduling algorithm to solve problems and describe the file system implementation and virtual machine.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

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

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Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Operating System Concepts	A. Silberschatz, G.Gagne and P.Galvin	Wiley Publications	9th edition 2018

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Modern Operating Systems	Andrew S. Tanenbaum and Herbert Bos	Pearson	5th Edition 2022
2	Operating Systems A Concept-based Approach	D M Dhamdhere	Tata McGraw Hill	2nd Edition 2006
3	Operating Systems: Internals and Design Principles	William Stallings	Pearson	9th Edition 2018

Video Links (NPTEL, SWAYAM…)	
No.	**Link ID**
1	https://archive.nptel.ac.in/courses/106/106/106106144/

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