CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EET433	MODERN OPERATING SYSTEMS	PEC	2	1	0	3

Preamble: Understanding of concepts of OS, through process/threads, system call interface, inter process communication, deadlock, scheduling, address space , main memory, virtual memory and file systems.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to:

CO 1	Describe the key concepts of modern operating systems
CO 2	Apply the concepts of scheduling, resource management and process synchronization for process management.
CO 3	Evaluate the implementation of various memory management techniques.
CO 4	Illustrate different file management and directory management methods.
CO 5	Evaluate Disc scheduling algorithms
CO 6	Explain RAID structures

Mapping of course outcomes with program outcomes

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

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		End Semester Examination
	1	2	
Remember (K1)	15	15	30
Understand (K2)	20	20	40
Apply (K3)	15	15	30
Analyse (K4)			
Evaluate (K5)	-	-	-
Create (K6)	-	-	-

Mark distribution

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern:

Attendance : 10 marks
Continuous Assessment Test (2 numbers) : 25 marks
Assignment/Quiz/Course project : 15 marks

End Semester Examination Pattern: There will be two parts; Part A and Part B. Part A contain 10 questions with 2 questions from each module, having 3 marks for each question. Students should answer all questions. Part B contains 2 questions from each module of which student should answer any one. Each question can have a maximum 2 sub-divisions and carry 14 marks.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. What is an operating system?(K1, PO1)
2. What are operating system services?(k2, PO1)
3. Explain time sharing operating system?(K1, PO1)
4. Explain OS structure?(K2, PO1, PO2)

Course Outcome 2 (CO2):

1. Define the process? (K1, PO1)
2. What is meant by the state of the process?(K1,PO2)
3. What are the types of schedulers?(K1, PO2)
4. Consider the following five processes, with the length of the CPU burst time given in milliseconds. Process Burst time P1 10 P2 29 P3 3 P4 7 P5 12 Consider the First come First serve (FCFS), Non Pre-emptive Shortest Job First (SJF), Round Robin(RR) (quantum=10ms) scheduling algorithms. Illustrate the scheduling using Gantt charts.(K3, PO1,PO2)
5. Define race condition.(K2, PO2)
6. What are the requirements that a solution to the critical section problem must satisfy?(K2, PO1, PO2)

Course Outcome 3 (CO3):

1. Define Swapping(K1,PO2)
2. What is Demand Paging?(K2,PO1,PO2)

3. Explain about the following page replacement algorithms a)FIFO b)OPR, c)LRU
4. Differentiate local and global page replacement algorithms. Differentiate local and global page replacement algorithm(K3, PO1,PO2)

Course Outcome 4 (CO4):

1. What is a File?(K1, PO1)
2. What are the various File Operations?(K1, PO1)
3. What are the different Accessing Methods of a File?(K2, PO2)
4. What are the Allocation Methods of a Disk Space?(K2, PO2)

Course Outcome 5 (CO5):

1. Explain different Disk scheduling algorithms SCAN,CSCAN.CLOOK(K3, PO1,PO2)
2. Explain disk structure in detail(K2, PO1)
3. What are goals for good disk scheduling algorithm(K1, PO1)
4. Define seek time, Rotational latency and disk bandwidth(K1, PO1)

Course Outcome 6 (CO6):

1. What is RAID Technology(K1, PO1)
2. What data is stored on the second hard drive with RAID 1?(K2,PO2
3. Explain RAID level 10(K2, PO1, PO2)

Model Question Paper

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, MONTH & YEAR

Course Code: EET433

Course Name:

Max. Marks: 100 **Duration: 3 Hours**

PART A (3 x 10 = 30 Marks)

Answer all Questions. Each question carries 3 Marks

1. Explain the concept of Multiprogramming and Multiprocessing
2. Enlist different kinds of computing environments
3. Compare and contrast user level threads & kernel level threads? Illustrate various multi-threading models.
4. What are the conditions for deadlock?

5. Differentiate between External fragmentation and Internal fragmentation
6. What is thrashing
7. Enlist five file attributes? What you mean by extended file attributes
8. Distinguish between sequential access file & direct access file. Give example on each
9. Define seek time, Rotational latency and disk bandwidth
10. Differentiate between viruses and worms , Give one example for each

PART B (14 x 5 = 70 Marks)

Answer any one full question from each module. Each question carries 14 Marks

Module 1

11. (a)Explain the role of OS as Extended Machine (7)

    (b) Explain User Operating-System Interface in detail (7)

OR

12. (a)Differentiate between grid computing & Cloud computing. Give examples for each. (6)

    (b)What are the functions of the process management module of the OS? What is PCB, Explain its structure (8)

Module 2

13. Consider the following five processes, with the length of the CPU burst time given in milliseconds. Process Burst time P1 10 P2 29 P3 3 P4 7 P5 12 Consider the First come First serve (FCFS), Non Preemptive Shortest Job First (SJF), Round Robin(RR) (quantum=10ms) scheduling algorithms. Illustrate the scheduling using Gantt chart. Also find average waiting time and turnaround time for each algorithm (14)

OR

14. (a) What is race condition? List the condition to be satisfied to ensure mutual exclusion in critical section (7)

    (b)Explain semaphores. (7)

Module 3

15. (a)What is contiguous memory allocation? (7)

    (b)Explain the different methods and strategies of contiguous memory allocation (7)

OR

16. (a)Explain paging scheme for memory management, discuss the paging hardware and Paging (5)

(b)Explain about the following page replacement algorithms a)FIFO b)OPR, c)LRU (9)

Module 4

17. (a)What are the operations that can be performed on files (7)

(b) Explain Indexed file allocation with proper illustration (7)

OR

18. (a)What is meant by directory structure (6)

(b)what is free space management? Illustrate bit vector free space management technique (8)

Module 5

19. (a)What are goals for good disk scheduling algorithm (4)

(b) Consider a disk with 300 tracks and the queue has random requests from different processes in the order: 60, 39, 23, 90, 170, 150, 38, 194, 295. Initially the arm is at 100. Find the Average Seek length using FIFO, SSTF, SCAN and C- SCAN algorithms (10)

OR

20. (a)Explain different RAID Level in details with proper illustration (8)

(b) Explain programme threats and system threats with proper examples (6)

Syllabus

Module 1: Introduction-Definition– Operating System Structure- Operating System Operations, Process Management- Memory Management- Storage Management- Protection and Security- User and Operating-System Interface-System Calls- Types of System Calls Computing Environments- Open-Source Operating Systems. Process Management- Process Concept- Operations on Processes-Threads Overview-Multithreading Models
Module 2 - CPU Scheduling- Basic Concepts- Scheduling Criteria- Scheduling Algorithms- First come first served scheduling - Shortest job first - Shortest remaining time next- Round robin scheduling - Priority scheduling. **Inter-process communication** - race condition - critical sections -Mutual exclusion with busy waiting - sleep and wakeup - Semaphores, Mutexes

Introduction to Deadlocks
Module 3: Memory Management-Swapping- Contiguous Memory Allocation- Virtual memory - Paging - Page tables – TLBs - Page replacement algorithms - Optimal page replacement algorithm - - First-in first-out algorithm - Second chance page replacement algorithm - Clock algorithm - Least recently used algorithm - the working set page replacement algorithm -Belady's anomaly, local verses global policies
Module 4: File Management- File-System Interface- File Concept- Access Methods - Directory and Disk Structure - File-System Mounting - File Sharing- Protection- File-System Implementation- File-System Structure- - Directory Implementation- Allocation Methods Free-Space Management - Efficiency and Performance
Module 5: Mass Storage Structure- Disk Scheduling- RAID Structure - - Protection and Security- Protection- Goals of Protection- Principles of Protection- Domain of Protection- Access Matrix Implementation of Access Matrix- Access Control- Revocation of Access Rights Security- The Security Problem -Program Threats- System and Network Threats

Text Book

1. Abraham Silberschatz, Greg Gagne, Peter B. GalvinAuthor, Operating System Concepts, 10th Edition "Title", Publisher, 9thth edition, Wiley publishers

Reference Books

1. William Stallings "Operating Systems: Internals and Design Principles, 7th edition, prentice Hall

2. Andrew S. Tanenbaum; Modern Operating systems ,4th edition, Person publications

Course Content and Lecture Schedule

No	Topic	No. of Lectures
	Module 1 (9 hrs)	
1.1	Introduction-Definition– Operating System Structure	1
1.2	Operating System Operations, Process Management and Memory Management	1
1.3	Storage Management- Protection and Security	1
1.4	User and Operating-System Interface	1
1.5	System Calls, Types of System Calls	1
1.6	Computing Environments- Open-Source Operating Systems	1
1.7	Process Management- Process Concept	1
1.8	Operations on Processes	1

1.9	Threads Overview- Multithreading Models	1
	Module 2 (8 hrs)	
2.1	CPU Scheduling- Basic Concepts- Scheduling Criteria	1
2.2	Scheduling Algorithms- First come first served scheduling- problems	1
2.3	Shortest job first - Shortest remaining time next- problems	1
2.4	Round robin scheduling - Priority scheduling.- problems	1
2.5	Inter-process communication - race condition - critical sections	1
2.6	critical sections and Mutual exclusion with busy waiting	1
2.7	Sleep and wakeup Semaphores, Mutexes	1
2.8	Deadlock- introduction only	1
	Module 3 (7 hrs)	
3.1	Memory Management-Swapping- Contiguous Memory Allocation	1
3.2	Virtual memory – Paging	1
3.3	Page tables – TLBs	1
3.4	Page replacement algorithms- Optimal page replacement algorithm - FIFO	1
3.5	Least recently used algorithm	1
3.6	Second chance page replacement algorithm - Clock algorithm	1
3.7	the working set page replacement algorithm -Beladys anomaly, local verses global policies	1
	Module 4 (7 hrs)	
4.1	File Management- File-System Interface- File Concept- Access Methods	1
4.2	Directory and Disk Structure	1
4.3	File-System Mounting - File Sharing- Protection- F	1
4.4	File-System Implementation- File-System Structure-	1
4.5	Directory Implementation-	1
4.6	Allocation Methods Free-Space Management	1
4.7	Efficiency and Performance	1
	Module 5 (5 hrs)	
5.1	Disk Scheduling-	1
5.2	RAID Structure	1
5.3	Protection- Goals of Protection- Principles of Protection- Domain of Protection	1
5.4	Access Matrix Implementation of Access Matrix- Access Control- Revocation of Access Rights Security-	1
5.5	The Security Problem -Program Threats- System and Network Threats	1