



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Computer Applications

Level: Post Graduate

Course / Subject Code : MC02094021

Course / Subject Name : Operating System

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Core Course

Prerequisite:	Basic knowledge of computer hardware and software
Rationale:	<p>Understanding of the basic concepts and role of modern Operating systems is an essential for the students. After completion of this course understand the concept of the interaction between user application, OS and hardware architecture.</p> <p>The course will provide an understanding of concept of process, concurrency, deadlock prevention, avoidance, detection and recovery for identification of solution strategies.</p> <p>They will able to understand the issues involved with preemptive vs non-preemptive scheduling.</p> <p>They will be clear about the concept of management of memory, disk and file and efficient use of primary and secondary storage for their application.</p>

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes	RBT Level*
1	Describe the basics of the operating systems and Discuss mechanisms of OS to handle processes & threads	RM
2	Explain the concepts of inter-process communication.	AN
3	Illustrate different conditions for deadlock and their possible solutions	AN
4	Analyze the memory management and its allocation policies	AN
5	Discuss various I/O management techniques and File system	UN

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours	Weightage (%)
1	<p>UNIT I : INTRODUCTION: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine.</p> <p>PROCESSES, THREAD & PROCESS SCHEDULING: Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads. Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR.</p>	12	25
2	<p>UNIT II : INTER-PROCESS COMMUNICATION: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer/Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc</p>	6	15
3	<p>UNIT III : DEADLOCKS: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.</p>	5	10
4	<p>UNIT IV : MEMORY MANAGEMENT & VIRTUAL MEMORY: Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compaction; Paging: Principle of operation, Page allocation Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory, Hardware and control structure, Locality of reference, Page fault, Working Set, Dirty page/Dirty bit, Demand paging, Page Replacement</p>	13	30



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	algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).		
5	UNIT V : I/O SYSTEMS, FILE & DISK MANAGEMENT: I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software. File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling algorithms - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks	9	20
Total Hours:		45	

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10%	30%	40%	20%	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

Textbook:

1. Operating System Concepts Essentials By by Avi Silberschatz, Peter Galvin, Greg Gagne | 9th Edition Wiley Asia Student Edition

Reference Books:

1. Operating Systems Internals and Design Principles By William Stallings | PHI | 5th Edition
2. Operating System: A Design-oriented Approach By Charles Crowley, | 1st Edition - Irwin Publishing
3. Operating Systems: A Modern Perspective By by Gary J. Nutt | Addison-Wesley; 2nd Edition | 2nd Edition
4. Design of the Unix Operating Systems By Maurice Bach, | Prentice-Hall of India | 8th Edition



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Suggested Course Practical List:

1) Shell Commands

- date, ls, who, cal, ps, wc, cat, uname, pwd, mkdir, rmdir, cd, cp, rm, mv, diff, chmod, grep, sed, head, tail, cut, paste, sort, find, awk
- Regular expression using sed, grep and awk
- Regular expression using meta characters (^, *, [], (dot), escape, <word>, \$, {}, -, +)

2) Task based on commands

1	Write a command to display all lines which begins with "NOKIA" string froman prd.lst file. [File named prd.lst should be created with data such that practical can be performed on it]
2	Delete first, last and all the blank lines from the specified file.
3	Searches for a line which does not start with the vowel letter in any specific file
4	Create a file named customer.dat which contains customer name, address and city. Sort the file in ascending order of customer name and then by city and redirectthe output to name.out file.
5	Create a file named customer.dat which contains customer name, address and city. a) Display all the lines who are started with A to M. b) Display 5 lines after the match of the word "Bombay".
6	Create columnar file named "emp" contains Empno, Empnm, Dept, Salary andHiredate. Write required command for following: a) Cut the Empnm and Salary column and transfer it to empsal file. Display the difference between "emp" and "empsal" file and also display total number of wordsand characters of "emp" and "empsal" file. b) Sort the data in descending order of joining year and also transfer the sorted outputin "experience" file and display only unique lines of "experience" file.
7	Create columnar file named "emp" contains Empno, Empnm, deptno, Desig, andSalary. Write required command for following a. Cut the deptno, Empnm and Salary column and transfer it to empsal file. Alsodisplay first 4 and 7th onwards employees from empsal file.
8	Create columnar file named "emp" contains Empno, Empnm, Desig, and Salary. Writerequired command for following b) Cut the empno,empnm and transfer them into "empinfo.out" file and count frequency of "SHAH" word of that file using single command.
9	Display all such files from your login which has size >= 50.



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10	Create columnar file named “restaurants” which contains restaurant name, pizza variety, delivery area and prize columns - Cut the restaurant name and price column and transfer it to file named “economy” and display first 3 three lines of the file “economy”.
11	Display all the files with read and write permissions throughout your login and save output in file and also display on terminal
12	Write a command to substitute „/“ with „:“ throughout the file with all occurrences of /etc/group
13	Using awk command Count number of lines found in a file
14	Using awk command find Sum of fields (Marks). File Format roll#, name, mark1, mark2, mark3

3) Shell Scripts

1	Write a script to compare identically named files in two different directories and if they are same, copy one of the min a third directory.
2	Write a script to copy the file system from two directories to a new directory in such a way that only the latest file is copied in case there are common files in both the
3	Write a script for generating a mark sheet after reading data from a file. File contains student rollno, name, and marks of three subjects.
4	Write a script to make following file and directory management operations menu based: 1. Display current directory 2. List directory 3. Make directory 4. Change directory 5. Copy a file 6. Rename a file
5	Write a script which reads a text file and output the following 1. Count of character, words and lines. 2. File in reverse. 3. Frequency of particular word in the file 4. Lower case letter in place of upper case letter.
6	Write A Script To Perform Following String Operations Using Menu: 1. COMPARE TWO STRINGS. 2. JOINTWO STRINGS. 3. FINDTHE LENGTH OF AGIVENSTRING. 4. OCCURRENCE OF CHARACTER ANDWORDS 5. REVERSE THE STRING.



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CO- PO Mapping:

Semester 2	Course Name : Operating System							
	POs							
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	0	0	0	0	0	0	0
CO2	3	2	2	0	0	0	0	0
CO3	3	2	2	0	0	0	0	0
CO4	3	2	2	0	0	0	0	0
CO5	3	2	1	0	0	0	0	0

Legend: '3' for high, '2' for medium, '1' for low and '-' for no correlation of each CO with PO.

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