GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Computer Applications

Level: Under Graduate

Course / Subject Code: BC03001011

Course / Subject Name: Operating System

w. e. f. Academic Year:	2025-26
Semester:	3
Category of the Course:	Core Courses

Prerequisite:	Basic knowledge of computer hardware and software, Basic knowledge of programming language
Rationale:	• This course enables students to understand the importance of modern operating system, its functionalities to manage resources and program execution. • Students will be made aware of process management, memory management, file management and I/O management, which will be useful to them for large application development in the field of computer application. • After completion of this course, students will understand the concept of the interaction between user application, OS and hardware architecture.

Course Outcome:

After Completion of the Course, students will be able to:

No.	Course Outcomes	RBT Level*
1	Describe the basics of the operating systems and their evaluation.	U
2	Explain the mechanisms of the OS to handle processes and threads.	U
3	Explain the concepts of inter-process communication and deadlock with their possible solutions.	N
4	Analyze the memory management, its allocation policies, and compare various CPU scheduling algorithms.	N
5	Discuss various I/O management techniques and File systems.	U

**as per Revised Bloom's Taxonomy*

Teaching and Examination Scheme:

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

Course Content:

Unit No.	Content	No. of Hours	Weightage (%)
1	**Introduction:** Computer System Overview, Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments and Leading to Modern Operating Systems, Fault Tolerance, OS Design Consideration for Multiprocessor and Multicore, Traditional UNIX Systems, Modern UNIX Systems	5	10
2	**Process and Threads Management:** ***Processes:*** What is Process? Process States, Process Description, Process Control, Execution of the Operating System ***Threads:*** Processes and Threads, Multithreading, Types of Threads, Thread States	9	20
3	**Concurrency and Deadlock:** ***Concurrency:*** Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writers Problem ***Deadlock:*** Principal of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Dining Philosophers Problem	10	25
4	**Memory Management and Scheduling:** ***Memory Management:*** Memory Management Requirements, Memory Partitioning, Paging, Segmentation ***Virtual Memory:*** Virtual Memory Terminology, Typical Memory Management Formats, Address Translation in a Paging System, Page Table Structure, TLB, Virtual Memory Implications, Fetch Policy, Placement Policy, Replacement Policy, Page Replacement Algorithms ***Scheduling:*** Types of Processor Scheduling, Scheduling Algorithms	10	25
5	**I/O and File Management:** ***I/O Management:*** I/O Devices, Organization of the I/O Function, I/O Buffering, Disk Scheduling, RAID ***File Management:*** File and File Systems, File System Architecture, File Organization and Access, File Directories, File Allocation Methods, Free Space Management,	11	20
	Total Hours:	**45**	**100%**

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 Systems Internals and Design Principles, By: William Stallings, 9th Edition, Pearson Education India, ISBN: 978-1-292-21429-0

Reference Books:

1. Operating System Concepts, By: Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 10th Edition, Wiley Publication, ISBN: 978-1-119-32091-3
2. Modern Operating Systems, By: Andrew S. Tanenbaum, Herbert Bos, 4th Edition, Pearson Publication, ISBN: 978-0-13-359162-0
3. Operating Systems A Concept-Based Approach, By: Dhananjay M. Dhamdhere, 3rd Edition, Mc Graw Hill Publication, ISBN: 978-1259005589
4. Operating Systems, By: Sukomal Pal, AICTE, (Gujarati and English Edition), https://ekumbh.aicte-india.org/, ISBN: 978-81-963773-1-1

List of Useful websites / MOOCs

1. Learners are advised to opt for NPTEL and SWAYAM courses that are relevant to this course

Suggested Course Practical List:

1	**Shell Commands** 1. 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 2. Regular expression using sed, grep and awk 3. Regular expression using meta characters (^, *, [], (dot), escape, <word>, $, {}, -, +)
2	Write a shell script to display all executable files, directories and zero sized files from current directory.
3	Write a shell script to check entered string is palindrome or not.
4	Shell programming using filters (including grep, egrep, fgrep)
5	Write a shell script to validate the entered date. (eg. Date format is : dd-mm-yyyy).

6	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
7	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
8	Write a shell script to read n numbers as command arguments and sort them in descending order.
9	Write a shell script to add the statement #include <stdio.h> at the beginning of every C source file in current directory containing printf and fprintf.
10	Write a script for generating a mark sheet after reading data from a file. File contains student rollno, name, and marks of three subjects.
11	Write a shell script to compare identically named files in two different directories and if they are same, copy one of them in a third directory.

CO- PO Mapping:

Semester : 3	**Course Name : Operating System**										
	POs										
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-
CO4	3	1	3	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-

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

Note: The CO-PO mapping is indicative; the institute/faculty member can change as required.

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