SARVAJANIK UNIVERSITY
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SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Year: B. Tech II (Semester IV)

Subject Name: Operating Systems **Subject Code:** BTCO13402
Type of course: Profession Core Course
Prerequisite (if any): Data Structure, C Programming

Rationale: This course covers basics of Operating System, role of Operating System in functioning of computer system and various services of Operating Systems.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments / projects / open book tests / closed book tests) CA2: Sincerity in attending classes / class tests / timely submissions of assignments / self-learning attitude / solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work / Quality of work submitted / Active participation in lab sessions / viva on practical skills learned in course.

Contents:

Sr. No.	Contents	Total Hours
1.	**Introduction** Basics of Operating Systems, Operating system from user view and system view, Concepts of Batch programming, Multiprogramming and Time sharing systems, Introduction to tightly coupled and loosely coupled systems, Dual mode of operations – privileged instructions, Operating system services, System calls	03
2.	**Process and Thread Management** **Processes:** Process concepts, Program vs process, Process creation and termination, Process states, process state transitions, Process control block, context switching **Threads**: Thread concepts, Thread vs process, Multithreading examples, Benefits of multithreading, Types of threads **Process Scheduling :** Basics of Process Scheduling, Concepts of CPU burst and IO burst, Types of Scheduling – Long term scheduling, medium term scheduling and short term scheduling, Pre-emptive vs non pre-emptive scheduling, Scheduling criteria, Scheduling algorithms : First come first serve scheduling	09

	algorithm, Round robin scheduling algorithm, Shortest process next scheduling algorithm, Shortest remaining time next scheduling algorithm, Priority scheduling algorithm, Highest response ratio next scheduling algorithm, Multi-level queue feedback algorithm, Scheduling in real time systems	
3.	**Inter Process Communication** Concepts of race condition, critical section and mutual exclusion, Mutual exclusion by disabling interrupts, Mutual exclusion with busy waiting – lock variables, strict alternation, Peterson's solution, TSL instruction, Concepts of sleep and wakeup - Priority inversion problem, Solving producer consumer problem using sleep and wakeup, Semaphores - Solving producer consumer problem using semaphore, Monitor, Message Passing, Classical IPC problems – Dining Philosopher Problem, Sleeping Barber problem, Reader Writer Problem	09
4.	**Deadlock Management** Basics of deadlock, Concepts of resource – Preemptable and Non preemptable Resources, Necessary conditions for deadlock, Deadlock modelling, Deadlock detection and recovery, deadlock avoidance, deadlock prevention	04
5.	**Memory Management** Main Memory : Concepts – Address binding, Logical Versus Physical Address Space, Swapping, Contiguous Memory Allocation - fixed-sized partition scheme, variable-partition scheme, fragmentation, Memory Allocation Strategies - First Fit, Best Fit, Worst Fit, buddy's algorithm, Paging, Translation Look-aside Buffer, Segmentation Virtual Memory : Concepts of Virtual Memory, Demand paging, Virtual Memory management, Page Replacement Policies - FIFO, Optimal, Least Recently Used, Enhanced LRU, Second chance LRU, Thrashing	09
6.	**File Management** File System – File concepts, File allocation methods – Contiguous allocation, linked allocation, Indexed allocation, Free space management – Bit vector, Linked list, Grouping, File system mounting, windows file system, Linux file system	02
7.	**I/O Management and Disk scheduling** I/O Devices - block devices, character devices, device controller, interrupt handler, device driver, buffering, disk arm scheduling – FCFS scheduling, SSTF scheduling, SCAN scheduling, C-SCAN scheduling, LOOK scheduling, C-LOOK scheduling, Disk Management – Disk formatting, Boot block, Bad block	05
8.	**Linux Commands and Shell Programming** Shell, Kernel, Role and functions of Kernel, Linux commands – Directory and file commands, Redirection – Standard input redirection, Standard output	04

	redirection, error redirection, piping, Memory management commands, Process management commands Shell Programming - What is shell script? Types of shell, Creating and executing shell script, Reading and displaying the data, Operators, Decision making statements, Case statement, Looping statements, Arrays in shell script, Command line arguments, Environment variables	

Suggested Specification table with Marks (Theory): (For B. Tech only)

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	20	10	5	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (Revised Bloom's Taxonomy)

Reference Books:

Sr no	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Operating System Concepts	Silberschatz, Peter B. Galvin and Greg Gagne	Wiley	2009	8th Edition
2	Modern Operating Systems	Andrew S Tanenbaum	Prentice Hall	2015	4th Edition
3	Operating Systems: Internals and Design Principles	William Stallings	Pearson	2012	7th Edition
4	Unix Concepts and Applications	Sumitabha Das	Mc-Graw Hill	2006	4th Edition
5	UNIX Shell programming	Yashwant Kanetkar	PBP	2003	1st Edition

Course Outcomes (CO):

Sr. No.	CO statements	Marks % weightage

CO-1	Identify the role of the operating system in functioning of the computer system	10%
CO-2	Recognize different Services provided by operating system	12%
CO-3	Outline and compare various process scheduling algorithms and demonstrate these algorithms for various operating systems	20%
CO-4	Understand the deadlock management techniques and mutually exclusive Inter-Process Communication techniques	12%
CO-5	Demonstrate and compare different techniques of memory management and decide which technique is useful given some scenario	20%
CO-6	Identify the structure and organization of file system	6%
CO-7	Understand the Input-Output mechanism and compare various disk scheduling algorithms	10%
CO-8	Understand the concepts of Unix/Linux operating system as a platform	10%

List of Open learning website:

1. www.nptel.ac.in
2. https://www.tutorialspoint.com/operating_system/index.htm
3. https://www.tutorialspoint.com/unix/index.htm
4. https://www.javatpoint.com/os-tutorial
5. https://www.javatpoint.com/linux-tutorial

List of Experiments:

Sr. No	Practical
1	Study of basic LINUX commands.
2	Study of advance LINUX commands and filters.
3	Write a shell script to generate marksheet of a student. Take marks of three subjects as an input and display total marks and percentage obtained. The script should also display the class obtained by the student.

4	Write a shell script to display multiplication table of given number.
5	Write a shell script to find factorial of given number.
6	Write a shell script which will accepts a number n and display first n prime numbers as output.
7	Write a shell script which will generate first n fibonnacci numbers like: 1, 1, 2, 3, 5, 13, …
8	Write a menu driven shell script which will print the following menu and execute the given task.
9	Display calendar of current month
10	Display today's date and time
11	Display your terminal number
12	Write a shell script to read n numbers as command line arguments and sort them in descending order.
13	Write a shell script to display all executable files, directories and zero sized files from current directory.
14	Write a shell script to check whether the entered string is palindrome or not.
15	Write a shell script to find word in file.
16	Write a shell script which takes a command line argument and report whether it is ordinary file or directory. Also check for its various permissions.
17	Write a shell script to accept two file names as command line arguments and check the contents of both files. If contents are same, remove any one file.
18	Study of Unix Shell and Environment Variables.
19	Write a program for process creation using C. (Use of gcc compiler).