



SILVER OAK UNIVERSITY

College of Technology

Bachelor of Technology

Information Technology

Course Name: Operating System

Course Code:1010043218

Semester:4th

Prerequisite:

Basics of Data structures and Programming Language (like C)

Objective:

1. This course enables one to understand the importance of the Operating System, its functionalities to manage resources of Computer and Peripherals, program development and its execution.
2. Students will be made aware of Process Management, Memory Management, File Management and I/O Management in detail, which will be useful to them for Large Application Development in the engineering field with emphasis given to the Linux type of Open-Source Operating System Administration.

Teaching Scheme:

Teaching Scheme				
L	T	P	Contact Hours	Credit
3	0	2	5	4

Contents:

Unit	Topics	Teaching Hours	Weightage %
1	Introduction: Computer system overview, Architecture, Goals & Structures of O.S, Basic functions, Interaction of O.S. & hardware architecture, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real-time O.S.	4	10
2	Process and Threads Management: Process Concept, Process states, Process control, Threads, Uni processor Scheduling: Types of scheduling: Preemptive, non preemptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait, Monitoring and managing linux processes, Controlling services and daemons	6	15
3	Concurrency: Principles of Concurrency, Semaphores, Mutual Exclusion: S/W approaches, H/W Support, Pipes, Message Passing, Signals, Monitors.	5	8
4	Inter Process Communication: Race Conditions, Critical Section, Mutual Exclusion, Hardware	7	20

	<p>Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc., Scheduling, Scheduling Algorithms.</p> <p>Deadlock: Principles of Deadlock, Starvation, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls.</p>		
5	<p>Memory Management: Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Adding disks, partitions and file systems to linux systems, Swapping, Paging and Fragmentation. Managing Logical volume management (LVM) storage, Demand Paging, Security Issues. Virtual Memory: Concepts, VM management, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing. Using virtualized systems</p>	10	18
6	<p>I/O Management & Disk scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C SCAN, SSTF), RAID, Disk Cache.</p> <p>Security & Protection: Security Environment, Design Principles Of Security, User Authentication, Protection Mechanism : Protection Domain, Access Control List, Managing SELinux Security, Limiting Network Communication with firewall</p> <p>System Administrator: Accessing Command Line, Managing files from command line Viewing and Editing Text files, Managing local linux users and groups, Controlling access to files with linux file system permissions</p>	10	22
7	<p>Unix/Linux Operating System: Development Of Unix/Linux, Role & Function Of Kernel, System Calls, Elementary Linux command & Shell Programming, Creating and Editing text files with Linux, Scheduling Future Linux Tasks, Managing Priority of Linux Processes,, Directory Structure Case Study: Window Operating System</p>	4	7

Course Outcomes:

Sr. No.	CO Statement	Unit
CO-1	Analyze the structure of OS, various CPU scheduling algorithms and basic architectural components involved in OS design.	1, 2
CO-2	Analyze various memory management algorithms and I/O management algorithms.	2, 3, 5
CO-3	Evaluate the requirements for the process synchronization and coordination in contemporary operating systems with understanding of deadlock management.	4
CO-4	Implement firewall concepts to Manage users and groups, files, file permissions and security aspects of operating systems using the concepts of firewall.	6

CO-5	Develop shell scripts in Unix/Linux O.S, virtual environment along with kernel system calls.	7
-------------	--	---

Teaching & Learning Methodology:

1. The course includes a laboratory, where students have an opportunity to learn about the open- source operating system and implement the concepts being taught in lectures.
2. Lectures with live practical examples using Projector and Computer.

List of Experiments:

Total Hours: 28

Sr. No.	Practical Name
1	Case Study and installation of Open-source Operating System.
2	Study the basic & advanced commands of Linux/UNIX such as ls, touch, mkdir, rm, cp, mv, rmdir, man, cd, history, pwd, clear, head, tail, cat, wc, date, timedatectl, su, sudo, chage, etc.
3	Usage of the Top command to observe various parameters of the process. Create a process & also explain how a process changes the state. Use the Kill command to terminate the process and verify with the Job command. Usage of fg and bg commands.
4	Write a Shell Script which works like a calculator and performs below operations like Addition, Subtract, Division and Multiplication.
5	Write a shell script to generate the mark sheet of a student. Take 3 subjects, calculate and display total marks, percentage and Class obtained by the student.
6	Write a shell script programming to check whether the given number is palindrome or not.
7	Write a shell script to generate a factorial of given number n.
8	Write a shell script which will generate first n Fibonacci numbers like: 1, 1, 2, 3, 5, 13, ...
9	Write a Shell Script which will print the following menu and execute the given task? a) Display calendar of current month b) Display today's date and time c) Display usernames that are currently logged in the system d) Display your name at given x, y position e) Display your terminal number
10	Write shell scripts to display the date, time and a welcome message (like Good Morning etc.). The time should be displayed with a.m. or p.m. and not in 24 hours notation.

Major Equipment: (Hardware/Software)

1. Computer System
2. Linux Operating System

Books Recommended:

1. William Stallings, "Operating Systems: Internals & Design Principles", Pearson Education India.
2. Peter B. Galvin, Greg Gagne, Abraham Silberschatz, "Operating System Concepts", John Wiley & Sons, Inc..
3. Andrew S. Tanenbaum, "Modern Operating Systems" ,PHI

List of Open-Source Software/learning website:

1. <https://www.redhat.com/en/topics/linux>
2. <https://www.geeksforgeeks.org/linux-commands/>

