



# SILVER OAK UNIVERSITY

## College Computer Application

### Bachelor of Computer Applications

Subject Name: Operating Systems

Subject Code:1040233108

Semester: II

**Prerequisite:** Linear and non-linear data structures, working experience of any one structured programming language.

#### Objective:

- Fundamental knowledge of how operating system works, manages the applications that are running.
- Understand process management, memory management including virtual memory, protection and security management.

#### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Evaluation Scheme				Total Marks
L	T	P		Internal		External		
				Th	Pr	Th	Pr	
4	0	2	5	40	20	60	30	150

#### Content:

Unit No.	Course Contents	Teaching Hours	Weightage %
1	<b>Introduction:</b> Computer system overview, Architecture, Goals & Structures of O.S, Basic functions, Interaction of O.S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & realtime O.S.	5	10
2	<b>Process Management:</b> 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.	8	15
3	<b>Inter Process Communication:</b> Race Conditions, Critical Section, 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.	8	15
4	<b>Deadlock:</b> Deadlock Problem, Deadlock Characterization, Deadlock Detection, Deadlock recovery, Deadlock avoidance: Banker's algorithm for single & multiple resources, Deadlock Prevention.	5	10

5	<b>Memory Management:</b> Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Swapping, Paging and Fragmentation. Demand Paging, Security Issues. <b>Virtual Memory:</b> Concepts, VM management, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing	8	15
6	<b>I/O Management &amp; Disk scheduling:</b> 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.	5	10
7	<b>Unix/Linux Operating System:</b> Development Of Unix/Linux, Role & Function Of Kernel, System Calls, Elementary Linux command & Shell Programming, Directory Structure, System Administration Case study: Linux, Windows Operating System	5	10
8	<b>Security &amp; Protection:</b> Security Environment, Design Principles of Security, User Authentication, Protection Mechanism: Protection Domain, Access Control List	4	08
9	<b>Virtualization Concepts:</b> Virtual machines; supporting multiple operating systems simultaneously on a single hardware platform; running one operating system on top of another. True or pure virtualization.	4	07

**Course Outcome:**

Sr. No.	CO statement	Unit No
CO-1	Analyze the structure of OS and basic architectural components involved in OS design	1
CO-2	Compare and contrast various CPU scheduling algorithms.	2
CO-3	Evaluate the requirements for the process synchronization and co-ordination in contemporary operating system	3,4
CO-4	Analyze various algorithms for memory management, I/O management and security aspects of operating system.	5,6
CO-5	Write shell scripts in Unix/Linux O.S and write simple programs using kernel system calls. Also understand virtualization concept.	7,8,9

**List of Experiments/Tutorials: -: Study of Basic commands of Linux/UNIX**

1. Study of Advance commands and filters of Linux/UNIX
2. Write a shell script to generate marksheet of a student. Take 3 subjects, calculate and display total marks, percentage and Class obtained by the student.
3. Write a shell script which will accept a number b and display first n prime numbers as output.
4. Write a shell script which will generate first n Fibonacci numbers like: 1, 1, 2, 3, 5, 13, ...
5. Write a shell script to check entered string is palindrome or not.
6. Write a shell script to generate marksheet of a student. Take 3 subjects, calculate and display total marks, percentage and Class obtained by the student.
7. Write a menu driven 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 those are currently logged in the system
  - d. Display your name at given x, y position
  - e. Display your terminal number
8. Write a shell script to display all executable files, directories and zero sized files from current directory.
9. Write a shell script to validate the entered date. (eg. Date format is : dd-mm-yyyy)
10. Write a program for process creation using C. (Use of gcc compiler).

**Major Equipment: -**

1. Gcc compiler and terminal in Ubuntu
2. Virtual Laboratory <https://www.vlab.co.in/>
3. Computer System with Ubuntu/Linux.

**Books Recommended: -**

1. Modern Operating Systems By Andrew S. Tanenbaum, Third Edition PHI
2. Operating Systems Internals and Design Principles , William Stallings , Seventh Edition, Prentice Hall
3. Operating Systems, D.M.Dhamdhare, TMH
4. Unix System Concepts & Applications, Sumitabha Das, TMH
5. Unix Shell Programming, YashwantKanitkar By BPB Publications.

**List of Open Source Software/learning website:**

1. <https://nptel.ac.in/courses/106/106/106106144/>
2. [https://onlinecourses.swayam2.ac.in/cec20\\_cs06/preview](https://onlinecourses.swayam2.ac.in/cec20_cs06/preview)
3. <https://www.youtube.com/watch?v=WJ-UaAaumNA&list=PLxCzCOWd7aiGz9donHRrE9I3Mwn6XdP8p&index=2>
4. <https://www.cse.iitb.ac.in/~mythili/os/>
5. <https://www.vlab.co.in/>