

Teaching Plan

Course: B.Sc.(Physical Sciences)

Semester-IV

Subject: (DSC04): Operating Systems

Learning Objectives

This course introduces the students to Operating Systems and its importance in computer systems. The focus is to explain the common services provided by an operating system like process management, memory (primary, secondary & virtual) management, I/O management, file management. The course talks about the various functional components of the operating and their design.

Learning Outcomes

On successful completion of the course, students will be able to:

- Gain knowledge of different concepts of the operating System and its components.
- Learn about shell scripts and would be able to use the system in an efficient manner.

Teaching Plan	
Weeks	Topics
Week 1	UNIT – I Introduction: Operating Systems (OS) definition and its purpose, Multiprogrammed and Time Sharing Systems, OS Structure, OS Operations: Dual and Multi-mode.
Week 2	UNIT – I OS as resource manager. UNIT-II OS Services, System Calls: Process Control.
Week 3	UNIT-II File Management, Device Management, and Information Maintenance.
Week 4	UNIT-II Inter-process Communication, and Protection, System programs.

Week 5	UNIT-II OS structure- Simple, Layered, Microkernel, and Modular. UNIT – III Process Management: Process Concept
Week 6	UNIT-III States. Process Control Block, Context Switch ,Process scheduling, Schedulers.
Week 7	UNIT – III Overview of threads and Scheduling Algorithms: First Come First Served, Shortest-Job-First.
Week 8	UNIT – III Priority & Round-Robin. (Test-1) UNIT – IV Physical and Logical address space
Week 9	UNIT – IV Swapping Contiguous memory allocation strategies - fixed and variable partitions
Week 10	UNIT – IV Segmentation, Paging, virtual memory:
Week 11	UNIT – IV Demand Paging. UNIT – V File Concepts, File Attributes, File Access Methods
Week 12	UNIT – V Directory Structure: Single-Level, Two-Level, Tree-Structured, and Acyclic-Graph Directories.
Week 13	UNIT – V Magnetic Disks, Solid-State Disks, Magnetic Tapes.
Week 14	UNIT – VI Shell variables, parameter passing conditional statements, iterative statements, writing and executing shell scripts,
Week 15	UNIT – VI utility programs (cut, paste, grep, echo, pipe, filter etc. (Test-2)

Practical exercises

1. Execute various LINUX commands for:
 - i. Information Maintenance: wc, clear, cal, who, date, pwd
 - ii. File Management: cat, cp, rm, mv, cmp, comm, diff, find, grep
 - iii. Directory Management : cd, mkdir,rmdir, ls
2. Execute various LINUX commands for:
 - i. Process Control: fork, getpid, ps

- ii. Communication: Input-output redirection, Pipe
 - iii. Protection Management: chmod, chown, chgrp
3. Write a program(using fork() and/or exec() commands) where parent and child execute:
 - i. same program, same code.
 - ii. same program, different code.
 - iii. before terminating, the parent waits for the child to finish its task.
 4. Write a program to calculate sum of n numbers using Pthreads.
 5. Write a program to generate a Fibonacci Series of numbers using Pthreads.
 6. Write a program to implement best-fit and worst-fit allocation strategies
 7. Write a program to copy files using system calls and using pthreads and compare timings.
 8. Write a program to implement FCFS scheduling algorithm.
 9. Write a program to implement SJF scheduling algorithm.
 10. Write a program to implement non pre-emptive priority based scheduling algorithm.

Essential/recommended readings

1. Galvin, S. P. B., Gagne, G., *Operating System Concepts*, 9th edition, John Wiley Publications, 2016.
2. G. Nutt, *Operating Systems*, Pearson, 2009
3. Das, S., *Unix: Concepts and Applications*, 4th edition, TMH, 2009.

Additional References

1. Dhamdhere, D. M., *Operating Systems: A Concept-based Approach*, 2nd edition, Tata McGraw-Hill Education, 2017.
2. Kernighan, B. W., Pike, R., *The Unix Programming Environment*, Englewood Cliffs, NJ: Prentice-Hall, 1984.
3. Stallings, W., *Operating Systems: Internals and Design Principles*, 9th edition, Pearson Education, 2018.
4. Tanenbaum, A. S., *Modern Operating Systems*. 3rd edition, Pearson Education, 2007.