

COURSE TITLE	OPERATING SYSTEM
COURSE CODE	09CE3405
COURSE CREDITS	5

Objective:

- 1 This course enables students to understand Operating System and their standards. Students will understand the concepts of CPU scheduling, memory management, file system, through scheduled lectures and labs. Also this course emphasis on Linux as open source operating system utilities and scripting.

Course Outcomes: After completion of this course, student will be able to:

- 1 Apply Linux commands and shell scripting to perform file operations and basic system tasks
- 2 Analyze operating system concepts, architecture, process management, and inter-process communication.
- 3 Evaluate CPU scheduling algorithms and deadlock handling techniques for system performance
- 4 Apply memory management and file system techniques to manage system resources efficiently

Pre-requisite of course: Students should be able to recall and understand basic concepts of C programming, apply fundamental data structures (arrays, stacks, queues), and comprehend basic computer organization concepts such as CPU and memory.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	4	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Linux Introduction to Linux, Linux installation, Editing files with vi, vim, gcc, Shell and commands-touch, pwd, cd, mkdir, rmdir, ls, cat, cmp, cp, rm, mv, echo, wc, comm, head, tail, grep, sort and related shell script programs	7
2	Operating System Operating System overview, Operating System concepts, Functions of OS, Services of OS, System call, Types of operating system: Batch Operating System, Multiprogramming Operating System, Multiprocessing Operating System, Real Time Operating System, Multitasking/Time Sharing OS, Distributed OS, Network OS, kernel, Architecture of operating system	6

Contents : Unit	Topics	Contact Hours
3	Process Management Process, Process States, Process Control Block, Threads, User Level and Kernel level thread, Multithreading-Many to one, One to One , Many to Many, Process Synchronization, race conditions, critical region problem, Mutual exclusion, classical problems of IPC, Concepts of Semaphore – Mutex – Monitor –Event Counters, Message Passing	8
4	CPU Scheduling and Deadlocks Scheduling -Basic Concept, Preemptive and Non-Preemptive scheduling, scheduling criteria, Types of Scheduling algorithm: Non-Preemptive-First Come First Served (FCFS), Non-Preemptive-Shortest Job First (SJF), Priority Preemptive-Shortest Remaining Time Next(SRTN) , Round Robin(RR), Deadlock concepts and its characterization, deadlock detection, prevention techniques of deadlock, techniques to get recovery from deadlock, deadlock avoidance-Bankers Algorithm	9
5	Memory Management Contiguous Memory Allocation, Swapping, Compaction, Partitioning Algorithm-First fit, Best fit, Worst fit, Fragmentation, paging concepts, segmentation, virtual memory, demand paging, page fault, page replacement policies- First In First Out (FIFO), Least Recently Used (LRU), Optimal(OPT)	7
6	File Management and Disk Structure File-Concept of file, attributes and operations of file, file accessing methods, directories, file sharing and protection, Disk-Disk structure- physical and logical structure, Disk Hardware, Disk Scheduling	5
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Practical-1 Case study to installation of Linux.	4
2	Practical-2 Case study to compare any two operating system	4
3	Practical-3 Study of Basic commands of Linux	4
4	Practical-4 Study of Advance commands and filters of Linux	4
5	Practical-5 Write a shell script to print “Hello world”.	2
6	Practical-6 Write a shell script that accepts a name string from user and print it with proper title.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
7	Practical-7 Write a shell script that performs simple arithmetic operation on given input.	2
8	Practical-8 Write a shell script to generate grade sheet of a student which accepts marks of five subjects, calculate and display total marks, percentage and grade obtained by the student.	2
9	Practical-9 Write a shell script to add and print all even numbers between given range.	2
10	Practical-10 Write a shell script to generate Fibonacci number from 1 to n.	2
11	Practical-11 Write a shell script to find factorial of given number n.	2
12	Practical-12 Write a shell script to generate prime numbers from 1 to n	2
13	Practical-13 Write a shell script that reverses the number.	2
14	Practical-14 Write a shell script to check whether the entered number is Armstrong number or not using the command line argument.	2
15	Practical-15 Write a shell script to check whether the string is palindrome.	2
16	Practical-16 Write a shell script that reverses the string.	2
17	Practical-17 Write a shell script that evaluates the following series $1+1/1+1/2+1/3+\dots+1/n$.	2
18	Practical-18 Write a shell script to read n numbers as command arguments and sort them in ascending order.	2
19	Practical-19 Write a shell script to wish Good morning, Good afternoon and Good night as per current system time.	2
20	Practical-20 Write a shell script to count number of characters, words & lines.	2
21	Practical-21 Write a shell script for calendar for current month & year also for range of months.	2
22	Practical-22 Write a shell script to convert lowercase to uppercase letter for a given file.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
23	Practical-23 Write a shell script for comparison between two strings whether both the strings are equal or not.	2
24	Practical-24 Write a shell script to accept two filenames, if both files exist then contents of first file should be appended to second. If second file does not exist then create it with the contents of first file.	2
Total Hours		56

Textbook :

- 1 Operating System: A Concept-Based Approach, 3rd edition, D. M. Dhamdhare, McGraw Hill Education, 2017

References:

- 1 Operating Systems: Internals and Design Principles, Operating Systems: Internals and Design Principles, 1. W. Stallings, Pearson Education, 2018

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
0.00	0.00	35.00	35.00	30.00	0.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 <http://williamstallings.com/OS/Animation/Animations.html>
- 2 <http://nptel.ac.in/courses/106106144/>

Supplementary Resources:

3 <http://nptel.ac.in/courses/106108101/>