INSTITUTE	FACULTY OF TECHNOLOGY
PROGRAM	BACHELOR OF TECHNOLOGY (COMPUTER ENGINEERING)
SEMESTER	4
COURSE TITLE	OPERATING SYSTEM
COURSE CODE	01CE1401
COURSE CREDITS	4

Objective:

1 Student will understand Modern Operating System and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of processes, CPU scheduling, memory management, file system, storage subsystem, and input/output management.

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

1 Understanding the role of operating system with its function and services.

2 Application and comparison of various CPU scheduling and memory management algorithms.

3 Apply various concepts and asses the requirement for inter process communication and deadlock.

4 Comprehend the mechanism of I/O and File Management

5 Implement algorithms and acquire a detailed understanding of various Unix commands

Pre-requisite of course: Data structures like stack, queue, linked list, tree, graph, hashing, file structures, any structured programming language (like C or python)

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Operating System:** Computer system overview, Architecture, Goals & Structures of O.S,, Functions of operating systems, protection and security, distributed systems, operating Systems structures, services,, Role & Function Of Kernel, system calls and their working.	3

Contents : Unit	Topics	Contact Hours
2	**Process and Threads:** Process and Threads - Process concepts,, threads,, scheduling-criteria,, scheduling-Algorithms, and their evaluation., Process Scheduling,, Thread Scheduling,, Real Time Scheduling., System calls like ps, fork, join, exec family, wait,, Microkernel's architecture and benefits,, case studies UNIX.	12
3	**Concurrency Control(IPC):** Process synchronization,, critical- section problem., classic problems of Synchronization,, Software Solutions for synchronization problem., Hardware Solutions for synchronization problem., Synchronization and Their applications., Understanding of Semaphore, Mutex – Monitor – Event Counters	8
4	**Memory Management:** Memory: Swapping,, contiguous memory allocation,, paging, page table, segmentation,, virtual memory, demand paging,, page-replacement, Allocation of frames,, Virtual Memory: Basics of Virtual Memory, Hardware and control structures – Locality of reference,, Page fault, Working Set, Dirty page/Dirty bit – Demand paging (Concepts only), Page Replacement policies: Least Recently used (LRU) Optimal (OPT), Second Chance (SC),, First in First Out (FIFO), Not recently used (NRU)	10
5	**Principles of Deadlock:** Deadlock - system model, deadlock and its characterization with example,, deadlock prevention techniques with example,, detection and avoidance of a deadlock,, methods to get recovery form deadlock	4
6	**File System Interface:** File system Interface- the concept of a file, Access Methods. Directory Structure. File system mounting, file protection and sharing mechanism., File System implementation- File system structure, file/directory implementation, efficiency and performance,, file allocation methods, Free-space management., I/O systems - Hardware, application l/o interface, kernel I/O subsystem,, Transforming I/O requests to Hardware operations. STREAMS, performance	5
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical 1** Case study: Linux, window operating system , Installation of Ubuntu OS	2
2	**Practical 2** Study of the Unix commands with option	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	**Practical 3** Write a script called hello which outputs the following: your username the time and date who is logged on Also output a line of asterisks (*********) after each section.	2
4	**Practical 4** Write a shell script which calculates the sum of two numbers.	2
5	**Practical 5** Write a shell script which prints a multiplication table for the number where n will be provided as input when prompted.	2
6	**Practical 6** Write a script to find the smallest of three numbers as well as largest among three numbers.	2
7	**Practical 7** Write a Shell Script to display the student's Result. Enter3 different subject marks display total and percentage of student and student's grade message display as per following conditions:- Per >=66 then Distinction Per < 66 and per >=60 then first class Per <60 and per >= 50 then second class Per < 50 and per >=40 pass class Per < 40 then fail.	2
8	**Practical 8** Write a shell Script to make a menu driven calculator	2
9	**Practical 9** Write a shell script which takes one number from the user and finds the factorial of a given number.	2
10	**Practical 10** Write a shell script which calculates nth Fibonacci number where n will be provided as input when prompted.	2
11	**Practical 11** Write a script to check if the entered string or a number is palindrome or not.	2
12	**Practical 12** Write a program for process creation using C Language. (Commands: fork(), getpid(),getppid()) [Use of gcc compiler]	2
Total Hours		**24**

Textbook :

1 Operating System Concepts, Abraham Silberchatz, Wiley, 2018

References:

1 Operating Systems - Internals and Design Principles, Operating Systems - Internals and Design Principles, Stallings, Pearson, 2009

2 Modern Operating Systems, Modern Operating Systems, Andrew S Tanenbaum, PHI, 2016

3 Unix Concepts and Applications, Unix Concepts and Applications, SumitabhaDas, TMH, 2017

References:

4 Shell Programming, Shell Programming, Yashvant Kanetkar, BPB publisher, 1996

5 The Design of Unix Operating System, The Design of Unix Operating System, Maurice Bach, Pearson Education India, 2015

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
20.00	25.00	25.00	15.00	15.00	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 and Virtual Laboratory.

Supplementary Resources:

1 http://nptel.ac.in/courses/106106144/

2 http://nptel.ac.in/courses/106108101/

3 http://codex.cs.yale.edu/avi/os-book/OS9/slide-dir