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 Analyse the role of an operating system with its functions, services, and architectural principles.

2 Apply and compare various CPU scheduling and memory management algorithms.

3 Analyse and apply concepts for inter-process communication, synchronization, and deadlock handling.

4 Comprehend the mechanisms of I/O and File Management.

5 Implement operating system algorithms and acquire understanding of Unix/Linux 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
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

MR. HARDIK AJAYBHAI DOSHI
Digitally signed by (Name of HOD)

DR. RAJENDRASINH BAHADURSINH JADEJA
Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
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
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

MR. HARDIK AJAYBHAI DOSHI
Digitally signed by (Name of HOD)

DR. RAJENDRASINH BAHADURSINH JADEJA
Digitally signed by (Name of Dean/ Principal)

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
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

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					
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

MR. HARDIK AJAYBHAI DOSHI
Digitally signed by (Name of HOD)

DR. RAJENDRASINH BAHADURSINH JADEJA
Digitally signed by (Name of Dean/ Principal)