Subject Code: 01CT1409
Subject Name: Operating System
B. Tech. Year – II (Semester IV)

Objective:
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.

Credits Earned: 03 Credits

Course Outcomes: After completion of this course, student will be able to:
1. Understanding the role of operating system with its function andservices
2. Compare Various Algorithm used for CPU Scheduling, Memory managementand Disk SchedulingAlgorithm.
3. Apply Various Concepts related with Deadlock to solveProblems.
4. Analyze Protection and Security Mechanism in OperatingSystem.
5. Analyze and illustrateshell commands and scripts that can manipulate text-based data, either in files or data streams.

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

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	00	03	50	30	20	00	00	100

Contents:

Unit	Topics	Hours
1	**Operating Systems** Operating Systems Overview- Overview and Functions of operating systems, protection and security, distributed systems, operating systems structures, services, system calls and their working. History and generationof operating system.	03
2	**Process and Threads** Process and Threads - Process concepts, threads, scheduling-criteria,algorithms, and their evaluation. Process Scheduling, Thread scheduling, **Case studies UNIX. Linux. Windows**	06
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]	08
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).	12
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 from deadlock.	06
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.	03

7	**Mass-storage structure & I/O systems** Mass-storage structure- RAID structure, Disk structure, disk attachment, disk scheduling, swap-space management. stable-storage implementation. overview of Mass-storage structure. Tertiary storage structure. I/O systems- Hardware, application l/o interface, kernel I/O subsystem, Transforming I/O requests to Hardware operations.STREAMS, performance.	04
	Total Hours	42

Suggested Text books / Reference books:
1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 8th edition.
2. Operating Systems - Internals and Design Principles. Stallings, 6th Edition-2009. Pearsoneducation.
3. Operating systems- A Concept based Approach-D.M.Dhamdhere. 3rd Edition.TMH
4. Modern Operating Systems, Andrew S Tanenbaum 3rd editionPHI.
5. Principles of Operating Systems, B.L.Stuart. Cengage learning, IndiaEdition.
6. Operating Systems. A.S. Godboie.2nd Edition,TMH

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

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	15%	10%	5%

Suggested Hands On Activities :

1) CPU scheduling Algorithm
    a. First Come First Serve(FCFS)
    b. Shortest Job First(SJF)
    c. Round Robin
    d. Priority
2) Memory Management Techniques
    a. Multi Programming with fixed number of tasks
    b. Multi Programming with variable number of tasks
3) Contiguous Memory Allocation
    a. Worst Fit

      b. Best Fit
      c. First Fit
4) Page Replacement Algorithm
      a. First In First Out (FIFO)
      b. Least Recently Used (LRU)
      c. Optimal
5) Deadlock Avoidance
6) Deadlock Prevention
7) Disc Scheduling Algorithm
      a. FCFS
      b. SCAN

Supplementary Resources:
1. http://williamstallings.com/OS/Animation/Animations.html
2. http://nptel.ac.in/courses/106106144/
3. http://nptel.ac.in/courses/106108101/
4. http://codex.cs.yale.edu/avi/os-book/OS9/slide-dir