Name of Department:- Computer Science and Engineering

1. Subject Code: TCS 502 Course Title: **Operating Systems**
2. Contact Hours: L: 3 T: - P: -
3. Semester: V

4. Pre-requisite: TCS 301, TCS 403, TCS 404

5. Course Outcomes: After completion of the course students will be able to

1. Understand the concept and design issues associated with an operating system
2. Identify the problems related to process management and synchronization and apply learned methods to solve basic problems
3. Explain the basics of memory management and the use of virtual memory in modern operating systems.
4. Understand the concept deadlock avoidance, prevention and detections techniques.
5. Implementation of process management, memory management and file management using system calls.
6. Analyze the data structures and algorithms used for developing an operating systems

6. Detailed Syllabus

UNIT	CONTENTS	Contact Hrs
Unit – I	**Introduction to Operating Systems, UNIX:** What operating systems do; Operating System structure; Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System structure; Unix command: Command Structure, Internal and External commands, filters; vi editor.	8
Unit - II	**Process Management:** Process concept; Process scheduling; Operations on processes; Multi-Threaded Programming: Overview; Multithreading models; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling. **Process Synchronization:** Inter-process communication; Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization.	10
Unit – III	**Deadlocks:** Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Memory Management:** Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement; Allocation of frames; Thrashing.	10

Unit – IV	**File System, Implementation of File System:** File System:File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; Directory implementation; Allocation methods; Free space management. **Secondary Storage Structures, Protection :** Mass storage structures; Disk structure; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Access matrix.	8
Unit – V	**Shell Programming:** Shell scripts, Running script in the current shell, Pattern Matching, Redirection, String handling, Conditional Parameter Substitution, Shell functions. **Case Study: The Linux Operating System:** Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication.	8
	Total	**44**

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne:" Operating System Principles", 7th edition, Wiley India, 2006.
2. William Stallings: "Operating Systems: Internals and Design Principles", 6th edition, Pearson, 2009
3. Sumitabha Das ,"Unix concepts and applications"

Reference Books:

1. Andrew S Tanenbaum: "Operating Systems: Design and Implementation", 3rd edition, Prentice Hall, 2006
2. Stuart E. "Madnick, John Donovan: Operating Systems", Tata McGraw Hill, 2008