Course Name: Operating System Principles

Course Code:

Course Credit: 3-0-2

Course Objectives:

- Introduction to the fundamentals of distributed computer systems and data transmission.
- Illustrate the importance of synchronization and deadlocks
- Characterize resource and process management by operating systems.
- Work on storage unit like file system with its features like file sharing, replication, and Fault tolerance

Course Content:

Theory

Module 1: Introduction to Operating System

Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,, Commonly Used Commands and getting Started (Login/Logout) . Creating and viewing files using cat, file comparisons, View files, disk related commands, checking disk free spaces.

Module 2: Process Management – Processes and Threads

Processes: Process concept, Process scheduling, Co-operating processes, Inter process Communication.

Threads: Introduction to Threads, Single and Multi-threaded processes.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling

Unix Process Management**:** The Structure of Processes: Process States and Transitions, Layout of system memory, Context of a process.

Process Control: Process Creation, Signals, Process Termination, Invoking other programs, PID & PPID, Shell on a Shell.

Module 3: Process Management – Synchronization and Deadlocks

Process Synchronization: Mutual Exclusion, Critical, section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions. Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Module 4: Storage Management

Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging.

Virtual Memory Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing,

File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics.

File-System Implementation: File-System structure. Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.
The Unix File System:Inodes, Structure of a regular file, Directories, Conversion of a path name to an inode, Super block, Inode assignment to a new file, Allocation of disk blocks. System calls for the file System: Open, Read, Write, Lseek, Close, File creation, Creation of special files, Changing directory and root, changing owner and mode, stat and fstat, pipes,
Dup, Mounting and Un mounting file systems, Link and Un link

Module 5: Protection and Security
Protection: Goals of Protection, Domain of Protection, Security: Security Problem, User Authentication, One – Time Password, Program Threats, System Threats,
Unix System Administration: Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disabling of user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel, installing and removing packages with rpm command

Course Outcomes:
After successful completion of the course, the students would be able to:
- Summarize distributed computing techniques, synchronization and handling remote procedures.
- Explain the Process Migration and the concept of Threads
- Identify Resource Management Based Scheduling Algorithms and their suitability.
- Summarize File Systems and Memory Management.
- Interpret synchronization, consistency and replication, fault tolerance, security and protection

Text Books:
1. Operating Systems: Design and Implementation., Andrew S. Tanenbaum

Reference Books:
1. Operating System Concepts and design by Milan Milonkovic, McGraw Hill.
2. Operation System Concepts by Tanenbaum, Pearson Education.
3. Operating System by Silberschatz / Galvin / Gagne,WSE (WILEY Publication)
4. Operating System by William Stallings, Pearson Education.
5. Operating System by H.M.Deitel ,Pearson Education