OPERATING SYSTEMS
(Common to CSE&IT)

Course Code : 13CT1104

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Course Educational Objectives:

The main objective of the course is to expose the students to different CPU scheduling, Memory Management and File Management Techniques. Upon completion of this course, the student should be able to:

❖ Select and apply best scheduling algorithm to schedule the CPU for given set of processes.

❖ Solve synchronization problems among the processes

❖ Understand the Page Table Structure stored in Memory and its implementation

❖ Solve the Deadlock situations.

❖ Understand the Secondary storage structure and File Management.

Course Outcomes:

At the end of the course the student will be able to

❖ Acquire the knowledge of Managing the Memory in an efficient manner,

❖ Solving Deadlock situations.

❖ Files and File System Structure, Disks and its Internal Structure, how to protect the system.

❖ Understand the concepts of paging and different Page Replacement algorithms, of I/O systems, Directory Implementation and File allocation methods, RAID and stable storage.

❖ System and Network Threats, Firewalls

UNIT-I   (10 Lectures)

INTRODUCTION & SYSTEM STRUCTURES:

Overview of computer operating systems, computer system organization, computer system architecture, operating systems operations, protection and security, distributed systems, special purpose systems, operating systems services, systems calls and its types, operating systems structure, operating systems generation.

UNIT-II   (14 Lectures)

PROCESS CONCEPT:

Process, Process Control Blocks, Operations on Processes, Interprocess Communication, Scheduling Criteria, scheduling-criteria algorithms(FCFS, SJF, Round Robin, Priority) and their evaluation, Multiprocessor scheduling, Thread scheduling. Case Study: Linux

SYNCHRONIZATION:

The Critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples, atomic transactions. Case Study: Linux

UNIT-III   (14 Lectures)

MEMORY MANAGEMENT STRATEGIES:

Swapping, contiguous memory allocation, paging, structure of the page table, segmentation.

VIRTUAL-MEMORY MANAGEMENT:

Virtual memory, demand paging, Copy on write, page-Replacement algorithms (FIFO, LRU, LFU, Optimal Page Replacement)

DEADLOCKS:

System model, deadlock characterization, Methods for Handling Deadlock, deadlock prevention, detection and Avoidance, recovery form deadlock.

UNIT-IV   (12 Lectures)

I/O SYSTEMS:

I/O Hardware, application interface, kernel I/O subsystem, Transforming I/O requests, Hardware operations, STREAMS, performance.

FILE SYSTEMS:

File Concept, Access Methods, Directory Structure, File System Mounting.

IMPLEMENTING FILE SYSTEMS:

File system structure, File System Implementation, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and performance, Log-Structured File Systems, Network File Systems. Case Study: Linux

UNIT-V   (10 Lectures)

SECONDARY-STORAGE STRUCTURE:

Overview of Mass-storage structure, disk structure, disk attachment, disk scheduling, swap-space management, RAID structure, stable-storage implementation, Tertiary storage structure.

PROTECTION:

Goals of Protection, Principles of Protection, Domain of protection,Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection.

SYSTEM SECURITY:

The Security problem, program threats, system and network threats cryptography as a security tool, user authentication, implementing security defenses, firewalling to protect systems and networks, computer–security classifications. Case Study: Linux

TEXT BOOK:

Abraham Silberchatz, Peter B. Galvin, Greg Gagne, *Operating System Principles*, 8thEdition, John Wiley & Sons, 2010.

REFERENCES:

1. William Stallings, *"Operating Systems – Internal and Design Principles"*, 6th Edition, Pearson education/PHI, 2011.

2. D.M. Dhamdhere, *"Operating systems - A Concept based Approach"*, 2nd Edition, TMH, 2010.

3. Charles Crowley, *"Operating Systems - A Design Approach"*, 1stEdition, TMH, 2011.

4.   Andrew S Tanenbaum, *"Modern Operating Systems"*, 3rd Edition, Pearson, PHI, 2010.

WEB REFERENCES:

http://nptel.iitm.ac.in/courses/Webcoursecontents/IIScBANG/
Operating%20Systems/New_index1.html