Course Title: Operating System (3 Cr.)
Course Code: CACS251
Year/Semester: II/IV
Class Load: 6 Hrs. / Week (Theory: 3 Hrs, Tutorial: 1, Practical: 2 Hrs.)

Course Description
This course includes the topics that help students understand operating system and its functionality along with its types.

Course Objectives
The general objectives of this subject are to provide the basic feature, function and interface with the hardware and application software to run the computer smoothly.

Course Contents
Unit 1 Introduction to Operating System 2 Hrs.

Unit 2 Operating System Structure 2 Hrs.

Unit 3 Process Management 15 Hrs.

Threads (1 Hr): Definitions of Threads, Types of Thread Process (Single and Multithreaded Process), Benefits of Multithread, Multithreading Models (Many-to-One Model, One-to-One Model, Many-to Many Model).

Process Scheduling (5 Hrs): Basic Concept, Type of Scheduling (Preemptive Scheduling, Nonpreemptive Scheduling, Batch, Interactive, Real Time Scheduling), Scheduling Criteria or Performance Analysis, Scheduling Algorithm (Round-Robin, First Come First Served, Shortest-Job- First, Shortest Process Next, Shortest Remaining Time Next, Real Time, Priority Fair Share, Guaranteed, Lottery Scheduling, HRN, Multiple Queue, Multilevel Feedback Queue); Some Numerical Examples on Scheduling.

Unit 4 Deadlocks
4 Hrs.

Unit 5 Memory Management
7 Hrs.
Basic Memory Management (3 Hrs.): Introduction, Memory Hierarchy, Logical Versus Physical Address Space, Memory Management with Swapping: Memory Management with Bitmaps and with Linked List; Memory Management without Swapping, Contiguous-Memory Allocation: Memory Protection, Memory Allocation, Fragmentation (Inter Fragmentation and External Fragmentation); Non-Contiguous Memory Allocation, Fixed Partitioning Vs. Variable Partitioning, Relocation and Protection, Coalescing and Compaction.

Virtual Memory (4 Hours): Background, Paging, Structure of Page Table: Hierarchical Page Table, Hashed Page Table, Inverted Page Table, Shared Page Table; Block Mapping Vs. Direct Mapping, Demand Paging, Page Replacement and Page Faults, Page Replacement Algorithms: FIFO, LRU, SCP; Some Numerical Examples on Page Replacement, Thrashing, Segmentation, Segmentation With Paging.

Unit 6 Input/ Output Device Management
4 Hrs.
Principle of I/O Hardware: I/O Devices, Device Controllers, Memory Mapped I/O, Direct Memory Access; Principle of I/O Software: Goals of I/O Software, Program I/O, Interrupt-Driven I/O, I/O Using DMA; I/O Software Layers: Interrupts Handler, Device Drivers, Device Independent I/O Software, User Space I/O Software; Disk: Disk Hardware; Disk Scheduling: Seek Time, Rational Delay, Transfer Time; Disk Scheduling Algorithms: FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, Lock Scheduling

Unit 7 File System Interface Management
2 Hrs.
Methods: Sequential, Direct; Protection: Types of Access, Access Control List, Access Control Matrix

Unit 8 Security Management 3 Hrs.

Unit 9 Distributed Operating System 4 Hrs.

Unit 10 Case Study 2 Hrs.
DOS and Windows Operating System, Unix Operating System, Linux Operating System

Laboratory Works
Lab works should be done covering all the topics listed above and a small project work should be carried out using the concept learnt in this course. Project should be assigned on Individual Basis.

Teaching Methods
The general teaching pedagogy includes class lectures, group discussions, case studies, guest lectures, research work, project work, assignments (theoretical and practical), and examinations (written and verbal), depending upon the nature of the topics. The teaching faculty will determine the choice of teaching pedagogy as per the need of the topics.

Evaluation

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<th>Examination Scheme</th>
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<tr>
<td><strong>Internal Assessment</strong></td>
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<tr>
<td><strong>Theory</strong></td>
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<td>20 (3 Hrs.)</td>
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Total
Text Books

Reference Books
1. Andrew S. Tanenbaum, "Distributed Operating System", Pearson