CSE3241: Operating System and System Programming

Lecture-1
(Syllabus)

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At a Glance

1. Operating System (OS) is a software which-
   - manages the computer resources (harware, software) and
   - provides an environment where application software can run in order to fullfill users' demands.

2. In this course, students will-
   - learn very basic things of OS.
   - be familiar with the Command Line Interface (CLI) of Linux kernel based OS.

3. Recommended Books: [1] and [2].

Summary of Syllabus

- Overview
  - Introduction
  - System Structures
- Process Management
  - Process Concept
  - Threads
  - CPU Scheduling
- Process Coordination
  - Synchronization
  - Deadlocks
- Memory Management
  - Memory-Management Strategy
  - Virtual Memory
- Storage Management
  - File System
  - Disk Management
  - I/O Systems
- Protection and Security
  - System Protection
  - System Security

Syllabus I

- Overview
  - Introduction
    - What is OS?
    - Tasks of OS
    - Evaluation of OS
    - Types of OS
  - System Structures
    - Computer System Operation
    - I/O structure
    - Storage Structure
    - Storage Hierarchy
    - Different Types of Protections
    - Operating System Structure
    - Operating System Services
    - System Call
- Process Management
  - Process Concept
    - What is Process?
    - Operations on Process

Syllabus II

- Co-operating Processes
- Interprocess Communication

⊛ Threads
- Overview
- Benefits of Threads
- User and Kernel Threads

⊛ CPU Scheduling
- Process Scheduling
- Scheduling Criteria
- Preemptive & Non-Preemptive Scheduling
- Scheduling Algorithms
- Algorithm Evaluation
- Multi-Processor Scheduling

• Process Coordination

⊛ Synchronization
- Background
- Critical Section Problems
- Critical Region
- Synchronization Hardware

Syllabus III

- Classical Problems of Synchronization
- Semaphores

⊛ Deadlocks

- What is Deadlock?
- Deadlock Characterization
- Methods for Handling Deadlocks
- Deadlock Prevention
- Deadlock Avoidance
- Deadlock Detection
- Recovery from Deadlock

- Memory Management

⊛ Memory-Management Strategy

- Background
- Logical Vs. Physical Address Space
- Swapping
- Contiguous Memory Allocation
- Paging
- Segmentation
- Segmentation with Paging

Syllabus IV

- ⊛ Virtual Memory
  - Background
  - Demand Paging
  - Page Replacement
  - Page Replacement Algorithm
  - Allocation of Frames
  - Trashing

- Storage Management
  - ⊛ File System
    - File Concept
    - Access Methods
    - Directory Structure
    - File System Structure
    - Allocation Methods
    - Free-Space Management
    - Directory Implementation
    - Efficiency and Performance
  - ⊛ Disk Management
    - Disk Reliability

Syllabus V

  - Disk Formatting
  - Boot Block
  - Bad Blocks
  - Swap-Space Management
- I/O Systems
  - I/O Hardware
  - Polling
  - Interrupts
  - DMA
  - Application I/O Interface
  - Kernel I/O Subsystem
  - Performance

- Protection and Security
- System Protection
  - Goals of Protection
  - Domain of Protection
- System Security
  - Security Problem
  - User Authentication

Syllabus VI

* One Time Password
* Program Threats
* System Threats
* Threat Monitoring
* Encryption

Recommended Books

P. B. Galvin A. Silbeschatz and G. Gagne.
Operating System Concepts.
John Wiley & Sons, 9 edition, 2012.

A. S. Tanenbaum and A. S. Woodhull.
Operating Systems– Design and Implementation.
Pearson Prentice Hall, 3 edition, 2006.