Teaching Guidelines for
Linux and Operating Systems
ACC-HPC June 2025

Duration: 48 hours (24 theory hours + 24 lab hours)

Prerequisites: Students are expected to know the Basics of an Operating System

Evaluation: 100 marks
Weightage: CCEE – 40%, Lab exam – 40%, Internals – 20%

Textbook:
- "Linux Bible" by Christopher Negus
- "Operating System Concepts" by Silberschatz, Galvin, and Gagne

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Session 1:
Lecture:
- Introduction to UNIX
- Introduction to the Linux Operating System
- History of Linux.
- Linux vs. Unix
- CentOS8-Stream Installation
- Basic Commands.

Lab:
- CentOS8-Stream Installation
- Linux Basic Commands

Session 2:
Lecture:
- Introduction to Shell and Shell Scripting
- Basic Shell Commands
- Writing Shell Scripts
- Conditional statements.
- Loops: for, while, until

Lab:
- Create a basic shell script.
- Basic Shell Commands
- Write scripts using `if`, `if-else`, and `if-elif-else`.
- Loops

Session 3:
Lecture:
- Process
- Types of Processes
- Process States

- Process Control Block (PCB)
- Context Switching

Scheduling & synchronization

- CPU Scheduling
- Scheduling Algorithms
- Synchronization Basics
- Synchronization Techniques

Lab:
- Write a C program to create child processes using `fork()`
- Simulate context switching with multiple processes by alternating I/O and CPU operations manually using sleep or scheduling.
- Simulate scheduling algorithms (FCFS, SJF, Round Robin, Priority) using C or Python.
- Implement mutual exclusion using semaphores (`P()`/`V()` operations in C)

Session 4:
Lecture:
Memory management
- Memory Allocation Techniques
- Paging
- Segmentation
- Virtual Memory

Lab:
- Create page tables and perform address translation.
- Convert logical addresses to physical using base and limit values for segments.
- Simulate demand paging with page fault handling.

Session 5:
Lecture:
File Systems
- File System Types
- Linux File Systems (Ext2/3/4,XFS).
- File and Directory Permissions

Lab:
- Explore and list the file systems used in your system.
- Format a partition using Ext4 and mount it on a directory.
- Change file permissions using `chmod`.

Session 6:
Lecture:
Package Managers (RPM, APT, etc.).
- Types of Package Managers
- RPM (Red Hat-based systems)
- APT(Debian-based systems)
- Differences between RPM

and APT,
YUM, DNF
basics

Lab:
- Install and remove a package using both RPM and APT.
- Install a `.rpm` file manually and verify the installation.
- Create a shell script to automate the installation of a software suite using a package manager.