Complete Linux Course Curriculum

Course Title: Linux Administration & System Programming

Duration: 8-12 Weeks (40-60 Hours)
Level: Beginner to Advanced
Prerequisites: Basic Computer Knowledge

Module 1: Introduction to Linux

1.1 What is Linux?
- History of Linux
- Linux vs. Windows vs. macOS
- Linux Distributions (Ubuntu, Fedora, CentOS, Debian, Arch, etc.)

1.2 Linux Architecture
- Kernel, Shell, and User Space
- File System Hierarchy Standard (FHS)

1.3 Installing Linux
- Dual Boot vs. Virtual Machine (VirtualBox/VMware)
- Installing Ubuntu/CentOS
- Post-Installation Setup

1.4 Basic Linux Commands
- `ls`, `cd`, `pwd`, `mkdir`, `rm`, `cp`, `mv`, `cat`, `echo`
- File Permissions (`chmod`, `chown`)
- Basic Shell Scripting Introduction

Module 2: Linux File System & Permissions

2.1 Understanding the File System
- `/bin`, `/etc`, `/home`, `/var`, `/usr`, `/tmp`
- Navigating Directories

2.2 File Permissions & Ownership
- Read, Write, Execute Permissions
- `chmod` (Symbolic & Numeric)
- `chown` & `chgrp`
- Special Permissions (SUID, SGID, Sticky Bit)

2.3 Managing Users & Groups
- `useradd`, `usermod`, `userdel`
- `groupadd`, `groupmod`, `groupdel`
- `/etc/passwd`, `/etc/shadow`, `/etc/group`

Module 3: Linux Process Management

3.1 Understanding Processes

- Foreground vs. Background Processes
- `ps`, `top`, `htop`, `kill`, `pkill`, `pgrep`

3.2 Job Control

- `&`, `nohup`, `jobs`, `fg`, `bg`
- `cron` & `at` (Scheduling Tasks)

3.3 System Monitoring & Performance

- `df`, `du`, `free`, `vmstat`, `iostat`
- Log Files (`/var/log`)

Module 4: Package Management & Software Installation

4.1 Package Managers

- Debian-based (`apt`, `dpkg`)
- Red Hat-based (`yum`, `dnf`, `rpm`)
- Arch-based (`pacman`)

4.2 Compiling from Source

- `./configure`, `make`, `make install`

4.3 Managing Repositories

- Adding & Removing Repositories
- GPG Keys

Module 5: Networking in Linux

5.1 Basic Networking Commands

- `ifconfig`/`ip`, `ping`, `netstat`, `ss`, `traceroute`
- `nslookup`, `dig`, `host`

5.2 SSH & Remote Access

- SSH Key Authentication (`ssh-keygen`)
- SCP & SFTP

5.3 Firewall & Security

- `iptables` Basics
- `ufw` (Uncomplicated Firewall)

Module 6: Shell Scripting & Automation

6.1 Bash Scripting Basics

- Variables, Loops, Conditionals
- Functions & Arguments
- Exit Codes

6.2 Advanced Scripting

- Regular Expressions (`grep` , `sed` , `awk`)
- Automating Tasks

6.3 Debugging & Best Practices
- `set -x` , `set -e`
- Script Optimization

Module 7: Linux Security & Hardening

7.1 User Security
- Password Policies (`/etc/login.defs`)
- `sudo` & `visudo`

7.2 Filesystem Security
- SELinux & AppArmor Basics
- File Integrity Checks (`md5sum` , `sha256sum`)

7.3 Security Tools
- `fail2ban`
- `ClamAV` (Antivirus)

Module 8: System Administration & Troubleshooting

8.1 Boot Process & GRUB
- BIOS vs. UEFI
- `/etc/default/grub`

8.2 Systemd & Service Management
- `systemctl` , `journalctl`

8.3 Backup & Recovery
- `tar` , `rsync` , `dd`
- Disaster Recovery

Module 9: Advanced Topics (Optional)

9.1 Virtualization & Containers
- KVM, Docker, Podman

9.2 Cloud & DevOps Basics
- AWS/GCP with Linux
- Ansible, Terraform

9.3 Linux Kernel Basics
- Compiling a Custom Kernel

Final Project & Certification

- **Hands-on Lab:** Set up a Linux server, configure users, firewall, and services
- **Exam:** Multiple-choice + Practical Tasks
- **Certification:** Upon successful completion

Recommended Books & Resources:
- **"The Linux Command Line"** — William Shotts
- **"UNIX and Linux System Administration Handbook"** — Nemeth et al.
- **Online:** Linux Documentation Project (tldp.org), Arch Wiki

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