Course Title: **System Administration using Linux**
Course Code: ICT. Ed. 486
Level: Bachelor
Semester: Eighth

Program: **BICTE**
Nature of Course: Theory + Practical
Credit Hours: 3 (2 +1)
Teaching Hours: 48 (32 Th+ 32 Pr)

1. Course Description

This course provides students with the skills to install, configure, and troubleshoot computer networks and system administration using Linux. The course covers server/client installation and configuration, IP, DHCP, Name Server, DNS, Web server, file, print, and mail server configuration and troubleshooting.

2. General Objectives

The general objectives of this course are:

- To provide knowledge in system administration and computer networks, including components, features, and architecture.
- To explore network standards, protocols, and access methods for network system implementation.
- To develop skills in the installation, configuration, and management of network services.
- To describe actions for enforcing network-level security.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand the foundational principles and advantages of open-source software and its role in modern computing. • Gain proficiency in navigating Unix and Linux systems, including command syntax, file management, and shell commands. • Develop skills in text processing and job control for efficient system administration and task automation. • Learn filesystem concepts and package management to effectively manage system resources and software installations.	**Unit 1: Introduction to Linux and CLI Commands (5 Hours)** 1.1 Introduction to Open-Source Software 1.2 Unix System Architecture, Linux Differences, Using a Linux System, Command Syntax 1.3 File Management 1.4 Shell Commands 1.5 Text Processing 1.6 Job Control 1.7 Filesystem Concepts 1.8 Package Management **Practical Works (5 Hours)** • Create and manage files and directories using CLI commands. • Practice text processing with commands like grep, awk, sed. • Manage processes using ps, top, and job control commands.

• Perform Linux installation, manage the boot sequence, and configure kernel and boot loaders. • Manage user accounts, groups, password policies, and authentication settings. • Configure file permissions and access control lists for secure resource management.	**Unit 2: Installation, Boot Process and User Administration (5 Hours)** 2.1 Linux Installation, Network-Based Installation, Boot Sequence, Kernel Initialization, Boot Loaders, Kernel Modules 2.2 User Account Management, Group Administration, Password Policies, Authentication Configuration, File Permissions, Access Control Lists **Practical Works (5 Hours)** • Install Linux on a virtual machine and configure boot loader settings. • Create, modify, and delete user accounts and groups. • Set file and directory permissions and configure ACLs.
• Configure and manage disk quotas to control user storage usage. • Implement RAID levels for data redundancy and performance optimization. • Create and manage logical volumes for flexible storage allocation. • Configure and manage IPv4 and IPv6 addressing and routing. • Diagnose and resolve network connectivity issues using troubleshooting tools.	**Unit 3: Disk Quotas, Storage Management, and Network Configuration (5 Hours)** 3.1 Quotas, RAID Implementation, Logical Volumes, Disk and Inode limits. 3.2 IPv4 and IPv6 Addresses, IP Configuration, Network Troubleshooting **Practical Works (5 Hours)** • Configure and manage disk quotas for users. • Implement RAID 1 using mdadm. • Configure static and dynamic IP addresses and troubleshoot network connectivity.
• Configure DNS and DHCP servers • Demonstrate hostname resolution • Set up and manage FTP, NFS, and Samba servers • Apply best practices for secure file sharing and directory access.	**Unit 4: Network Services and File Sharing (5 Hours)** 4.1 DNS and DHCP Configuration, Hostname Resolution, DNS Queries, Implementing Servers 4.2 FTP, NFS, Samba Server Configuration, Directory Access **Practical Works (5 Hours)** • Configure a DNS server and resolve domain names. • Set up and manage a DHCP server. • Configure and share directories using Samba and NFS.
• Configure Apache, MySQL, Postfix, and Dovecot for seamless operations.	**Unit 5: Web, Email, Database Services, and Network Security (4 Hours)** 5.1 Apache, HTTPD, Email Operations (SMTP, Postfix, Dovecot) 5.2 MySQL Administration.

• Troubleshoot and resolve issues in servers and networks. • Secure systems using SSL/TLS, SSH, and firewalls. • Implement ACLs and anti-spam measures for security.	5.3 Cryptography, SSH, Firewall Configuration, ACLs **Practical Works (4 Hours)** • Set up a basic Apache web server and host a sample website. • Configure an email server using Postfix and Dovecot. • Secure a Linux server using SSH keys, configure a firewall with iptables or firewall.

4 Instructional Techniques

The instructional techniques for this course are divided into two groups. First group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to particular units.

4.1 General Techniques

Reading materials will be provided to students in each unit. Lecture, Discussion, use of multi-media projector, brain storming are used in all units.

4.2 Specific Instructional Techniques

Demonstration is an essential instructional technique for all units in this course during teaching learning process. Specifically, demonstration with practical works will be specific instructional technique in this course.

5 Evaluation

Internal Assessment	External Practical Exam/Viva	Semester Examination	Total Marks
40	20	40	100

Note: Students must pass separately in internal assessment, external practical exam and semester examination.

5.1 Internal Evaluation (40 %):

Internal evaluation will be conducted by subject teacher based on following criteria:

1)	Class Attendance	5 Marks
2)	Learning Activities and Class Performance	5 Marks
3)	First Assignment (Written assignment)	10 Marks
4)	Second Assignment (Case Study/Project work with Presentation)	10 Marks
5)	Terminal Examination	10 Marks
	Total	40 Marks

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5.2 Semester Examination (40 Marks)

Examination Division, Dean office will conduct final examination at the end of semester.

1)	Objective Question (Multiple Choice Questions)	(10 × 1) = 10 Marks
2)	Subjective Answer Questions (6 Questions with 2 Or)	(6× 5) = 30 Marks
	Total	40 Marks

5.3 **External Practical Exam/Viva (20 Marks):**

Examination Division, Dean Office will conduct final practical examination at the end of semester.

6 Recommended Books and Reading Materials

- Negus, C. (2020). *Linux Bible* (10th ed.). Wiley.
- Negus, C. (2025). *Linux Bible* (11th ed.). Wiley.
- Nemeth, E., Snyder, G., Hein, T. R., Whaley, B., & Mackin, D. (2021). *UNIX and Linux system administration handbook* (5th ed.). Addison-Wesley.
- Fox, R. (2021). Linux with Operating System Concepts (2nd ed.). CRC Press.
- Wale Soyinka, W. (2020). Linux Administration: A Beginners Guide (8th ed.). McGraw Hill.
- Limoncelli, T. A., Hogan, C. J., & Chalup, S. R. (2017). *The practice of system and network administration* (3rd ed.). Addison-Wesley.
- Rankin, K., & Hill, B. M. (2013). The official Ubuntu server book (3rd ed.). Pearson.
- Smith, R.W. (2002). Advanced Linux Networking (1st ed.). Addison-Wesley Professional.
- Frisch, Æ. (2002), Essential System Administration: Tools and Techniques for Linux and Unix Administration, 3rd Edition, O'Reilly