**Course Title: System Administration** **Credit: 3**
**Course No: CSIT.415.3** **Number of period per week: 3+3**
**Nature of the Course: Theory + Lab** **Total hours: 45+45**
**Year: Fourth, Semester: Seventh**
**Level: B. Sc. CSIT**

## 1. Course Introduction

The course introduces the ideas and techniques underlying the principles and designs of system administration. The course concentrates on the popular Linux operating system, and covers topics ranging from initial installation of Linux to day-to-day administrative tasks such as management of user accounts and disk space, and even imparting the trouble-shooting skills future system administrators will need to cope with unexpected behavior. The course is featured with working with kernels as well as securing and monitoring the Linux system.

## 2. Objectives

The main objective of the course is to introduce concepts of System Administration. The general objectives are to,

- learn about system administration
- use different tools and techniques for system administration
- identify and access file system, storage and network management services
- learn about the system kernels, security essentials and system monitoring

## 3. Specific Objectives and Contents

| Specific Objectives | Contents |
|---|---|
| • Understand basics of Linux environment<br>• Understand different installations<br>• Understand the startup services | **Unit I: Introduction (6 Hrs)**<br>1.1. Linux workstation installation, Linux server installation, Post-install system configuration,<br>1.2. Scripting installation of custom setups using kickstart, Linux boot process,<br>1.3. SysV init concepts and configuration,<br>1.4. Managing startup of system daemons,<br>1.5. Controlling startup of services in xinetd / inetd |
| • Understand components user management<br>• Explore authentication approach<br>• Use root account commands | **Unit II: User Management (4 Hrs)**<br>2.1. Creation, modification, and deletion of users and groups,<br>2.2. Creating group directories<br>2.3. Password aging under Linux,<br>2.4. The Linux login process and login authentication, |

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|---|---|
| | 2.5. Regulating access to the root account via su and sudo |
| • Understand the file system<br>• Create files, set file attributes<br>• Understand using ACL over files<br>• Understand disk management and backups | **Unit III: File System and Storage (4 Hrs)**<br>3.1. Path Names: Absolute and Relative Paths,<br>3.2. File Types, File Attributes, Access Control Lists<br>3.3. Creation, modification, and deletion of partitions and file systems,<br>3.4. Management of RAID devices under Linux,<br>3.5. Disk space regulation using quotas,<br>3.6. Backing up and restoring Linux filesystems, |
| • Understand job scheduling and process management<br>• Understand and analyze system logs<br>• Explore the fundamental ideas of network configurations<br>• Understand network issues | **Unit IV: Process and Network Service Management (12 Hrs)**<br>4.1. Scheduling jobs using cron, anacron, and at,<br>4.2. Management of processes running on the system, Usage of process accounting and implementation of process limits,<br>4.3. Configuration and analysis of system logs,<br>4.4. System performance analysis,<br>4.5. Configuring network interfaces, Setup of DNS and DHCP clients,<br>4.6. Diagnosing network setup issues, Configuring NFS clients<br>4.7. Basic installation and configuration of common network services: telnet and SSH servers file sharing via NFS, SMB, HTTP, FTP, and TFTP e-mail services via SMTP, POP, and IMAP ISC DHCP services |
| • Understand the basic concepts of kernels<br>• Understand Linux Troubleshooting | **Unit V: Working with Kernels (9 Hrs)**<br>5.1. Configuration of optimized Linux kernels, Compiling and installing custom Linux kernels,<br>5.2. Using third-party patches with Linux kernels, Updating userland to support new kernels,<br>5.3. Concepts for troubleshooting Linux, Analysis of system logs to identify problems,<br>5.4. Use of systems-level debugging aids in troubleshooting, Usage of the Linux rescue environment |
| • Understand security in Linux<br>• Understand configuring the file security, authentication and firewalls | **Unit VI: Security (5 Hrs)**<br>6.1. Securing freshly installed Linux systems,<br>6.2. Protecting files and the file system,<br>6.3. User authentication,<br>6.4. Keeping Linux systems up-to-date, Configuration of Linux firewalls |
| • Explore system monitoring and | **Unit VII: Managing System Resources (5 Hrs)** |

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|---|---|
| management of CPU, Memory, Disk and Network | 7.1. Monitoring and Controlling Processes<br>7.2. Managing CPU Resources<br>7.3. Managing Memory<br>7.4. Monitoring Disk Space Usages<br>7.5. Managing Network Performances |

## Evaluation System

| Undergraduate Programs | | | | | | | |
|---|---|---|---|---|---|---|---|
| **External Evaluation** | **Marks** | **Internal Evaluation** | **Weightage** | **Marks** | **Practical** | **Weightage** | **Mark** |
| End semester examination | 60 | Assignments | 20% | 20 | Practical Report copy | 25% | 20 |
| (Details are given in the separate table at the end) | | Quizzes | 10% | | Viva | 25% | |
| | | Attendance | 20% | | Practical Exam | 50% | |
| | | Internal Exams | 50% | | | | |
| Total External | 60 | Total Internal | 100% | 20 | | 100% | 20 |
| Full Marks 60+20+20 = 100 | | | | | | | |

**External evaluation**

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

| Nature of question | Total questions to be asked | Total questions to be answered | Total marks | Weightage |
|---|---|---|---|---|
| Group A:<br>multiple choice* | 20 | 20 | 20×1 = 20 | 60% |
| Group B:<br>Short answer type questions | 7 | 6 | 6×8 = 48 | 60% |
| Group C:<br>Long answer type questions | 3 | 2 | 2×16 =32 | 60% |
| | | | 100 | 100% |

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

## Internal evaluation

**Assignment:** Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

**Quizzes:** Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

**Attendance in class:** Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

**Presentation:** Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

**Mid-term examination:** It is a written examination and the questions will be asked covering all the topics in the session of the course.

**Discussion and participation**: Students will be evaluated on the basis of their active participation in the classroom discussions.

**Instructional Techniques:** All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

## Laboratory Work

Student should have practical session for configuring and using above mentioned topics in Linux However, nature of Linux Platform can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

## Prescribed Text

1. **Æleen Frisch**, *Essential System Administration*, O'Reilly

### References


2. Fedora System Administrator's Guide
3. Red Hat Enterprise Linux System Administrator's Guide
4. **Evi Nemeth, Garth Snyder, Trent R. Hein**, *Linux Administration Handbook,* Addison-Wesley Professional
5. **Evi Nemeth, Garth Snyder, Trent R. Hein , Ben Whaley** *Unix and Linux System Administration Handbook,* Prentice Halls
6. **Ronald McCarty,** *Ubuntu Linux System Administration*