A. Course Handout | Prepared on 02nd Jan, 2023

Institute/School Name	Chitkara University Institute of Engineering & Technology		
Department Name	Computer Science & Engineering		
Programme Name	Bachelor of Engineering, Computer Science & Engineering		
Course Name	Linux System Administration	Session	2022-2023
Course Code	CS155	Semester/Batch	4th/ 2021
L-T-P (Per Week)	3-0-2	Course Credits	04
Course Coordinator	Dr. Vikas Lamba		

1. Objectives of the Course

Linux System Administration course is designed to help the student to become a Linux Admin Expert. The course is designed to shape the student as a Linux professional & help run applications, perform desired functions on system and networks, create a network configuration, and maintain security administration. The course provides a wide scope of learning and understanding of the subject. The objectives of the course are:

- To use Linux operating system knowledge for solving real world problem statements.
- To get familiar with the design, architecture and installation of Linux OS.
- To understand concepts of booting process, File system, working with files and directories, Editors and Filters/ Text processing commands of Linux OS.
- To understand basic concepts to manage the user, group of user's accounts on a system or on a network.
- To get familiar with shell scripting or program Linux system.

2. Course Learning Outcomes

On completion of the course, students will be able to:

CLO1. Understand fundamental concepts of Linux operating system.

CLO2. Apply concepts of Linux operating system in order to solve the real-life problems.

CLO3. Analyze the processes, file system and system directories in Linux operating system.

CLO4. Understand the working of Linux based system to manage the user or group of users in a network.

CLO5. Construct solutions for engineering problems by using shell script programming in Linux.

CLO-PO mapping grid |Program outcomes (POs) are available as a part of Academic Program Guide (APG)

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CLO1		M			M			M				M
CLO2	M		M	M		M	M	M	M		M	M
CLO3						M	M		M			M
CLO4	M	M		M	M	M		H	H	M	H	H
CLO5	H	H	H	M	H		H	H			H	H

3. Recommended Books (Reference Books/Text Books):

RB1: Linux the Complete Reference, John Purcell, 7th edition, Walnut Creek, 1999.

RB2: Linux Command Line and Shell Scripting Bible, Richard Blum, 4rd edition, Wiley, 2021.

RB3: Your Unix - The Ultimate Guide, Sumitabha Das, 4th Edition, Tata McGraw-Hill, 2008.

RB4: Linux Programming Bible, John Goerzen, 8th Edition, IDG Books, 2001.

RB5: A Practical Guide to Linux, Mark G. Sobell, 3rd Edition by Pearson Education, 2013.

RB6: Unix Shell programming, Yashwant Kanetkar, 1st Edition, BPB Publications, 20034.

4. Other readings and relevant websites:

S. No.	Link of Journals, Magazines, websites and Research Papers
1.	https://www.techtarget.com/searchdatacenter/definition/Linux-operating-system
2.	https://www.geeksforgeeks.org/introduction-to-linux-operating-system/
3.	https://resources.infosecinstitute.com/topic/installing-configuring-centos-7-virtualbox/
4.	https://ubuntu.com/tutorials/install-ubuntu-server#1-overview
5.	https://techlog360.com/basic-ubuntu-commands-terminal-shortcuts-linux-beginner/
6.	https://www.redhat.com/sysadmin/vim-commands
7.	https://learning.edx.org/course/course-v1:LinuxFoundationX+LFS101x+1T2017/home
8.	https://onlinecourses.swayam2.ac.in/aic20_sp24/course
9.	https://www.redhat.com/sysadmin/linux-command-basics-7-commands-process-management
10.	https://www.tutorialspoint.com/unix/unix-file-system.htm

5. Recommended Tools and Platforms:

- RedHat Enterprise Linux 8
- Ubuntu 6.1
- VM VirtualBox 7.0

6. Course Plan

Lecture Number	Topics	Recommended Book / Other reading material
1-3	**Introduction:** History, Linux Foundation, Linux requirements, Linux Components, Distributions, Features.	RB1 RB2
4-6	Linux architecture, Kernel, Difference between Windows and Linux. Configuration & customizations of Linux, Linux structure, and Installation.	RB1 RB2
7-12	**Installation:** Different ways to install Linux, Linux installation (CentOS7 - Recommended), CentOS vs. CentOS stream, Take a snapshot of VM.	RB1 RB3
13-18	**Boot Process:** The boot process, Partitioning, dual boot, Virtual memory and swap space disk partition (df, fdisk), Adding swap space.	RB2 RB3
19-21	**File System:** File system structure, Navigation commands (cd, ls and pwd) Absolute and relative Paths, Creating files and directories (touch, cp, mkdir)	RB2, RB3
22-24	**Working with Files & Directories:** Linux file types, find, locate, Changing Password, cp, rm, mv, mkdir, rmdir)	RB1 RB3
25-27	**File Display Commands:** cat, less, more, head, tail) redirection, Files and directory permissions (chmod), File ownership commands (chown, chgrp)	RB1 RB4
28-30	**Editors:** Linux file editor (vi), Difference between vi and vim editors, nano,pico and other linuxeditors,"sed" command.	RB4 RB5
31-33	**Filters / Text Processing Commands:** cut, awk, grep/egrep, sort/uniq, wc, compare files (diff and cmp), Compress and uncompress (tar, gzip, gunzip).	RB5 RB6
34-36	**User Account Management:** useradd, groupadd, usermod, userdel, groupdel, Switch users and sudo access (su, sudo), Monitor users (who, last, w, id). **System Utility Commands:** date, uptime, hostname, uname, which, cal, bc.	RB4 RB5
37-39	**Process Management & System Monitoring:** ps, bg, fg, nice commands. **Troubleshooting:** ifconfig, ping, traceroute, DNS troubleshooting tools etc.	RB2, RB6

40-42	**Shell Scripting:** Shell scripting basics, Types of shells, starting a shell, Create your first script - Hello world, Conditions/If else statements Scripts, Case statements script, Conditions/If else statements, Scripts, Case statements script, for loop script, do-while scripts, Exit status, Script, For loop script, do-while scripts, Exit status	RB4 RB5
43-45	**Introduction to GCC compiler:** Basics of GCC, Compilation of program, Execution of program, Time stamping.	RB3 RB4

7. Lab Plan

Lecture Number	Experiments
1-2	**Installation:** Configuration & customizations of Linux.
3-4	Implement the basic and user status commands like: su, sudo, man, help, history, who, whoami, id, uname, uptime, free, tty, cal, date, hostname, reboot, clear, bc.
5-6	**File system:** Introduction to file system, File system architecture and file types.
7-8	Implement the commands that is used for creating and manipulating files: cat, cp, mv, rm, ls and its options, touch and their options, which is, where is, what is.
9-10	Implement directory-oriented commands: cd, pwd, mkdir, rmdir
11-12	Implement file system commands: Comparing files using diff, cmp, comm
13-14	Implementation of compressing files: tar, gzip
15-16	Usage of these commands along with its working: bzip2, compress, uncompress files.
17-18	**Text editors:** gedit, vi, vim editor (Insert Text, delete text, navigation, copy-paste, cut-paste, search operation)
19-20	Apply different searching commands: Search file or directory in directory structure using find and locate command with various options, wildcards *, ?, [], !
21-22	Implementation of managing user commands: Types: super, owner, group, others, adding user
23-24	Implement commands for removing user, working with passwords, expiry dates using usermod.
25-26	Implement process-oriented commands: ps, pstree, kill, killall (with all their options)
27-28	**Implement shell scripting programs:** using if-else, conditional statements
29-30	**Implement shell scripting programs:** using loops (for, while, do-while), exit status statements

8. Delivery/Instructional Resources

Lecture Number	Topics	Web References	Audio-Video
1-3	Introduction: History, Linux Foundation, Linux requirements, Linux Components, Distributions, Features.	https://www.redhat.com/en/topics/linux/what-is-linux	https://www.techtarget.com/searchdatacenter/definition/Linux-operating-system
4-6	Linux architecture, Kernel, Difference between Windows and Linux. Configuration & customizations of Linux, Linux structure, and Installation.	https://www.geeksforgeeks.org/introduction-to-linux-operating-system/	https://www.geeksforgeeks.org/introduction-to-linux-operating-system/
7-12	Installation: Different ways to install Linux, Linux installation (CentOS7 - Recommended), CentOS vs. CentOS stream, Take a snapshot of VM.	https://resources.infosecinstitute.com/topic/installing-configuring-centos-7-virtualbox/	https://www.youtube.com/watch?v=wSVA-VOwKgE

13-18	Boot Process: The boot process, Partitioning, dual boot, Virtual memory and swap space disk partition (df, fdisk), Adding swap space.	https://learning.edx.org/course/course-v1:LinuxFoundationX+LFS101x+1T2017/home	https://onlinecourses.swayam2.ac.in/aic20_sp24/course
19-21	File System: File system structure, Navigation commands (cd, ls and pwd), Absolute and relative Paths, Creating files and directories (touch, cp, mkdir)	https://www.tutorialspoint.com/unix/unix-file-system.htm	https://www.geeksforgeeks.org/linux-file-hierarchy-structure/
22-24	Working with Files & Directories: Linux file types, find, locate, Changing Password, cp, rm, mv, mkdir, rmdir)	https://www.edureka.co/blog/linux-commands/	https://www.youtube.com/watch?v=snoVPKX1I4g
25-27	File Display Commands: cat, less, more, head, tail) redirection, Files and directory permissions (chmod), File ownership commands (chown, chgrp)	https://learning.edx.org/course/course-v1:LinuxFoundationX+LFS101x+1T2017/home	https://onlinecourses.swayam2.ac.in/aic20_sp24/course
28-30	Editors: Linux file editor (vi), Difference between vi and vim editors, nano,pico and other linuxeditors,"sed" command.	https://www.tutorialspoint.com/top-5-best-linux-text-editors	https://ru.coursera.org/lecture/linux-fundamentals/editing-text-files-xkv0S
31-33	Filters / Text Processing Commands: cut, awk, grep/egrep, sort/uniq, wc, compare files (diff and cmp), Compress and uncompress (tar, gzip, gunzip).	https://learning.edx.org/course/course-v1:LinuxFoundationX+LFS101x+1T2017/home	https://onlinecourses.swayam2.ac.in/aic20_sp24/course
34-36	User Account Management: useradd, groupadd, usermod, userdel, groupdel, Switch users and sudo access (su, sudo), Monitor users (who, last, w, id), System Utility Commands: date, uptime, hostname, uname, which, cal, bc.	https://docs.fedoraproject.org/en-US/fedora/latest/system-administrators-guide/basic-system-configuration/Managing_Users_and_Groups/	https://www.youtube.com/watch?v=FtwRe8w2kWI
37-39	Process Management & System Monitoring: ps, bg, fg, nice commands. Troubleshooting: ifconfig, ping, traceroute, DNS troubleshooting tools etc.	https://learning.edx.org/course/course-v1:LinuxFoundationX+LFS101x+1T2017/home	https://onlinecourses.swayam2.ac.in/aic20_sp24/course
40-42	Shell Scripting: Shell scripting basics, Types of shells, starting a shell, Create your first script - Hello world, Conditions/If else statements Scripts, Case statements script, Conditions/If else statements, Scripts, Case statements script, for loop script, do-while scripts, exit status, Script, For loop script, do-while scripts, Exit status	https://linuxhint.com/30_bash_script_examples/	https://linuxhint.com/30_bash_script_examples/
43-45	Introduction to GCC compiler: Basics of GCC, Compilation of program, Execution of program, Time stamping.	https://learning.edx.org/course/course-v1:LinuxFoundationX+LFS101x+1T2017/home	https://onlinecourses.swayam2.ac.in/aic20_sp24/course

9. Action plan for different types of learners

Slow Learners	Average Learners	Fast Learners
Remedial Classes	Doubt-sessions	Advance Practical assignments

10. Evaluation Scheme & Components

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment
Component 1	Subjective Test/Sessional Tests (STs)	02*	40%	Offline
Component 2	End Term Examinations	01	60%	Offline
Total		100%		

* Out of 02 STs, the ERP system automatically picks the average of best 01 ST marks for evaluation of the STs as final marks.

11. Details of Evaluation Components

Evaluation Component	Description	Syllabus Covered (%)	Timeline of Examination	Weightage (%)
Component 01	ST 01	Upto 50%	Week 7	40%
	ST 02	51% - 100%	Week 15	
Component 02	End Term Examination*	100%	To be notified by Dean Examination	60%
Total				100%

* A minimum 90% attendance is required to become eligible for appearing in the End Semester Examination.

12. Syllabus of the Course

S. No.	Topic	No. of Lectures	Weightage %
1	Introduction: History, Linux Foundation, Linux requirements, Linux Components, Distributions, Features. Linux architecture, Kernel, Difference between Windows and Linux. Configuration & customizations of Linux, Linux structure, and Installation. Installation: Different ways to install Linux, Linux installation (CentOS7 - Recommended), CentOS vs. CentOS stream, Take a snapshot of VM.	12	16%
2	Boot Process: The boot process, Partitioning, dual boot, Virtual memory and swap space disk partition (df, fdisk), Adding swap space. File System: File system structure, Navigation commands (cd, ls and pwd), Absolute and relative Paths, Creating files and directories (touch, cp, mkdir)	09	12%
3	Working with Files & Directories: Linux file types, find, locate, Changing Password, cp, rm, mv, mkdir, rmdir) File Display Commands: cat, less, more, head, tail) redirection, Files and	06	8%

	directory permissions (chmod), File ownership commands (chown, chgrp)		
4	Editors: Linux file editor (vi), Difference between vi and vim editors, nano,pico and other linuxeditors,"sed" command. Filters / Text Processing Commands: cut, awk, grep/egrep, sort/uniq, wc, compare files (diff and cmp), Compress and uncompress (tar, gzip, gunzip).	06	8%
5	User Account Management: useradd, groupadd, usermod, userdel, groupdel, Switch users and sudo access (su, sudo), Monitor users (who, last, w, id). System Utility Commands: date, uptime, hostname, uname, which, cal, bc.	03	4%
6	Process Management & System Monitoring: ps, bg, fg, nice commands. Troubleshooting: ifconfig, ping, traceroute, DNS troubleshooting tools etc.	03	4%
7	Shell Scripting: Shell scripting basics, Types of shells, starting a shell, create your first script - Hello world, Conditions/If else statements Scripts, Case statements script, Conditions/If else statements, Scripts, Case statements script, for loop script, do-while scripts, exit status, Script, for loop script, do-while scripts, Exit status.	03	4%
8	Introduction to GCC compiler: Basics of GCC, Compilation of program, Execution of program, Time stamping.	03	4%
9	Laboratory Experiments	30	40%

This Document is designed and approved by:

Designation	**Name**	**Signature**
Course Coordinator	Dr. Vikas Lamba	
Head Academic Delivery	Dr Vikas Khullar	
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Date	**02-01-2023**	