**Unix/Linux**

**Objectives**

Understand the Linux operating system including the features below that will be included more in a description of the course such as

1. Basic Command Line Interface (CLI) and commands, All work will be from the command line.
2. Structure and architecture of general Unix systems
3. Redirection
4. File input/output
5. Searching and sorting
6. Basic administration commands and use
7. Shell scripting including awk.

**Outcomes**

Learners will understand how to work in a Linux/Unix environment and develop skills in problem solving using this operating system. They will gain confidence in working with software packages and programming languages with Unix as the underlying operating system.

**Course Structure**

**Module 1**

1. Background of Unix and Linux – history, rationale, developers of the system
2. Unix system architecture – hardware, kernel, shell, applications
3. How to install, use, acquire Unix/Linux, virtual machines
4. Basics of logging in and out
5. Unix file system
6. blocks such as boot, super, inode, data
7. hierarchical file structure and important directories in the system
8. relative and absolute paths
9. Significance of files such as .bashrc and .profile files, some other files
10. Basic commands and options including – ls, cd, pwd, mkdir, rm, mv, cp, which, whereis, alias, more, less, echo, cat, whoami, touch, export, other commands
11. How to get built in help on features, commands, including man pages.
12. Piping and redirection, file descriptors, here documents
13. Standard input, output, error
14. Basic treatment of admin commands such as chown, chgrp and what this means
15. Basics of umask command
16. Use and importance of quotes – single, double, back quotes
17. File permissions and analysis of long file listing ls -al

**Module 2**

1. vi/vim editor editing and more features
2. More advanced commands – grep/egrep, sed, find
3. Basic sorting including options
4. Compression utilities like tar, gzip, gunzip, unzip, tar
5. File pattern matching
6. Custom printing and flags with printf
7. More filtering commands – head, tail, cut, tr
8. Links
9. Special variables in Linux beginning with **$** - emphasis on **$?**
10. Fundamentals of processes and jobs – ps, jobs, fg, bg, killing a job, traps
11. Special variables for processes - $$, $!
12. Shell types and shell patterns

**Module 3**

1. Shell scripts
2. Structure of a script
3. Executable file permissions and running scripts, chmod command
4. Simple debugging of shell scripts
5. Variables and arrays
6. read command
7. if blocks
8. Evaluating expressions with [] and [[ ]] and test
9. Special variables for shell scripting besides $? such as $0, $1, $2, …, $#, $\*, $@
10. Numeric and string comparisons
11. for loops, while loops
12. expr command for computations and string manipulation, double parentheses (( ))for computations
13. case blocks
14. bc utility
15. functions in scripting
16. awk programming including commands in shell scripts
17. Running awk with command line and in files
18. awk patterns including regular expressions
19. awk built-in variables and blocks
20. for and while loops in awk
21. printing and calculations with awk
22. Basic administration
23. SSH and some remote commands
24. crontab and cron files
25. Unix services and systemctl
26. Some other administrative commands and features as needed