# LINUX PROGRAMMING

**VI Semester: CSE**

| Course Code | Category | Hours / Week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | C | CIA | SEE | Total |
| ACS010 | Core | 3 | 1 | - | 4 | 30 | 70 | 100 |
| Contact Classes: 45 | Tutorial Classes: 15 | Practical Classes: Nil | | | | Total Classes: 60 | | |

## I. COURSE OVERVIEW:

This course provides a deep understanding of the operating system architecture and low-level interfaces (principally, system calls and library functions) that are required to build system-level, multithreaded, and network applications on Linux and UNIX systems. The course consists of a mixture of detailed presentations coupled with a large number of carefully designed practical exercises that allow partici- pants to apply the knowledge learned in the presentations. By the completion of the course, participants will have the mastery needed to write complex system, network, and multithreaded applications on a Linux or UNIX system.

## II. OBJECTIVES:

**The course should enable the students to:**

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| I | Interpret the Linux utilities to control the resources |
| II | Learn basic concepts of shell scripts and file structures. |
| III | Understand the concepts of process creation and interruption for multitaskingapplications. |
| IV | Explore memory allocation and inter process communication methods. |
| V | Provide support for distributed and network applications in Linux environment. |

## III. COURSE OUTCOMES:

**After successful completion of the course, students should be able to:**

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| CO 1 | **Demonstrate** operations using file handling, text processing and linuxutilities. | Understand |
| CO 2 | **Outline** the different shell scripts to execute systems programs and application programs. | Remember |
| CO 3 | **Make use of** different system calls for file I/O operations and managing the file systems. | Apply |
| CO 4 | **Demonstrate** the concepts of process and signal system calls forprocess creation, scheduling, controlling and termination. | Understand |
| CO 5 | **Outline** IPC mechanisms such as pipes, shared memory, message queues, semaphores for performing inter process communication | Remember |
| CO 6 | **Utilize** socket concepts for connection-oriented and connectionless communication between client and server systems. | Apply |

## IV. SYLLABUS:

| UNIT-I | INTRODUCTION TO LINUX UTILITIES | Classes: 08 |
|---|---|---|

Linux utilities: A brief history of UNIX, architecture and features of UNIX, introduction to vi editor. General purpose utilities, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands; Text processing and backup utilities: Text processing utilities and backup utilities; SED: Scripts, operation, addresses, commands; AWK: Execution, fields and records, scripts, operation, patterns, actions, associative arrays, string and mathematical functions, system commands in awk, applications.

| UNIT-II | WORKING WITH THE BOURNE AGAIN SHELL (BASH) | Classes: 10 |
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Shell: Shell responsibilities, types of shell, pipes and i/o redirection, shell as a programming language, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution,

shell variables, command substitution, shell commands, quoting, test command, control structures, arithmetic in shell, interrupt processing, functions, and debugging scripts; File structure and directories: Introduction to file system, file descriptors, file types, file system structure; File metadata: Inodes; System calls for file I/O operations: open, create, read, write, close, lseek, dup2, file status information-stat family; File and record locking: fcntl function, file permissions, file ownership, links; Directories: Creating, removing and changing directories, obtaining current working directory, directory contents, scanning directories.

| UNIT-III | PROCESS AND SIGNALS | Classes: 09 |
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Process: Process identifiers, process structure: process table, viewing processes, system processes, process scheduling; Starting new processes: Waiting for a process, process termination, zombie processes, orphan process, system call interface for process management, fork, vfork, exit, wait, waitpid, exec.

Signals: Signal functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets.

| UNIT-IV | DATA MANAGEMENT AND INTER PROCESS COMMUNICATION | Classes: 10 |
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Data Management: Managing memory: malloc, free, realloc, calloc; File locking: Creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks; Inter process communication: Pipe, process pipes, the pipe call, parent and child processes, named pipes, semaphores, shared memory, message queues; Shared memory: Kernel support for shared memory, APIs for shared memory, shared memory example; Semaphores: Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

| UNIT-V | SOCKETS | Classes: 08 |
|---|---|---|

Introduction to sockets: Socket, socket connections, socket attributes, socket addresses, socket system calls for connection oriented protocol and connectionless protocol, socket communications, comparison of IPC mechanisms.

**Text Books:**


1. W. Richard, Stevens, "Advanced Programming in the UNIX Environment", Pearson Education, 1st Edition, 2005.
2. Sumitabha Das, "Unix Concepts and Applications", Tata McGraw-Hill, 4th Edition, 2006.
3. Neil Mathew, Richard Stones, "Beginning Linux Programming", Wrox, Wiley India, 4th Edition, 2011.


**Reference Books:**


1. Sumitabha Das, "Your Unix the Ultimate Guide", Tata McGraw-Hill, 4th Edition, 2007.
2. W. R. Stevens, S. A. Rago, "Advanced Programming in the Unix Environment Pearson Education, 2nd Edition, 2009.
3. B. A. Forouzan, R. F. Gilberg, "Unix and Shell Programming", Cengage Learning, 3rd Edition, 2005.


**Web References:**

1. http://www.linux-tutorial.info/
2. http://www.ee.surrey.ac.uk/Teaching/Unix/
3. http://www.tutorialspoint.com/listtutorials/linux/1
4. http://linuxcommand.org/learning_the_shell.php

**E-Text Books:**

1. http://vic.gedris.org/Manual-ShellIntro/1.2/ShellIntro.pdf
2. http://www.freeos.com/guides/lsst/

**Course Home Page:**