Semester III
Minor - III
DATA STRUCTURES and OPERATING SYSTEMS
Course Code: UCS231T

Course Outline

Unit I

Stacks: Stacks terminology, Representation of Stacks in Memory, Operation on Stacks, Polish Notations, Translation of infix to postfix & prefix expression, Infix to Postfix Conversion, Evaluation of Postfix Expression, Recursion, Problems on Recursion, Quick Sort and Tower of Hanoi Problem.

Queue: Representation of Queues in Memory, Circular Queue. Dequeue and Priority Queue, Operations of above Structure using Array and Linked Representation.

Unit II

Linked List: Linked List, Representation of Single, Double, Header, Circular Single and Double Linked list, All possible operations on Single and Double Linked List using Dynamic representation, Polynomial Representation and its Manipulation.

Unit III

Sorting and Searching: Selection Sort, Insertion Sort, Merge Sort, Efficiency of Sorting Methods, Big-O Notations. Hash Tables, Hashing Technique, Collision Resolution Technique.

Trees: Basic Terminologies, Representation of Binary Trees in Memory, Traversing of Binary tree, Binary Search Tree, Operation on Binary Search Tree, Heap Tree, Operation on Heap Tree, Heap Sort Method.

Graphs: Basic Terminologies, Definition and Representation of Graphs in Memory: Linked List and Matrix Representation. Traversing graphs: BFS, DFS Method.

Unit IV

Structure of Operating System, Operating System functions, Characteristics of Modern OS. Process Management: Process states, Creation,

Termination, Operations on Process, Concurrent processes, Process Threads, Multithreading, Micro Kernels.

CPU Scheduling: Schedulers, Scheduling Methodology, CPU Scheduling Algorithms: FCFS, SJF, RR, Priority Scheduling.

Unit V

Performance Comparison: Deterministic Modeling, Queuing analysis, Simulators. Deadlock and Starvation: Resource Allocation Graph, Conditions for Dead Lock, Dead Lock Prevention, Dead Lock Detection, Recovery from Deadlock.

Memory Management: Logical Vs. Physical Address Space, Swapping, Memory Management Requirement, Dynamic Loading and Dynamic Linking, Memory Allocation Method: Single Partition allocation, Multiple Partitions, Compaction, paging, segmentation, segmentation with paging, protection.

Unit VI

I/O Management: I/O hardware, I/O Buffering, Disk I/O, Raid, Disk Cache.

File Management: File Management system, File Accessing Methods, File Directories, File Allocation Methods, File Space Management, Disk Space Management, Record blocking.

Protection Mechanisms: Cryptography, Digital Signature, User Authentication.

SEMESTER IV
(COMPUTER SCIENCE Minor)
(BSc Physics with Computer Science as Minor/ BSc Electronics with Computer Science as Minor/ BSc Mathematics with Computer Science as Minor)

(To be implemented from Academic Session 2024-25, presented for approval in BoS dated 27.03.2024)

JAVA PROGRAMMING and LINUX OPERATING SYSTEM
Course Code: UCS241T

Aim of the Course

This course imparts the basics of core Java programming concepts and an introduction to Linux Operating System, various commands used to interact with it.

Learning Objectives	Course Learning Outcomes
Students will try to learn:	After successful completion of the course student will be able to:
To know the basic concepts of Java programming like variables, data types, operators, class, and object.	Learn the basic concepts of Java programming like variables, data types, operators, class, and object.
To get familiar with arrays, strings, inheritance, interface, packages and applets.	Understand and Implementation of arrays, strings, inheritance, interface, packages and applets.
To grasp and implement AWT and GUI components in Java.	Understand and implement AWT and GUI components in Java.
To understand components of Linux Operating Systems, anatomy, shell, and basic Linux commands.	Understand components of Linux Operating Systems, anatomy, shell, and basic Linux commands.
To get acquainted with concepts associated backup and recovery mechanisms, and system administration.	Know concepts associated backup and recovery mechanisms, and system administration.
To have knowledge of the techniques for disk management, communication utilities, and Linux GUIs.	Get acquainted with the techniques for disk management, communication utilities, and Linux GUIs.

Course Outline

Unit I

    Introduction to Java: History of Java, features of Java, getting started with Java. **Java programs:** Introduction of Application & Applets. **Variables:** naming, initialization, rules. Data types, Operators, Decision and Looping constructs, **Creating a class & subclass:** Declaring a class, Naming a class, Rules to assign Class & Subclass, Creating a new object, **Methods:** Invoke a method, passing arguments to a method, calling method. **Access Specifiers & Modifiers:** Public, Private, Protected, Static & Final. **Overloading:** Method overloading, Constructor overloading.

Unit II

    Inheritance: Single & multiple inheritances. **Interfaces:** Defining interfaces, extending interfaces, implementing interfaces.

    Packages: Java API packages, creating packages, accessing packages, adding a class to packages, import a package. **Applets:** Introduction and Application, how applets and application are different, creating an applet. Applet life cycle, designing a web page, creating an executable applet, running the applet, applet tags, passing a parameter to applet, HTML tag, Converting applet to application. **Exceptions & Errors:** Introduction, types of error, exception, syntax of exception, handling techniques, exception for Debugging.

Unit III

    Event: Event driven programming, handling an (AWT) events. **Graphics class:** Introduction, the Graphics classes, drawing & filling of lines, rectangle, circle & ellipse, arcs, polygons, text & fonts, creating a font class, font objects, text, coloring object. **AWT Applications:** Creating a GUI using AWT toolkit, using component class, frames. **Components & Control:** Textfield, Textarea class, label, button, choice, list, checkbox, class, and combo. **Menus:** Creating a popup menus. **Layouts:** Using Window Listener interface, Different types of Layout, Layout manager. **Swing:** What is Swing? Difference between AWT and Swing, Swing Layouts, Managers, Containers, and Components – JFrame, JButton, JLabel, JText, JTextArea, JCheckBox And JRadioButton, JList, JComboBox, JMenu.

Unit IV

Introduction to Open-Source: Open Source, Need and Principles of OSS, Open-Source Standards, Free Software vs. Open-Source Software, Public Domain. **History:** BSD, The Free Software Foundation and the GNU Project. **Open-Source Operating Systems:** GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies.

Logging In and Logging Out, Anatomy of Linux OS, Directory Structure, /usr Directory, **File Types:** User data files, System data files, Executable files. Naming files and directories, Spawning Processes. **Shell:** Creating User Account, Shell Program, bash shell, Changing shell prompt.

Unit V

Commands: Basic Syntax for a command, Exploring the Home Directory, ls, mkdir, rmdir, stat, cat, rm, mv, cp. **Editor:** Vi editor. **Hooking up Hardware Devices:** Formatting a Floppy Disk, Gathering important system information.

Backing Up and restoring the File System: Simple Backup, gzip, gunzip, tar. **Printing files:** Print Spool directory, Sending files to Printer. **Sharing Files with other Users:** Maintaining User Accounts, Changing Password, Creating Group Accounts, Granting Access to files, Changing File Ownership, Protecting Files, Making a File Read-Only.

Unit VI

Working with Processes: Types of processes, ps Command, Creating process, killing process, free command and top utility.

Managing Disk Space: df, du commands, Creating Additional Free Disk Space, Locating Unused Files, Setting System Clock. **Communication Utilities:** who, who am i, finger, mesg, write, wall, talk, Creating a message of the day.