**Java Programming**

**Course Overview**

The **Java Programming** course is a comprehensive introduction to one of the most widely used, platform-independent, and object-oriented programming languages in the world — **Java**. Java is the backbone of enterprise applications, Android development, server-side technologies, and more. This course is ideal for beginners as well as programmers who wish to understand Java from a software development perspective. It covers Java's syntax, OOP principles, data structures, GUI programming, and introductory concepts for web and mobile app development.

**Course Objectives**

By the end of this course, learners will be able to:

* Understand Java's structure, syntax, and development environment.
* Apply core object-oriented principles using Java.
* Write clean, modular, and reusable code using classes and interfaces.
* Handle files, exceptions, and dynamic memory with advanced Java features.
* Implement real-world applications using Java Collections and GUI frameworks.
* Prepare for Android development, Spring framework, or Java-based back-end systems.
* Build and deploy Java applications using standard tools like Eclipse/IntelliJ and command-line compilers.

**Syllabus Breakdown**

**Module 1: Introduction to Java**

* History and features of Java
* JVM, JDK, JRE – roles and differences
* Setting up the environment (Eclipse/IntelliJ/VS Code)
* Writing, compiling, and running Java programs
* Java program structure
* Data types, variables, operators

**Module 2: Control Statements and Arrays**

* Conditional statements: if-else, switch
* Loops: for, while, do-while
* Nested loops and control flow (break, continue)
* Arrays: single and multi-dimensional
* Command-line arguments

**Module 3: Object-Oriented Programming in Java**

* Classes and Objects
* Constructors (default, parameterized, copy)
* Method overloading
* this and static keywords
* Access specifiers
* Garbage collection and finalize()

**Module 4: Inheritance and Polymorphism**

* Inheritance: single, multilevel, hierarchical
* super and final keywords
* Method overriding
* Runtime polymorphism and dynamic method dispatch
* Abstract classes and interfaces

**Module 5: Exception Handling and File I/O**

* Types of exceptions
* try, catch, finally, throw, throws
* Custom exceptions
* File handling: FileReader, FileWriter, BufferedReader
* Reading/writing files with Scanner and PrintWriter

**Module 6: Java Collections Framework**

* Collection interfaces: List, Set, Map
* ArrayList, LinkedList, HashSet, TreeSet, HashMap
* Iterators and for-each loop
* Sorting and searching with Collections class

**Module 7: GUI Programming (Swing or JavaFX)**

* Introduction to Java GUI
* Creating windows, frames, and event-driven interfaces
* Basic components: labels, buttons, text fields
* Layout managers
* Handling events: ActionListener, MouseListener
* Creating a small desktop application

**Module 8: Introduction to Advanced Java Concepts**

* Multithreading: creating threads, thread lifecycle
* Synchronization and inter-thread communication
* Networking basics (sockets, client-server model)
* JDBC (Java Database Connectivity) – connecting Java with MySQL
* Overview of Java packages and modular development

**Module 9: Capstone Projects**

* Project 1: Student Report Card Generator
* Project 2: Personal Expense Tracker (GUI)
* Project 3: Address Book Application using Collections
* Optional: Mini Web Project (Servlets & JSP basics)

**Career Opportunities**

Java remains one of the most in-demand programming languages globally. Mastery of Java opens up diverse roles and industries. Possible career paths include:

* **Java Developer / Software Engineer**
* **Android App Developer**
* **Back-End Developer (Java Spring, Hibernate)**
* **Full Stack Developer**
* **Automation Tester (Java + Selenium)**
* **API Developer using Java EE / Spring Boot**
* **Big Data Engineer (Hadoop with Java base)**

Java skills are highly sought after in **enterprise software**, **mobile apps**, **financial systems**, and **cloud-based solutions**. It is a primary language for companies like Oracle, IBM, Infosys, TCS, Accenture, and many startups.