Object Oriented Programming with Java

Nature of the course: Theory + Practical

Credits: 3
Lecture Hours: 48

Semester: II

Course Objectives

The main objective of this course is to provide students both theoretical and practical knowledge of object-oriented programming using Java programming language.

Course Description

This course covers different concepts of object-oriented programming with Java including fundamental concepts, different programming structures, classes and objects, inheritance, interface, package, exception handling, generic programming, modules and some essential Java classes.

Course Details

Unit 1: Introduction **4 LHs**

Java Introduction; Short History of Java; Java Buzzwords; Java Virtual Machine (JVM); Java Runtime Environment (JRE); Bytecode; Object Oriented Programming and its Principles; Writing Simple Java Programs; Compiling and Running Java Programs using Command Line and IDE; Using Command Line Arguments; Using Scanner for Reading Input and System.out.print() for Writing Output

Unit 2: Fundamental Programming Structures **12 LHs**

Writing Comments; Primitive Data Types; Variables and Constants; Type Conversion and Casting; Operators (Arithmetic, Bitwise, Logical, Assignment, and Conditional); Precedence and Associativity of Operators; Control Statements (if, switch, for, while, do-while, for-each, nested statements, break, continue, and return); Working with Big Numbers; Arrays (One Dimensional and Multidimensional)

Unit 3: Classes and Objects **10 LHs**

Object Oriented Principles; Defining Classes; Adding Variables and Methods; Creating Objects and Accessing Class Members; Method Parameters and Return Types; Constructors; static Fields and Methods; Method Overloading; this Keyword; Access Control; Nested and Inner Classes; Recursive Methods; Garbage Collection; Creating and Using Packages

Unit 4: Inheritance and Interface **7 LHs**

Inheritance Basics; Defining Subclasses; Using super and final Keywords; Abstract Class; The Object Class; Dynamic Method Dispatch; Declaring, Extending, and Implementing Interfaces

Unit 5: Exception Handling **4 LHs**

Exception Handling Fundamentals; Exception Types; Uncaught Exceptions; Using try, catch, throw, throws, and finally; Java's Built-in Exceptions; Creating Your Own Exception

Unit 6: Generics and Modules **4 LHs**

Importance of Generic Programming; Defining Generic Classes and Methods; Bounds for Type Variables; Generic Code and Virtual Machine; Restrictions and Limitations; Inheritance Rule; Wildcard; Reflection and Generics; Modules

Unit 7: Essential Java Classes **7 LHs**

String, StringBuffer, and StringBuilder Classes; Primitive Type Wrappers; Math Class; I/O Classes and Interfaces; File I/O

Laboratory Works:

Students should write Java programs to implement all the concepts studied in each unit of the course.

Text Books:

1. Core Java Volume I – Fundamentals, Eleventh Edition, Cay S. Horstmann, Pearson Education, 2019.
2. Java: The Complete Reference, Twelfth Edition, Herbert Schildt, McGraw Hill, 2022.

Reference Books:

1. Effective Java, Third Edition, Joshua Bloch, Pearson Education, 2018.
2. Learning Java – An Introduction to Real World Programming with Java, Marc Loy, Patrick Niemeyer, and Daniel Leuck, O'Reilly, 2020.