

## Java 9-11 and OO Development

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### Course Summary

#### Description

Java and OO Development provides a comprehensive introduction to Java. It is suitable for programmers with good working programming experience (no Java experience needed). In addition to covering basic Java programming, the course provides a solid understanding of the core OO and Java concepts and practices needed to create well-designed Java programs. This includes creating well-designed Java classes, encapsulation, composition, and inheritance/interfaces.

#### Objective

Upon completion of this course, Students will:

- Understand Java's importance, uses, strengths and weaknesses
- Understand the release cycle and Long Term Support (LTS) releases
- Understand Java language basics
- Write, compile, and run Java programs
- Use the Java shell (Java 9) for interactive programming
- Understand the Object Model and Object Oriented Programming
- Understand and use classes, inheritance, polymorphism
- Create well designed classes and use them in your Java programs
- Use composition and delegation to create objects from other objects
- Understand & use packages to organize code
- Understand and use Java 9 modules
- Understand interfaces, their importance, and their uses
- Use interfaces to implement abstraction
- Learn good Java coding style
- Create a well-structured Java program.
- Compile and execute programs with the JDK development tools and with an Integrated Development Environment (IDE) of your choice
- Use the core Java libraries (java.lang, java.util)
- Understand & use exceptions for error handling
- Understand the basics of using JDBC and JPA, and use them to access databases from Java
- Use the Java Collections Framework including new API introduced in Java 9-11
- Use other new features such as type inference
- Be aware of, and use the new features of Java 8, as well as important advanced features of earlier Java versions
- Understand and use basic I/O streams (Optional)

#### Topics

- A First Look
- Java Basics
- Class and Object Basics
- More on Classes and Objects
- Flow of Control
- Strings, Arrays, and Dates/Times
- Packages and Modules
- Composition and Inheritance
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- Interfaces
- Exceptions
- Java Collections and Generics
- Database Access with JDBC and JPA
- Additional Java Features
- I/O Streams (Optional)

#### Duration

Five Days

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### Course Outline

- I. **A First Look**
  - A. A Simple Java Class
  - B. Java's "Hello World" Program
  - C. The Java Shell (REPL)
    - LABS:
      - Hello World: A Simple Application
- II. **Java Basics**
  - A. Language and Platform Features
  - B. The Java Release Cycle
  - C. Program Life Cycle
  - D. The Java SE Development Kit (JDK)
    - LABS:
      - Working with the Development Environment
- III. **Class and Object Basics**
  - A. The Object Model and Object-Oriented Programming
  - B. Classes, References, and Instantiation
  - C. Adding Data to a Class Definition
  - D. Adding Methods (Behavior)
    - LABS:
      - Exploring Types and Object Instances
      - Writing and Using a Class Definition with Fields and Methods
- IV. **More on Classes and Objects**
  - A. Accessing data, the "this" variable
  - B. Encapsulation and Access Control, public and private Access
  - C. Constructors and Initialization
  - D. static Members of a Class
  - E. Type Inference (Java 10+)
  - F. Scopes, Blocks, References to Objects
  - G. Type-safe Enums
    - LABS:
      - Encapsulation / Access Protection
      - Writing and Using Constructors
      - (Optional) Static Members
      - Using enums
- V. **Flow of Control**
  - Using the Debugger
  - A. Branching: if, if-else, switch
  - B. Iteration: while, do-while, for, break, continue
    - LABS:
      - Flow of Control / Data Validation
- VI. **Strings, Arrays, and Dates/Times**
  - A. String, StringBuffer, StringBuilder
  - B. Arrays, Primitive Arrays, Arrays of Reference Types
  - C. varargs
  - D. LocalDate/LocalTime (Java 8+)
    - LABS:
      - Using Strings and Arrays
- VII. **Packages and Modules**
  - A. Package Overview - Using Packages to Organize Code
  - B. import statements
  - C. Creating Packages, package Statement, Required Directory Structure
  - D. Java 9 Module Overview
  - E. Defining Modules, Requires, and Exports
  - F. Module Path and Classpath - Differences and Coexistence
    - LABS:
      - Using Packages and Modules
- VIII. **Composition and Inheritance**
  - A. Using Composition to Deal With Complexity
  - B. Composition/HAS-A, Delegation
  - C. Using Inheritance and Polymorphism to share commonality
  - D. IS-A, extends, Inheriting Features, Overriding Methods, Using Polymorphism
  - E. Class Object
  - F. Abstract Classes
    - LABS:
      - (Optional) Working with Composition

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### Course Outline(cont.)

- Using Inheritance to Specialize Classes
- IX. **Interfaces**
  - A. Using Interfaces to Define Types
  - B. Interfaces and Abstract Classes
  - C. Default Methods and static Methods (Java 8)
  - LABS:
    - Using Interfaces to Remove Implementation Dependencies
- X. **Exceptions**
  - A. Exceptions and the Exception Hierarchy
  - B. try and catch
  - C. Handling Exceptions
  - D. Program Flow with Exceptions
  - E. finally
  - LABS:
    - Throwing and Handling Exceptions
- XI. **Java Collections and Generics**
  - A. The Collections Framework and its API
  - B. Collections and Java Generics
  - C. Collection, Set, List, Map, Iterator
  - D. Autoboxing
  - E. Collections of Object (non-generic)
  - F. Using ArrayList, HashSet, and HashMap
  - G. for-each Loop
  - H. Processing Items With an Iterator
  - I. More About Generics
  - LABS:
    - Using Lists and Generics
    - Using Sets
- XII. **Database Access with JDBC and JPA**
  - A. JDBC Overview
    1. JDBC Architecture and API
    2. Using DriverManager, Connection, Statement and ResultSet
  - B. JPA Overview
    1. JPA Architecture and Programming View
    2. Entity Classes and Annotations
    3. Mapping an Entity Class
    4. EntityManagerFactory and EntityManager
    5. Working with JPA (Find by primary key and inserts)
  - LABS
    - Mapping an Entity Class
    - Working with JPA
- XIII. **Additional Java Features**
  - A. Annotations
  - B. Lambda Expressions and Method References (Java 8+)
  - C. Additional Features
- XIV. **I/O Streams (Optional)**
  - A. Readers and Writers
  - B. Filter Streams
  - C. Byte Streams
  - D. Formatted Output
  - E. The File Class
  - F. New I/O (NIO) APIs
  - LABS:
    - Formatting Output