

# Diploma Course in Java Platform and Web Services

## Contents

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### 1. Core Java

#### a) What is Java?

#### b) Writing your first Java program

- Installing JDK
- Installing an IDE (Eclipse or IntelliJ)
- Creating a Project
- Creating your first Program
- Understanding the syntax
  - package, import, class
  - Methods, Access specifiers, Blocks and Comments

#### c) Data Types

- Reference
  - Classes/Objects, Enumeration, Arrays
- Primitives
  - Numeric (Integer, Floating point), Boolean, Character, String, Literals
- Non-existent Type (null)

#### d) Operators

- Operator Precedence
- Parenthesis, Assignment, Mathematical (unary)
- Auto increment and decrement, Relational, Equality
- Logical (&&, ||), Bitwise (&, ^, |), Shift, Ternary if-else
- Operator overloading for Strings, Casting

#### e) Functions

- Syntax
- void vs. non-void, Instance vs. Static, Recursive, final

#### f) Control Flow, Looping and Branching

- Control Flow (if and if-else, switch)
- Looping(for, for-each, while, do-while)
- Branching(break, continue, return)

#### g) Object Oriented Programming

- Objects
  - Creating Objects
    - Constructors, default constructor
    - this keyword
    - Member, Constructor and Array initializations
    - Order of initialization
  - Storage for created objects
  - Clean-up
    - finalize
- Access Control
  - package
  - Access specifiers (public, private, protected, package)
  - Encapsulation
- Reusability via Behaviour/Data Abstraction
  - Composition, Inheritance, Up-casting, final
- Polymorphism
  - Constructors
  - Method overloading
  - Method overriding
  - Substitution vs. Extension
  - RTTI (Run Time Type Identification)
- Interfaces
  - Abstract classes and methods

- Interfaces
- Multiple Inheritance
- Nesting interfaces
- Inner Classes
- “Object” class methods
  - equals(), toString(), wait(), notify(), notifyAll()
- Comparing and Sorting Objects
- Design Patterns
  - Singleton, Factory, MVC
- Type Information
  - Need for RTTI, Class object, Check before cast (instanceof)
- Exception Handling
  - Checked vs. Unchecked Exceptions
  - Error, RuntimeException, Creating a new Exception class
  - try-catch, throws clause, finally, try-with-resources (JDK 7)
- h) **Arrays and Collections**
  - Static vs. Dynamic data
  - Arrays,
  - Lists, Maps, Sets, Stack and Queue
  - Hashing and Hash-codes
- i) **Strings**
  - Immutable strings
  - Overloading vs. StringBuilder
  - StringTokenizer
- j) **I/O**
  - File class
    - Create, Open and Delete a file
    - Create and Delete a directory
    - Directory Lister
  - Read and Write content
    - Input and Output streams
    - Read from Stream
    - Write to Stream
- k) **Multithreading**
  - What is Multithreading and why is it required?
  - Thread and Runnable
  - Sleeping, Priority, Yielding, Joining
  - Sharing resources
  - Terminating tasks
  - Cooperation between tasks
    - wait(), notify() and notifyAll()
- l) **Garbage Collection**
  - Memory Allocation
    - Marking and Sweeping
    - Memory Settings (heap-size, perm-gen size)
  - Garbage Collection (GC)
    - Generations
    - Scavenges and Full Collections
    - GC Settings

## 2. Relational Database Management Systems

- **What is RDBMS**
  - What is DBMS? Why is it required?
  - Characteristics of DBMS
  - Data Models (Hierarchical, Network, Relational)
  - Normalization Process (1NF, 2NF, 3NF)
- **Structured Query Language**
  - SQL Syntax | SQL Data Types | SQL Operators | SQL Expressions
  - CREATE, DROP, SELECT database
  - CREATE, DROP tables
  - SELECT for querying data

- Filtering using WHERE clause
- Ordering, Grouping and Sorting data
- Distinct Results
- **Introduction to MySQL**
- **JDBC**
- 3. Advanced Java**
  - a) **Generics**
    - Comparison with C++ | Simple generics
    - Generic interfaces and methods
    - Erasure
  - b) **Multithreading**
    - Executor Framework
  - c) **Localization**
    - Localization (L10N) vs. Internationalization (I18N)
    - ResourceBundle
    - Localizing labels in .properties
    - Runtime message format
  - d) **What's New in JDK 1.8**
- 4. Servlets**
  - Web Application Basics
  - Servlet life cycle
  - Developing and Deploying Servlets
  - Exploring Deployment Descriptor (web.xml)
  - Servlet Chaining
  - Session Tracking & Management
  - User Authentication
  - Filtering Request and Response, Filter Mapping
  - Servlet Listeners
- 5. JSP**
  - Architecture & Lifecycle
  - JSP Tags, Expressions and Directives
  - Role of JSP in MVC-2
  - JSTL | JSP Expression Language
  - Custom Tags
  - JSP with Java Beans
  - Session Management
- 6. Data Exchange Formats**
  - XML, JSON
    - XML Parsers (SAX, DOM)
    - XML Schema (XSD) & Namespaces
    - Serialization and De-serialization using JAXB
- 7. Web Services**
  - SOAP vs REST Web Services
  - RESTful Web Services using Apache CXF
  - Testing RESTful Web Services Jersey and Postman client
- 8. Spring Framework**
  - **Architecture**
  - **Bean Definition**
    - Scopes | Lifecycle | Post Processors | Inheritance
  - **Dependency Injection/Inversion of Control**
    - Injecting Beans
  - **Autowiring Beans**
  - **Configuration**
    - XML based | Annotation based
  - **Aspect Oriented Programming (AOP)**
  - **Introduction to Spring MVC Framework**