Java Programming

Module 1: Introduction to Java

- History and evolution of Java
- Features of Java (OOP, Platform Independence, etc.)
- JDK, JRE, and JVM
- Setting up Java environment (installation, IDEs like IntelliJ, Eclipse, VS Code)
- First Java program: "Hello, World!"
- Java code compilation and execution process

Module 2: Basic Syntax and Data Types

- Java program structure
- Identifiers, keywords, and naming conventions
- Data types (primitive and reference)
- Variables and constants
- Type conversion and typecasting
- Operators:
    - Arithmetic
    - Relational
    - Logical
    - Assignment
    - Bitwise
    - Ternary
- Input/Output using `Scanner` and `System.out`

Module 3: Control Flow Statements

- Conditional statements:
    - `if`, `if-else`, `else-if`, `switch-case`
- Looping constructs:
    - `for`, `while`, `do-while`
- Jump statements:
    - `break`, `continue`, `return`

Module 4: Object-Oriented Programming (OOP)

- Classes and Objects
- Methods and Constructors
- `this` keyword
- Static variables and methods
- Method overloading
- Encapsulation and Access Modifiers
- Inheritance:
    - `extends` keyword
    - `super` keyword

    - Method overriding
- Polymorphism:
    - Compile-time and Run-time
- Abstraction:
    - Abstract classes and methods
    - Interfaces
- Final keyword, Object class

Module 5: Packages and Access Control

- Built-in packages (`java.util`, `java.io`, etc.)
- User-defined packages
- Import statements
- Access modifiers: `public`, `private`, `protected`, default

Module 6: Exception Handling

- Types of exceptions
- Checked vs Unchecked exceptions
- Try-catch block
- `finally` clause
- `throw` and `throws`
- Creating custom exceptions

Module 7: Arrays and Strings

- One-dimensional and multidimensional arrays
- Enhanced `for` loop
- String class and methods
- StringBuilder and StringBuffer
- String immutability and memory allocation

Module 8: Java Collections Framework

- Collection hierarchy: `List`, `Set`, `Map`, `Queue`
- Interfaces: `Collection`, `Iterable`, `Comparator`

- Classes:
    - `ArrayList`, `LinkedList`
    - `HashSet`, `TreeSet`
    - `HashMap`, `TreeMap`, `LinkedHashMap`
    - `PriorityQueue`
- Iterating collections: Iterator, for-each loop, Streams

Module 9: File I/O and Serialization

- Byte and character streams
- File handling using `File`, `FileReader`, `FileWriter`, `BufferedReader`, etc.

- Object Serialization and Deserialization
- Reading/writing using `Scanner` and `PrintWriter`

Module 10: Multithreading and Concurrency

- Thread lifecycle and creation
    - Extending `Thread` class
    - Implementing `Runnable` interface
- Thread methods: `start()`, `sleep()`, `join()`, `yield()`
- Thread synchronization
- Inter-thread communication (`wait()`, `notify()`, `notifyAll()`)
- Executors and thread pools (intro)

Module 11: GUI Programming (Optional/Intermediate)

- Introduction to AWT and Swing
- JFrame, JPanel, JLabel, JButton, JTextField, etc.
- Layout Managers
- Event Handling
- Simple GUI application (calculator, form)

Module 12: Java Standard Libraries and Utility Classes

- `java.util` classes: `Date`, `Calendar`, `Random`, `Arrays`
- Wrapper classes (`Integer`, `Double`, etc.)
- Auto-boxing and unboxing
- `Math` and `System` classes
- Regular expressions (Regex)

Module 13: Advanced Java (Intro Only)

- JDBC (Java Database Connectivity) basics
- Java Networking (Sockets, URL, HTTP)
- Java 8 Features:
    - Lambda expressions
    - Functional interfaces
    - Stream API
    - Optional class
    - Method references

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