Java - Programming Language

➔ Language Fundamentals

- **Class**
- **Variables**
- **Variable Types**
- **Identifiers**
- **Literals**
- **Data Types**
- **Operators**
- **Input & Output**
- **Flow Controls**
- **Java Keywords**
- **Arrays**
- **Command Line Arguments**
- **Main Method**
- **Coding Standards**

➔ OOPS Principles

- **Class & Objects**
- **Methods**
- **Constructor**
- **`this` Keyword**
- **Access Modifiers**
- **Inheritance**
- **Polymorphism**
- **Super Keyword**
- **Abstract Class & Methods**
- **Interfaces**
- **Encapsulation**

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➔ Collection Framework

- **Collection Framework**
- **Collection Hierarchy**
- **List Interface & Its Implementations**
- **Set Interface & Its Implementations**
- **Map Interface & Its Implementations**
- **Concurrent Collections**

➔ Exception Handling

- **Exception Hierarchy**
- **Errors vs Exceptions**
- **Java Exception Types**
- **Exception Handling (`throw`, `throws`)**
- **Try-with-Resources**

➔ Multi-Threading

- **Thread Creation Methods**
- **Thread Naming & Priorities**
- **Thread Synchronization**
- **Deadlock Prevention**

➔ Java Lang Package & String Handling

- **Object Class Methods**
- **String**
- **String Buffer**
- **StringBuilder**
- **Wrapper Classes**
- **Autoboxing & Auto Unboxing**
- **Cloning**
- **Type Casting**

➔ Serialization

- **Serialization**
- **Deserialization**
- **Transient Keyword**
- **Static vs Transient**
- **Transient vs Final**
- **Marker Interface**

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➔ IO Package

- **File Class**
- **File Writer**
- **File Reader**
- **Buffered Writer**
- **Buered Reader**
- **Print Writer**

➔ Reflection & Generics

- **Reflection on Fields, Methods, Constructors**
- **Creating Generic Classes & Methods**
- **Enum Handling (`ordinal()`, `compareTo()`, `toString()`**

➔ Java 8 Features

- **Stream API & Lambda Expressions**
- **Default & Static Methods**
- **Date & Time API**
- **Optional Class**

➔ Enum

- **Java Enum**
- **Enum Class**
- **Methods of Enum**
- **ordinal()**
- **compareTo()**
- **toString()**
- **name()**
- **valueOf()**
- **values()**
- **Why Enums?**

➔ Advanced Java

- **JSP & Servlets**
- **JDBC (Database Connection & CRUD Operations)**

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MySQL Database

- ➔ Database & Table
  - **create database**
  - **create table**
  - **drop database**
  - **drop table**
  - **alter table**
  - **backup database**
- ➔ Insert, Update & Delete
  - **insert into**
  - **update**
  - **select into**
  - **delete and truncate rows**
- ➔ Select Query - 1
  - **SELECT**
  - **AND, OR, Not**
  - **DISTINCT**
  - **ASLIMIT, TOP, FETCH FIRST**
  - **IN operator**
  - **BETWEEN operator**
  - **IS NULL & NOT NULL**
  - **MIN() & MAX()**
  - **COUNT()**
  - **SUM() & AVG()**

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- ➔ Select Query - 2
  - **ORDER BY**
  - **GROUP BY**
  - **LIKE**
  - **wildcards**
  - **Union**
  - **Subquery**
  - **ANY & ALL**
  - **CASE**
  - **HAVING**
  - **EXISTS**
- ➔ Join
  - **JOIN**
  - **INNER JOIN**
  - **LEFT JOIN**
  - **RIGHT JOIN**
  - **FULL OUTER JOIN**
- ➔ Constraints
  - **not null**
  - **unique**
  - **primary key**
  - **foreign key**
  - **check**
  - **Default**
  - **create index**
- ➔ Other Topics
  - **Data types**
  - **Date and Time**
  - **Operators**
  - **Comments**

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Spring & Spring Boot Framework

➔ Introduction

- What is Spring Boot?
- Spring Boot Features
- Comparison with Spring Framework
- Advantages of Spring Boot
- Spring Boot Architecture
- Setting Up a Spring Boot Project
  - Using Spring Initializer
  - Maven/Gradle Configuration

➔ Spring Boot Basics

- Main Application Class
- Auto-Configuration
- Spring Boot Starters
- Dependency Management
- Overview of Spring Boot
- @SpringBootApplication
  - @Conguration
  - @ComponentScan
  - @EnableAutoConguration
- Running Spring Boot Application
- Embedded Servers (Tomcat Jetty Undertow)

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➔ Spring Boot Configuration

- ◆ **Externalized Configuration**
  - **Properties and YAML Files**
  - **Accessing Configurations with @Value**
  - **Using @CongurationProperties**
- ◆ **Proles in Spring Boot**
  - **Activating Proles**
  - **Profile-Specific Configurations**
- ◆ **Customizing Application Properties**
- ◆ **Configuration Precedence**

➔ Dependency Injection

- ◆ **Injection Types**
  - **Constructor (preferred)**
  - **Field, Setter Injection**
- ◆ **Annotations**
  - **@Autowired**
  - **@Qualier**
  - **@Primary**
  - **@Bean.**
- ◆ **Component Scanning:**
  - **@Component**
  - **@Service**
  - **@Repository**
  - **@Controller.**
- ◆ **Bean Lifecycle:**
  - **@PostConstruct**
  - **@PreDestroy.**
- ◆ **Best Practices:**
  - **Prefer constructor injection,**
  - **avoid field injection**
  - **use proles (@Profile)**

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➔ Spring Boot REST API

- **Building REST APIs with Spring MVC**
- **HTTP Methods (GET, POST, PUT, DELETE)**
- **Request and Response Handling**
  - **@RequestMapping,**
  - **@GetMapping,**
  - **@PostMapping, etc.**
- **Path Variables and Query Parameters**
- **RequestBody and ResponseBody**
- **Exception Handling in REST APIs**
  - **@ControllerAdvice**
  - **Global Exception Handling**
- **Versioning REST APIs**

➔ Spring Boot Data Access

- **Spring Data JPA**
  - **Setting up JPA with Spring Boot**
  - **Defining Repositories**
  - **Query Methods**
- **CRUD Operations with JPA**
- **Database Configuration**
- **Using H2, MySQL, PostgreSQL, etc.**
- **Pagination and Sorting**
- **Custom Queries with JPQL and Native SQL**
- **Transactions in Spring Boot**
  - **Declarative Transactions (@Transactional)**
  - **Propagation Levels**

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➔ Spring Boot Security

- **Introduction to Spring Security**
- **Securing REST APIs**
- **Basic Authentication and Authorization**
- **Role-Based Access Control**
- **JWT (JSON Web Token) Authentication**
- **Custom User Details Service**
- **CSRF Protection**

➔ Spring Boot Testing

- **Testing Overview**
- **Unit Testing with JUnit 5**
- **Writing Test Cases**
- **Mocking with Mockito Integration**
- **Testing Using @SpringBootTest**
- **Testing REST APIs with MockMvc**
- **Testing Data Repositories**
- **@DataJpaTest**
- **Test containers for Database Testing**

➔ Spring Boot Actuator

- **Monitoring and Managing Applications**
- **Actuator Endpoints**
  - **Health Checks**
  - **Metrics**
  - **Customizing Actuator Endpoints**
- **Integrating with Monitoring Tools (e.g., Prometheus, Grafana)**

➔ Spring Boot Logging

- **Overview of Logging in Spring Boot**
- **Configuring Logback and Log4j2**
- **Logging Levels**
- **Customizing Log Outputs**
- **Externalizing Logging**
- **Configurations**

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➔ Devtools

- **Hot Reloading**
- **Auto-Restart vs LiveReload**
- **Debugging Applications with DevTools**

➔ Websocket

- **Introduction to WebSocket**
- **Implementing WebSocket Communication**
- **Building Real-Time Applications (e.g., Chat)**

➔ Messaging

- **Introduction to Messaging Systems**
- **Integrating with RabbitMQ**
- **Integrating with Kafka**

➔ Caching

- **Introduction to Caching**
- **Configuring Cache in Spring Boot**
- **Cache Abstractions**
- **Caching with Redis, EhCache, etc.**

➔ Cloud

- **Deploying Spring Boot Applications to:**
  - **AWS**
  - **Azure**
  - **Google**
- **Cloud Working with**
- **Cloud Databases**
- **Spring Boot with Kubernetes**

➔ File Handling

- **Uploading Files**
- **Downloading Files**
- **Handling Large Files**

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➔ Scheduling

- **Task Scheduling**
- **@Scheduled**
- **Cron Expressions**
- **Asynchronous Processing with**
- **@Async**

➔ Advanced Topics

- **Customizing Embedded Servers**
- **Working with Filters and Interceptors**
- **Writing Custom Starters**
- **Building Custom Actuator Endpoints**

➔ Deployment & Prod Reediness

- **Creating Executable JARs and WARs**
- **Externalizing Configuration for Production**
- **Dockerizing Spring Boot Applications**
- **CI/CD Integration with Jenkins/GitHub Actions**

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Spring Boot Microservices

Microservices

- **Introduction – Microservices Architecture Overview**
- **Project Setup – Spring Boot Microservices Setup & Creating a Microservice**
- **Service Communication – REST, Messaging, Authentication**
- **Service Discovery & Gateway – Spring Cloud, API Gateway**
- **Configuration & Resilience – Cloud Cong, Fault Tolerance**
- **Monitoring & Logging – Observability in Microservices**
- **Testing & Deployment – Spring Boot Testing, Deployment**
- **Security & Best Practices – Authentication, Authorization**
- **Real-world Example – Practical Microservices Application**

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30+ REAL-TIME TOOLS🚀

Category	Tool	Description
Version Control	Git	A distributed version control system used for tracking changes in source code and collaborating with teams.
Build Automation	Maven/Gradle	- **Maven**: A build automation tool for Java projects managing dependencies and builds. - **Gradle**: A flexible build automation tool supporting Java and other languages.
Database Management	MySQL Workbench	A visual tool for database design, administration, and management of MySQL databases.
Testing & Mocking	JUnit/Mockito	- **JUnit**: A testing framework for unit testing Java code. - **Mockito**: A mocking framework for Java used in unit testing.
Logging	Logging	Tools like **Log4j**, **SLF4J**, and **Logback** used to capture and log application events (errors, warnings, info).
Application Servers	Tomcat/Websphere	- **Tomcat**: A servlet container for running Java-based web applications. - **Websphere**: IBM's enterprise-level application server for Java applications.
IDE	Eclipse/STS	- **Eclipse**: An integrated development environment (IDE) for Java and other languages. - **STS**: Spring Tool Suite, based on Eclipse, for Spring framework development.

CI/CD Tools	Jenkins	An open-source automation server used for continuous integration and delivery in software development.
Containerization	Docker	A platform for developing, shipping, and running applications inside containers, ensuring consistency across environments.
API Testing	Postman	A popular tool for API development and testing, enabling users to make requests and analyze responses.
API Testing (CLI)	Newman	A command-line collection runner for Postman, useful for running tests in CI/CD pipelines.
Design Patterns	Design Patterns	Reusable solutions to common software design problems (e.g., Singleton, Factory, Observer, etc.).
Project Management	Jira/Rally	- **Jira**: A tool for issue and project tracking, commonly used in Agile development. - **Rally**: An Agile project management tool to track and manage development progress.
Debugging	Debugging	Tools used to identify and fix issues in the code. Examples include IDE debuggers and logging tools.
Development Methodology	Agile	A methodology focusing on iterative development, collaboration, and flexibility in project management.
Documentation	Confluence	A collaboration tool used for creating, sharing, and managing documentation and knowledge bases.
Code Quality	SonarQube	A tool for continuous inspection of code quality to detect bugs, vulnerabilities, and code smells.
Security	Veracode	A cloud-based static application security testing (SAST) platform that identifies vulnerabilities in code.
Database Connectivity	JDBC	Java API used to connect Java applications to databases and perform CRUD operations.

Repository Management	Nexus Repo	A repository manager that stores and organizes build artifacts and dependencies for software projects.
Cloud Services	AWS Services	A collection of cloud computing services provided by Amazon Web Services for storage, computing, and networking.
Deployment	Deployment (Dev, Test, Prod)	Tools and processes used to deploy applications across different environments: development, testing, and production.
Remote Access	Putty/WinSCP	- **Putty**: A free SSH client for Windows, used for remote server access. - **WinSCP**: A file transfer client for Windows, used for secure file transfers.
Operating System	Linux Basics	Basic commands and functionalities of the Linux operating system used for server management and development.
Kubernetes CLI	Kubectl	A command-line tool for managing Kubernetes clusters, deploying, and managing containerized applications.
Communication	Teams/Mail Communication	Tools for team collaboration and communication, such as Microsoft Teams, email clients, and communication platforms.
Service Management	Service-Now	A cloud-based IT service management tool, often used for IT operations and workflows.
Data Formats	XML/JSON	Data formats used for representing and exchanging structured data: **XML** (Extensible Markup Language) and **JSON** (JavaScript Object Notation).
Log Management	Splunk	A platform for searching, monitoring, and analyzing machine-generated big data, particularly for log management.
API Documentation	Swagger	A framework for documenting and designing APIs, making it easier to develop, test, and consume RESTful services.

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