TUES TECHNO EDUCATION INSTITUTION

Private Limited | ISO 9001:2015 Certified Institution

1-YEAR MASTER DIPLOMA

PROGRAM NAME	DURATION	FORMAT	WEBSITE
Master Java Engineering	12 Months (52 Weeks)	100% Online & Recorded	www.tuestechno.com

QUARTER 1 (MONTHS 1–3): JAVA FOUNDATIONS & DATA STRUCTURES

CORE PROGRAMMING & ALGORITHMIC MASTERY

WEEKS 1 - 13

Module 1: Java Syntax, Object-Oriented Blueprint & JVM Internals

Weeks 1 - 4

- **Java Environment:** JDK 21+ installation, JVM vs. JRE, Bytecode execution, Memory layout (Heap, Stack, Metaspace).
- **Core Language Concepts:** Control structures, Primitives vs Object Wrappers, Operators, Arrays, and Strings immutability.
- **OOP Pillars:** Classes, Encapsulation, Polymorphism, Inheritance, Abstract classes, Interfaces, and SOLID Principles.
- **Memory & Garbage Collection:** GC algorithms (G1GC, ZGC), Memory leaks identification, and StackOverflow prevention.

Module 2: Java Collections, Multithreading & Concurrency

Weeks 5 - 8

- **Collections Deep Dive:** List, Set, Map, Queue implementations (ArrayList, HashMap internals, ConcurrentHashMap).
- **Java 8 - 21 Innovations:** Streams API, Lambda expressions, Optional class, Sealed classes, Pattern Matching, Record types.
- **Concurrency Framework:** Thread Lifecycle, Synchronization, Deadlocks, ReentrantLocks, Atomic variables, ExecutorService.
- **Modern Concurrency:** Virtual Threads (Project Loom), Structured Concurrency, CompletableFuture async workflows.

Module 3: Data Structures & Algorithm Optimization

Weeks 9 - 11

- **Data Structures in Java:** Linked Lists, Stacks, Queues, Binary Search Trees, Heaps, and Hash Tables.
- **Algorithmic Complexity:** Big-O Time & Space Analysis, Sorting & Searching algorithms optimization.
- **Problem Solving:** Recursion, Dynamic Programming, Greedy Algorithms, Graph Traversals (BFS/DFS).

Module 4: Software Engineering Tools & Build Systems

Weeks 12 - 13

- **Version Control:** Advanced Git workflows, Branching strategies, Merging, Rebasing, Stashing, Pull Request reviews.
- **Build Automation:** Maven & Gradle lifecycle, Dependency management, Plugin configurations, Multi-module builds.

★ 1-Year Master Diploma Highlights

✔ **Live + Recorded Access:** Continuous learning with expert faculty.

✔ **Earn While Learning:** Day 1 income opportunities available (T&C Apply).

✔ **ISO Certified Diploma:** Officially recognized post-completion certificate.

✔ **Dedicated Career Guidance:** Mock interviews & resume development.

QUARTER 2 (MONTHS 4–6): DATABASE SYSTEMS & SPRING ECOSYSTEM

RELATIONAL, NOSQL & ENTERPRISE FRAMEWORKS

WEEKS 14 - 26

Module 5: Relational Databases & Advanced SQL

Weeks 14 - 17

- **RDBMS Architecture:** MySQL & PostgreSQL setup, Data types, Table normalization (1NF to BCNF).
- **Advanced Querying:** Complex JOINs, Subqueries, Window functions, CTEs (Common Table Expressions), Stored Procedures.
- **Database Performance:** Indexing strategies (B-Tree, Hash), Query execution plans, EXPLAIN analysis, Locking mechanisms.
- **Database Migrations:** Schema versioning with Flyway and Liquibase scripts.

Module 6: Persistence, JDBC & NoSQL Data Stores

Weeks 18 - 20

- **Java Database Connectivity:** JDBC Drivers, PreparedStatement, ResultSet processing, Connection Pools (HikariCP).
- **NoSQL Databases:** MongoDB document model, CRUD operations, Aggregation pipelines, Spring Data MongoDB.
- **Caching Layer:** Redis setup, Data types, In-memory caching strategies, Cache eviction policies (@Cacheable).

Module 7: Spring Core Architecture & Spring Boot 3

Weeks 21 - 23

- **Spring Framework Core:** Inversion of Control (IoC), Dependency Injection (DI), Spring Bean lifecycle, Configuration types.
- **Spring Boot Essentials:** Auto-configuration internals, Custom Starters, Application.properties/yml, Profiles management.
- **Aspect-Oriented Programming (AOP):** Cross-cutting concerns, JoinPoints, Advice types (@Before, @Around, @After).

Module 8: ORM & Persistence with Hibernate & JPA

Weeks 24 - 26

- **JPA & Hibernate:** Entity Mapping, Primary Key strategies, Relationships (@OneToMany, @ManyToMany, @ManyToOne).
- **Advanced JPA:** JPQL, Criteria API, Native queries, Entity Lifecycle States, Cascade types, Lazy vs Eager loading.
- **Performance Tuning:** Solving N+1 Select Problem, Entity Caching (L1/L2 Cache), Transaction Isolation Levels.

MID-YEAR ASSESSMENT & MILESTONE TRACK

Milestone	Evaluation Focus	Target Outcome
End of Month 3	Core Java & Data Structures Exam	Minimum 70% in Algorithmic Code Challenge
End of Month 5	Database Design & Complex Query Test	Complete Schema & SQL Query Optimization
End of Month 6	Spring Boot & Data JPA Practical Exam	Build Functional Data-Driven Backend Service

QUARTER 3 (MONTHS 7–9): RESTFUL APIS, SECURITY & MICROSERVICES

ENTERPRISE WEB ARCHITECTURE & DISTRIBUTED SYSTEMS

WEEKS 27 - 39

Module 9: RESTful Web API Architecture & Integration

Weeks 27 - 29

- **REST Principles:** Statelessness, Resource endpoints design, HTTP verb semantics, Response Status Codes.
- **Spring MVC Controller:** Request Mapping, PathVariables, RequestParams, RequestBody, DTO Pattern.
- **Validation & Error Handling:** Spring Validation (@Valid, @NotNull), Custom Validators, Global Exception Handler (@ControllerAdvice).
- **API Documentation:** Swagger UI, OpenAPI 3 specification, Postman workspace setup & collection testing.

Module 10: Spring Security 6 & Authentication Protocols

Weeks 30 - 32

- **Spring Security Fundamentals:** Security Filter Chain, AuthenticationManager, UserDetailsService, Password Encoders (BCrypt).
- **Stateless Security with JWT:** JSON Web Token architecture, Token creation, Signing, Verification Filters, Refresh Tokens.
- **OAuth2 & OpenID Connect:** Third-party authorization (Google/GitHub login), Resource Server configuration.
- **Web Security Practices:** Protection against CSRF, XSS, CORS setup, Rate limiting with Bucket4j.

Module 11: Microservices Architecture & Spring Cloud

Weeks 33 - 36

- **Microservice Patterns:** Decomposition by Domain, Service Registry (Eureka), Dynamic Routing (Spring Cloud Gateway).
- **Inter-Service Communication:** Synchronous calls via RestTemplate & OpenFeign; Fault Tolerance via Resilience4j (Circuit Breaker).
- **Centralized Configuration:** Spring Cloud Config Server, Bus refresh, Vault for secrets management.
- **Event-Driven Architecture:** Asynchronous messaging using Apache Kafka & RabbitMQ (Producers, Consumers, Topics).

Module 12: Full Stack Integration (React.js Basics for Backend Developers)

Weeks 37 - 39

- **Frontend Essentials:** ES6+ JavaScript, React Components, JSX, Props, State, React Hooks (useState, useEffect).
- **API Integration:** Fetch API, Axios client setup, Connecting React UI with Spring Boot REST Endpoints, handling CORS.

QUARTER 4 (MONTHS 10–12): DEVOPS, CLOUD & INDUSTRIAL CAPSTONE

CLOUD DEPLOYMENT, CI/CD & ENTERPRISE PROJECT

WEEKS 40 - 52

Module 13: Testing, Quality Assurance & Code Quality

Weeks 40 - 42

- **Unit & Integration Testing:** JUnit 5 assertions, Mockito framework (@Mock, @InjectMocks), Testcontainers for DB integration tests.
- **API & Performance Testing:** REST Assured for endpoint testing, JMeter for load testing backend APIs under traffic.
- **Code Analysis:** SonarQube setup, Static code inspection, Security vulnerability scanning, Code coverage reports.

Module 14: Containerization, CI/CD & Cloud Deployment (AWS)

Weeks 43 - 46

- **Docker Mastery:** Container concepts, Dockerfile creation, Multi-stage builds, Docker Compose for multi-container apps.
- **CI/CD Pipelines:** Automated build & deployment pipelines using GitHub Actions & Jenkins.
- **Cloud Deployment (AWS):** EC2 instance management, RDS database setup, S3 bucket storage, Elastic Beanstalk / ECS deployment.
- **Kubernetes Basics:** Pods, Deployments, Services, ConfigMaps, and cluster orchestration fundamentals.

Module 15: Year-End Capstone Project & Career Placement

Weeks 47 - 52

- **Production-Grade Capstone Project:** Design, build, test, and deploy a full-scale Enterprise Fintech or E-Commerce Microservices platform.
- **System Architecture Review:** Code reviews with senior engineers, System Design documentation (HLD/LLD).
- **Placement Support:** Technical resume building, GitHub portfolio review, Mock interview drills, and Direct company referrals.

FINAL GRADUATION CRITERIA & DIPLOMA AWARD

Evaluation Area	Weightage	Passing Threshold
Quarterly Assessments (Q1–Q3)	30%	Minimum 65% aggregate score
End-of-Module Coding Labs & Quizzes	20%	80% submission & review rate
Year-End Capstone Microservices Project	40%	Live Cloud Deployment & System Defense
Class Participation & Code Quality	10%	Compliance with clean code standards

APPLY NOW & FILL OUR ONLINE ENQUIRY FORM!

Enroll today at **www.tuestechno.com** or contact our admissions office to secure your seat in the upcoming batch.

**Terms and conditions apply for income generation programs. Diploma awarded upon successful completion of all academic requirements.*