Advanced Java – Course Outline

1 Duration

- 25 half-days (100 hours)

2 Objectives

At end of this workshop, participants will able to :

- Get understanding on Java advanced concepts and Java 8 features
- Get understanding on how to build web apps with Java stack and using web frameworks
- Get detail understanding on Spring Framework, MVC, REST APIs and database integration with JPA
- Get detail understanding of how to develop, test, deploy and monitor Spring Boot apps
- Get understanding on how to monitor, troubleshoot, profile, tune and optimize Java apps

Note: *This course is designed for intermediate to advance level.*

3 Audience

Developers who are interested to learn and build scalable web apps/APIs with Java, Spring Boot and JPA

4 Pre-requisite

- Good knowledge on Core Java programming

5 Hardware & Network Requirements

- Desktop/Laptop with minimum 8GB RAM
- Open Internet connection (minimum 5 Mbps per user)
- Local Admin Access (to download maven packages)

6 Software Requirements

- Windows / Linux / Mac OS
- JDK 11
- Eclipse 4.8+ / STS 4+ / Intellij IDE
- Git 2.3+
- Maven 3.4+
- Tomcat 9
- MySQL Server 8+
- MySQL Workbench 8+
- Postman 8+

7 Outline

Topic	Module	Day	Topic of Coverage	Duration (in hrs)
Advanced Java	Introduction	Day 1	• Recap of Java Fundamentals • Java Environment Setup • Object Oriented Programming • Packages • Exception Handling	2
	Collection Framework		• Collection Framework Overview • Collection Interfaces and Hierarchy • List, Set, Map and Queue • Vector • ArrayList • LinkedList	2
	Collection Framework	Day 2	• HashSet • LinkedHashSet • TreeSet • HashMap • LinkedHashMap • TreeMap • Comparator • Collections • Iterator • ListIterator	2
	Generics / Annotations		• Generics Overview • Applying Generics on Collection Framework • Annotations Overview • Understanding pre-defined annotations • Defining custom annotations	2
	I/O	Day 3	• I/O Stream Hierarchy • CharacterStream vs ByteStream • Read and Write with Console • File Management - Read, Write, Browse • Serialization Overview • ObjectInputStream and ObjectOutputStream • Why NIO, Streams Versus Blocks • Integrated I/O, Channels and Buffers • Reading and Writing from file • Buffer Internals – Memory mapped buffers • Scattering and gathering • Asynchronous I/O	4

	Multi-Threading	Day 4	• Understanding Threads • Needs of Multi-Threaded Programming • Thread Life-cycle • Thread Priorities • Synchronizing Threads • Inter communication of Threads • Critical Factor in thread Deadlock • Thread Executor framework	4
	Databases and JDBC Fundamentals	Day 5	• What is Database? • What is MySQL? • Parts of MySQL • DDL, DML, DQL and DCL • Operators and Clauses in MYSQL • Functions and procedures in MYSQL • What is JDBC? • Types of Drivers • Loading the drivers • Connection, Statement, Prepared Statement • CallableStatement, ResultSet, RowSet Interfaces	4
			• Weekly Assessment 1	
Java 8	Java 8 Features	Day 6	• Fundamentals of Functional Programming • Lambda Expressions • Functional Interfaces • Method References • Type Inference • Default Methods • Maven Overview • POM (Project Object Model) • Maven Java Project	4
		Day 7	• Stream API Overview • Stream Operations and Patterns • Filtering • Mapping • Finding and Matching • Reducing • minBy/maxBy • Collectors Overview • Grouping and partitioning • Collecting to lists and sets • Collection operations • Aggregation and Reduction • Parallelizing Stream Processing • Optional Class • New Date/Time API	4

JUnit	Intro to JUnit	Day 8	• Unit Testing Overview • JUnit Overview • JUnit 4 vs JUnit 5 • JUnit 5 architecture • Test Classes and Methods • Assertions, Test lifecycle, Running Tests • Test Mocks with Mockito	4
Performance Tuning	Intro to Performance Tuning	Day 9	• Introduction to Performance Tuning • Java Platform Overview • JVM Architecture and Internals	2
	Performance Bottlenecks, Analysis and Monitoring Tools		• Potential Performance Bottlenecks • Management and Monitoring Tools Overview • Detecting Memory Leaks - Heap Dump Analysis • Detecting reasons for High CPU Utilization	2
	Detecting Performance Bottlenecks and Profiling Tools	Day 10	• Profiling Overview • Profiling Tools • Detecting Garbage Collection Overhead - GC Log Analyzer • Detecting Concurrency Issues - Thread Dump Analysis	2
	Tuning of Java Applications		• JVM Tuning • Code Optimization • Caching - EhCache, MemCache, Redis, etc • Load Balancing • Distributed Computing	2
			• Weekly Assessment 2	
Web Technologies	Intro to Web Technologies & Servlets	Day 11	• Web Technologies overview • Web Application vs Enterprise Application • Web / Enterprise Application Servers • Java EE Overview • Java EE Architecture • Servlet API Overview • Servlet Life Cycle • Servlet Concepts • Sample Servlet program	4
	JSP	Day 12	• JSP Overview • JSP Life Cycle • JSP Concepts • JSTL Overview • Sample JSP application	4

Spring Framework	Spring Core Basics	Day 13	• Spring Framework Overview • Inversion of Control (IoC) • Depedency Injection (DI) • Spring Project Setup • IoC Container Instantiation - Bean Factory, Application Context • Bean Instantiation - Constructor, Static Factory, Instance Factory • XML based configuration • Constructor Injection, Setter Injection • Bean Scopes • Bean Lifecycle Methods • Lazy Init • Autowiring • Bean Definition Inheritance	4
	Spring Core Advanced	Day 14	• Annotation Based Configuration • @Component, @ComponentScan, @Bean • @Autowired, @Primary, @Qualifier • @Scope, @Lazy, @Value, @PostConstruct, @PreDestroy, @Configuration, @Bean • Java Based Configuration • Spring AOP Overview	4
	Spring MVC	Day 15	• MVC Architecture Overview • Spring MVC Overview • Spring MVC Request Flow • Front Controller - Dispatcher Servlet • Handler Mapping - @RequestMapping • Handler Adapter • Controller • Model, ModelAndView, ModelMap • Forms, Form Validation, View Resolvers • Exception Handling	4
			• Weekly Assessment 3	
	Spring REST	Day 16	• Webservices Overview • SOAP vs REST • RESTful Webservice Overview • RESTful Webservices using Spring • What is Resource? • Characteristics of Resource - Addressability, Accessiblity and Representation • Spring REST Request Flow • Create HelloWorld REST API • Request and Response Handling using @RequestBody, @ResponseBody, @RestController, @RequestMapping @RequestParam,@PathVariable,@MatrixVariable	4

		Day 17	• URI Naming and Design Best practices • API Design using HTTP Methods - GET, POST, PUT, DELETE • Content Representation using MediaTypes (PLAIN, JSON, XML) • Content Negotiation • REST Clients - Postman, REST Client API, REST Template	4
ORM Framework	JPA / Hibernate	Day 18	• ORM Framework Overview • Hibernate Overview • SessionFactory and Session • Hibernate Configuration and Mapping • JPA Overview • EntitiyManagerFactory and EntityManager • JPA Annotations • Integration with Database with JPA/Hibernate • Integration with Spring Framework	4

Spring Boot	Intro to Spring Boot	Day 19	• Spring Boot Overview
			• Spring vs Spring Boot
			• Benefits of Spring Boot
			• Create Spring Boot Project
			  ○ Spring Maven Project
			  ○ Spring Starter Project
			  ○ Spring Initializr
			  ○ Spring Boot CLI
			• Build and run sample Spring Boot Application
				4

	Spring Boot Features	Day 20	• Auto Configuration • @SpringBootApplication / SpringApplication • Externalized Configuration • Logging • Profiles • Packaging • Embedded Container • DevTools • Testing	4
			• Weekly Assessment 4	
	Spring Boot Web & REST API	Day 21	• Spring Boot support for Spring MVC • Spring Boot support for Spring REST • Embedded web container support • Sample web services using Spring Boot	4

	Data Access with Spring Boot	Day 22	• Spring Boot support for SQL Databases
			  ○ JdbcTemplate
			  ○ JPA (Hibernate)
			  ○ Spring Data (JPA Repository)
			• Embedded database support (H2)
			• Sample web application with data
				4

	Security	Day 23	• Spring Security Concepts • How to Authenticate and Authorize requests • Access Tokens • OAuth 2.0 • JWT • Secure the REST APIs with OAuth 2.0 and JWT	4
	Monitoring and Management	Day 24	• Actuator Overview • Endpoints • Developer Tools • Tuning Spring Boot Applications	4
Microservices	Introduction to Microservices	Day 25	• Architectural Styles Overview • Monolith Architecture • Service Oriented Architecture (SOA) • Distributed Architecture • Twelve Factor Principles for App Development • Microservice Based Architecture (MSA) • Microservice and API Ecosystem • Microservice characteristics • Microservice Concepts Overview • Benefits and limitations • Microservice Reference Architecture • Example with Monolith and Microservice App • Microservices Design Patterns	4
			• Weekly Assessment 5	