Java Full Stack with Microservices - Course Outline

Topic	Module	Day	Topic of Coverage	Duration (in hrs)
Core Java	Introduction	Day 1	• Intro about Programming Language Paradigms • Why Java? • Flavors of Java • Java Designing Goal • Role of Java Programming in industry • Features of java Language • Difference between JDK, JRE and JVM • JVM- The heart of Java • Java's Magic Byte code • Java Architecture	2
	Environment Setup		• Java Environment • Installing JDK and Eclipse IDE • Java Program Development • Java Source File Structure • Compilation • Executions	2
	Language Fundamentals		• Java Fundamentals • Data Types • Variables, Keywords, Literals • Comments • Assignment ,Initialization • Control Structures – IF ELSE, Switch Case • Loops – For, While, Do While, ForEach	4
	Oops in java	Day 2	• Introduction to OOPs • 4 main pillars of OOPs • Inheritance • Type of inheritence • Polymorphism and its advantages • Type of polymorphism • method overloading and overriding • Introduction Abstraction • Abstract class and method • Interfaces • Encapsulation	8
	Arrays and Strings	Day 3	• Defining of an Array • Initializing and accessing an Array • Multi-Dimensional Array • Operation on String • Mutable and immutable String • Using Collection Bases loop for String • Tokenizing a String • Creating Strings using String Buffer and Builder	2
	Packages and Wrapper Classes		• Organizing Classes and interfaces in Packages • Package as Access Protection	3

			• Defining Package • CLASSPATH Setting for Packages • Import and Static Import • Naming Convention for packages • What is Wrapper Class • Why Wrapper • How to handle wrapper Classes	
	Exception Handling		• What is Exception • Types of Exception • Exception Hierarchy • Control Flow in Exception • VM reaction to Exception • Exception handling with try catch, throws, try with resources, custom exception	3
			• Module Level Assessment 1	
Advanced Java	Collection Framework	Day 4	• Collection of objects • Collection Interfaces and Hierarchy • List, Set And Map • Types of List • Types of Set • Types of Map • Iterator • Generics	8
	Multi-Threading	Day 5	• 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	8
	Databases and JDBC Fundamentals	Day 6	• What is Database? • What is MySQL? • Parts of MySQL • DDL, DML, DQL and TCL • 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	8
			• Module Level Assessment 2	
Java 8	Java 8 Features	Day 7	• Fundamentals of Functional Programming • Lambda Expressions • Functional Interfaces • Stream API - foreach, map, filter, parallel processing, collectors, etc. • Method References • Default Methods	8

			• Optional Class • New Date/Time API	
Java 11	Java 11 Features	Day 8	• Java11 New Features: • Module System • String API Changes • New File Methods • Local Variable Syntax • New HTTP client • Java 11 Usecases	8
			• Module Level Assessment 3	
Reactive Programming	RxJava	Day 9	• Reactive Programming with RxJava • What Is Reactive Programming? • Non-blocking Programming • Asynchronous Programming • Functional and Declarative Programming • Introduction • Reactive Streams • Project Reactor • Setting up the Project • Mono • Flux	8
JUnit	Intro to JUnit	Day 10	• Unit Testing Overview • JUnit Overview • JUnit 4 vs JUnit 5 • JUnit 5 architecture • Writing tests in JUnit 5 • Annotations • Test Classes and Methods • Assertions • Assumptions • Test lifecycle • Tagging and filtering tests • Conditional test execution • Nested tests • Repeated tests • Dependency Injection • Test Templates • Test Interfaces • Parameterized Tests • Timeouts • Running Tests • Test Mocks with Mockito	8
			• Module Level Assessment 4	
Spring Framework	Spring Core Basics	Day 11	• Spring Framework Overview • Inversion of Control (IoC) • Depedency Injection (DI) • Spring Project Setup	8

			• 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 • Maven Overview • POM (Project Object Model) • Maven Java / Spring Project	
	Spring Core Advanced	Day 12	• Annotation Based Configuration • @Component, @ComponentScan, @Bean • @Autowired, @Primary, @Qualifier • @Scope, @Lazy, @Value, @PostConstruct, @PreDestroy, @Configuration, @Bean • Java Based Configuration • Spring AOP Overview	4
			• Module Level Assessment 5	
	Spring MVC		• 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
	Spring REST	Day 13	• 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 • URI Naming and Design Best practices • API Design using HTTP Methods - GET, POST, PUT, DELETE • Content Representation using MediaTypes (PLAIN, JSON, XML) • Content Negotiation	8

			• REST Clients - Postman, REST Client API, REST Template	
			• Module Level Assessment 6	
Spring Boot	Spring Boot Internals and Features	Day 14	• Configuration • Auto-Configuration • @SpringBootApplication Annotation • Externalized Configuration • Profiles • Logging • Packaging	8
	Spring Boot Web & REST API		• Spring Boot support for Spring MVC • Spring Boot support for Spring REST • Embedded web container support • Sample web services using Spring Boot	

	Data Access with Spring Boot	Day 15	• Spring Boot support for SQL Databases
			  ○ JdbcTemplate
			  ○ JPA (Hibernate)
			  ○ Spring Data
			• Embedded database support (H2)
			• Sample web application with data
				8

	Monitoring and Management		• Actuator Overview • Endpoints • Developer Tools	
			• Module Level Assessment 7	
Microservices	Introduction to Microservices	Day 16	• 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

	Microservices Design		• Service decomposition by Business Capability
			• Service decomposition by Sub Domain
			• Domain Driven Design
			  ○ Domain
			  ○ Domain Logic/Business Logic
			  ○ Model
			  ○ Context
			  ○ Bounded Context
			  ○ Entity
			  ○ ValueObject
			  ○ Aggregate
			  ○ Repository
			  ○ Factory
			• Big Mud Ball to Sweet Gem (Monolith to Microservices)
				4

	Microservices Implementation with Spring Boot	Day 17	• Microservices development with Spring Boot • Spring Cloud overview • API Gateway and Service Discovery • Configuration Management and Load Balancing • Data Management implementation • Sample Microservices based application applying above concepts	4
	Inter-service Communication		• Inter service communication with Kafka	4
	Reactive Microservices	Day 18	• Reactive Manifesto • Reactive Programming Versus Reactive System • Understand Microservice Architecture • How Spring project-Reactor Supports Reactive Microservices? • Introduction to Spring Reactor • Message Driven Architecture • How to design services with Elasticity, Resilience and Responsiveness • Reactive Microservices sample implementation	4
	Testing Microservices		• Testing scenarios and strategy • Test at Different Levels • Unit Testing with JUnit • Integration Testing with REST Assured • Testing Best Practice for Microservices	4
	Securing Microservices	Day 19	• MicroServices Security Principles • Spring Security Concepts • How to Authenticate Microservice requests • How to Authorize Microservice requests • Access Tokens • Oauth 2.0 • JWT • Spring Cloud + Security integration	4
	Monitoring Microservices		• Distributed Tracing with Zipkin • Logging in & Auditing with Elasticsearch • Monitoring with Kibana / Grafana dashboard	4

			Module Level Assessment 8	

Containerization and Deployment	Deploying Microservices (Containerization with Docker)	Day 20	• Introduction to Docker
			• Docker Architecture
			• Virtual Machines vs Containers
			• Docker Setup and Configuration
			• Components
			  ○ Docker Engine
			  ○ Docker Registry
			  ○ Docker Compose
			  ○ Docker File, Images
			• Create Docker File for Spring Boot application
			• Build Docker image
			• Deployment workflow
			• Docker Automation with Continuous Integration
			• Hands-on exercise to package spring boot microservices into Docker images and deploy
				8

	Deploying Microservices (Container Management with Kubernetes)	Day 21	• Service Mesh Pattern Overview
			• Kubernetes Overview
			• Kubernetes Architecture
			• Kubernetes Setup and Configuration
			• Components - Node, Service, Pod
			• Features Overview
			  ○ Deployments
			  ○ Services
			  ○ Jobs
			  ○ Replication
			  ○ Load Balancing
			  ○ Auto Scaling
			• Creating and deploying an application in Kubernetes with Docker
			• Configure Auto Scaling and High Availability
			• Managing and accessing K8s cluster with Kubectl
			• Kubernetes Monitoring with Dashboard
			• Istio overview
			• Routing, Discovery, Circuit Breaker with Istio
				8

			• Module Level Assessment 9	

DevOps	Automate Deployment with CI/CD (Jenkins) Cloud Computing	Day 22	• Continuous Integration Overview • Intro to Jenkins • Characteristics and Features • Architecture, Benefits and Limitations • Installation and Configuration • Integration with Git and Maven • Pipelines Overview • Setting up build jobs • Automate Tests and Quality Analysis • Automate Dockerization of services with Jenkis • Automate Docker deployments into K8s with Jenkins • Cloud Computing Overview • Cloud Service Providers Overview • Cloud deployment options for Microservices • Serverless deployment options for Microservices	8
			• Module Level Assessment 10	