Java Full Stack with Microservices - Course Outline

Topic	Module	Day	Topic of Coverage	Duration (in hrs)
Java	Introduction	Day 1	• Why Java? • Flavors of Java • Java Designing Goal • Role of Java Programming in industry • Features of java Language • JVM- The heart of Java • Java's Magic Byte code	2
	Language Fundamentals		• Java Environment • Installing JDK and Eclipse IDE • Java Program Development • Java Source File Structure • Compilation • Executions • Java Fundamentals • Data Types • Variables, keywords, Literals • Comments • Assignment ,Initialization	4
	Array and String		• 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
	Oops in java	Day 2	• Inheritance • Use of Benefits of inheritance in OOP • Types of inheritance in Java • Inheriting Data Member and Methods • Role of Constructors in inheritance • Overriding super Class methods • Use of "Super" • Polymorphism in inheritance • Interfaces And Abstract Classes • Multiple Inheritance • Restrictions for Interfaces • Interface Vs Abstract • Relationship between classes	6
	Packages and Wrapper Classes		• Organizing Classes and interfaces in Packages • Package as Access Protection	2

			• 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	
	Collection Framework	Day 3	• Collection of objects • Collection Interfaces and Hierarchy • List, Set And Map • Types of List • Types of Set • Types of Map • Iterator • Generics	6
	Exception Handling		• What is Exception • Types of Exception • Exception Hierarchy • Control Flow in Exception • VM reaction to Exception • Exception handling	2
	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	4
	JDBC Fundamentals		• Introductions to JDBC • JDBC Drivers and architectures • CURD operations using JDBC • ODBC and other Drivers	4
Java 8	Java 8 Features	Day 5	• Fundamentals of Functional Programming • Lambda Expressions • Functional Interfaces • Stream API - foreach, map, filter, parallel processing, collectors, etc. • Method References • Default Methods • Optional Class	8
		Day 6	• Enhanced Collections Framework with Lambdas • Enhanced Concurrency API with Lambdas • New Date/Time API • Reactive Programming with RxJava	4
			• Java 8 Usecases Implementation	4

JUnit	Intro to JUnit	Day 7	• 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
Spring Framework	Spring Core Basics	Day 8	• 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 • Maven Overview • POM (Project Object Model) • Maven Java / Spring Project	8
	Spring Core Advanced	Day 9	• 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		• 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 10	• 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 • REST Clients - Postman, REST Client API, REST Template	8
Spring Boot	Spring Boot Internals and Features	Day 11	• 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 12	• Spring Boot support for SQL Databases
			   o JdbcTemplate
			   o JPA (Hibernate)
			   o Spring Data
			• Embedded database support (H2)
			• Sample web application with data	

	Monitoring and Management		• Actuator Overview • Endpoints • Developer Tools	8
Spring Security	Spring Security		• Understanding Spring Security modules • Writing a simple security configuration • Spring Boot Support for Spring Security • Basic Authentication • User Authorization • CORS • Securing REST Webservices	
Microservices	Introduction to Microservices	Day 13	• Architectural Styles Overview • Monolith Architecture • Service Oriented Architecture (SOA) • Distributed Architecture • Twelve Factor Principles for Application Development • Microservice Based Architecture (MSA) • Microservice and API Ecosystem • Microservice characteristics • Microservice Concepts Overview • Benefits and limitations • Microservice Reference Architecture • Example with Monolith Application and Microservice Application	4
	Microservices Design Patterns		• Service Decomposition • Cross Cutting Concerns • Service Discovery • API Gateway • Communication Styles • Data Management • Database Querying • Transactional Messaging • UI Patterns • Reliability (Circuit Breaker) • Observability • Security • Testing • Deployment	4

Microservices Design	Day 14	• Service decomposition by Business Capability
		• Service decomposition by Sub Domain
		• Domain Driven Design
		   o Domain
		   o Domain Logic/Business Logic
		   o Model
		   o Context
		   o Bounded Context
		   o Entity
		   o ValueObject
		   o Aggregate
		   o Repository
		   o Factory
		• Big Mud Ball to Sweet Gem
		 (Monolith to Microservices)
			4

Microservices Implementation with Spring Cloud		• Introduction to Spring Cloud • Create Spring Boot app with Spring Cloud • Centralized and versioned Configuration Management with Spring Cloud Config • Dynamic Configuration updates with Spring Cloud Bus • Service Discovery with Spring Cloud Netflix Eureka • Sample Microservices based application applying above concepts	4
Microservices Implementation with Spring Cloud	Day 15	• Applying circuit breakers with Spring Cloud Netflix Hystrix • Load Balancing with Spring Cloud Netflix Ribbon • Declarative REST clients with Spring Cloud Netflix Feign • Working with API Gateway - Zuul • Sample Microservices based application applying above concepts	4
Inter-service Communication		• Inter service communication with RabbitMQ and Kafka	4
Reactive Microservices	Day 16	• 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 17	• 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

	Deploying Microservices (Containerization with Docker)	Day 18	• Introduction to Docker
			• Docker Architecture
			• Virtual Machines vs Containers
			• Docker Setup and Configuration
			• Components
			  o Docker Engine
			  o Docker Registry
			  o Docker Compose
			  o 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 19	• Service Mesh Pattern Overview
			• Kubernetes Overview
			• Kubernetes Architecture
			• Kubernetes Setup and Configuration
			• Components - Node, Service, Pod
			• Features Overview
			  o Deployments
			  o Services
			  o Jobs
			  o Replication
			  o Load Balancing
			  o 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
				8

	Automate Deployment with CI/CD (Jenkins) Cloud Computing	Day 20	• 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