# Course Title: Architecting, Designing and Developing Microservices on Azure with Spring Boot (Java)

**Duration: 5 Day (40 Hrs.)**

**Course Description:** Architecting, Designing, and Developing Microservices on Azure with Spring Boot (Java) is a comprehensive five-day course designed for Java developers seeking to build, deploy, and manage scalable microservices using Spring Boot and Azure cloud services. This course focuses on equipping participants with the skills to design robust, cloud-native architectures while leveraging the best practices and tools for security, scalability, and resiliency. Through practical hands-on sessions and in-depth discussions, attendees will gain expertise in creating and deploying microservices that are ready for modern cloud environments.

**Course Objectives:** By the end of this course, participants will be able to

- Understand Microservices Architecture
- Leverage Spring Boot for Microservices
- Implement Advanced Design Patterns
- Master Inter-Service Communication
- Deploy on Azure Cloud
- Enhance Performance and Resiliency
- Secure Microservices
- Monitor and Observe Systems
- Test Microservices
- Embrace Future Trends

**Pre-Requisites:**

- Working knowledge of Java Language
- Knowledge of Java Servlets and Web Servers like Apache Tomcat
- Knowledge of basics of Spring Framework

**Course Contents:**

**1. Introduction to Microservices and Cloud-Native Architecture**

- Overview of Microservices architecture
- Various Acceptable definitions of microservices
- Pros and cons of microservices architecture
- Benefits of Microservices in the cloud
- Challenges of Microservices and how cloud platforms address them

**2. Microservices Design with Spring Boot**

- Introduction to Spring Boot and its role in microservices development
- Key Spring Boot features for Microservices: Spring Boot Starter, Spring Actuator, Spring Cloud
- Designing loosely coupled, independent services with Spring Boot
- RESTful APIs and Spring Web for communication

**3. Domain-Driven Design (DDD) for Microservices**

- Understanding DDD concepts (Bounded Context, Entities, Value Objects)
- Mapping DDD to Microservices using Spring Boot
- Decomposing monolithic applications into services using DDD patterns

**4. Building Microservices with Spring Boot**

- Setting up Spring Boot projects for microservices
- Service Layer, Repository Layer, and Controller Layer in Spring Boot
- Dependency Injection and Bean Configuration
- Security best practices for Spring Boot Microservices (JWT, OAuth2)

**5. Implementing Service Discovery and API Gateway**

- Introduction to Spring Cloud for Microservices
- Implementing Eureka Server for Service Discovery
- Spring Cloud Gateway as the API Gateway
- Routing and Load Balancing in Microservices

**6. Inter-Service Communication**

- Synchronous communication: REST APIs with Spring Rest Client /Web Client.
- Asynchronous communication: Messaging with RabbitMQ, Kafka, or Azure Service Bus
- Handling failures and retries with Resilience4j

**7. Data Management in Microservices**

- Database per service pattern with Spring Data JPA
- Polyglot persistence strategy in Spring Boot (SQL, NoSQL)
- Event Sourcing and CQRS with Spring Boot
- Managing distributed transactions using the Saga pattern

**8. Deploying Microservices on Azure Cloud**

- Overview of Azure cloud services (Azure App Service, Azure Kubernetes Service)
- Containerizing Spring Boot microservices with Docker
- Deploying Spring Boot microservices to Azure App Service
- Using Azure Kubernetes Service (AKS) for scaling Spring Boot microservices
- CI/CD pipeline for Microservices on Azure DevOps

**9. Scaling and Performance Optimization on Azure**

- Autoscaling microservices with Azure Kubernetes Service (AKS)
- Monitoring and scaling using Azure Monitor and Application Insights
- Optimizing the performance of Spring Boot microservices on Azure

**10. Security Considerations for Microservices on Azure**

- Implementing JWT for securing Microservices
- Role-Based Access Control (RBAC) in Azure
- Securing API Gateway with Azure Active Directory
- Network security and Azure Virtual Network for Microservices

**11. Handling Failures and Ensuring Resiliency**

- Circuit Breaker pattern using Spring Cloud Netflix Hystrix or Resilience4j
- Distributed tracing with Spring Cloud Sleuth and Azure Application Insights
- Managing retries, timeouts, and fallbacks in Spring Boot microservices

**12. Monitoring, Logging, and Observability**

- Centralized logging with ELK Stack (Elasticsearch, Logstash, Kibana) on Azure
- Distributed tracing with Spring Cloud Sleuth and Azure Application Insights
- Using Prometheus and Grafana for monitoring Spring Boot microservices on Azure

**13. Testing Microservices with Spring Boot**

- Unit testing and integration testing with Spring Boot
- Testing inter-service communication (Contract Testing with Spring Cloud Contract)
- End-to-end testing with tools like Postman and RestAssured

**14. Best Practices and Patterns for Microservices**

- Effective versioning of microservices and APIs
- Design patterns for Microservices (e.g., API Gateway, CQRS, Event Sourcing)
- Cloud-Native principles for designing Microservices
- Managing microservice lifecycle in Azure

**15. Future Trends and Innovations**

- Serverless architectures and Azure Functions for Microservices
- Machine Learning and AI in Microservices on Azure
- Kubernetes and the future of cloud-native microservices

**16. Q&A and Wrap-up**

- Questions and clarifications
- Recap of key learnings and takeaways.