CSE-Zzz: Microservices Architecture and Application Development

Programme: B.Tech (CSE) Year: 3 Semester: 6
Course: Program Core Credits: 3 Hours: 40

Course Context and Overview (100 words):

The architectural style of microservices is gaining momentum for rapid application development (RAD) in large scale enterprise environments. Besides in-depth discussion of the technicality of microservices using Spring Boot, Spring Cloud (Java based frameworks) this course also emphasizes on why microservices are well-suited to modern computing environments which require short development and delivery cycles. This course also covers associated tools necessary to successfully deploy, manage and monitor microservices based applications using containers and Kubernetes.

Prerequisites Courses:

Advanced Programming, Information and Database Management Systems.

Course outcomes (COs):

On completion of this course, the students will have the ability to:
CO1 Discuss the Rapid Application Development, Full stack development and microservices architecture.
CO2 Explain fundamentals of microservices and continuous delivery.
CO3 Discuss the leading products in market for microservice development and deployment.
CO4 Design and develop microservice based application using Spring Boot in Java.
CO5 Managing operational complexity by deploying microservices using containers and Kubernetes.

Course Topics:

Contents	**Lecture Hours**	
UNIT – 1: Fundamentals of Microservices		10
1.1 Overview of Rapid Application Development and Full Stack Development	1	
1.2 Concepts of Microservices and Characteristics of a Microservices Applications	1	
1.3 Concepts of Monolythic Architecture Style, Service Oriented Architecture and Microservices Architecture	3	
1.4 Getting Started with Spring Boot 2.0	3	
1.5 Auto-Configuration of String Boot Application	2	
UNIT-2: Spring Boot Microservices Important Components		8
2.1 Spring Boot CLI	1	
2.2 Monitoring the Applications using Spring Boot Actuator	2	
2.3 Cloud-Native Applications using Spring Cloud	2	
2.4 Database Access and RESTful Services	2	
2.5 React Programming	1	
UNIT-3:Advanced Components of Microservices		8

3.1 Creating API Gateway using Netflix Zuul Proxy	2	
3.2 HTTP API with Feign Client	2	
3.3 Building Event-Driven and Asynchronous Reactive Systems	2	
3.4 Building Resilient System using Hystrix and Turbine	2	
UNIT-4: Microservices Testing and Security		6
4.1 Test Driven Development, Unit Testing and Integration Testing	1	
4.2 Hands on JUnit	2	
4.3 JUnit and Spring Boot Applications	1	
4.4 Spring Security	1	
4.5 OAuth 2.0	1	
UNIT-5: Scalable Microservices with containerization and Kubernetes		8
5.1 Introduction and Background of Containers	1	
5.2 Dockerizing Spring Boot Application	2	
5.3 Creating Docker Images and Docker Compose	2	
5.4 Using Kubernetes to handle operational complexity	3	

Textbook references:

Text Book:

1. Dinesh Rajpoot, *Mastering Spring Boot 2.0: Build modern, cloud-native, and distributed systems using Spring Boot*, Packt Publishing Ltd., 1st Edition, May 2018.
2. Juha Hinkula, *Hands-On Full Stack Development with Spring Boot 2.0 and React*, Packt Publishing ltd., 1st Edition, Jun 2018.

Reference books:

1. Josh Long, Kenny Bastani, *Cloud Native Java: Designing Resilient Systems with Spring Boot, Spring Cloud, and Cloud Foundry*, O'Reilly Media, 1st edition, September 2017

Additional Resources (Video Lectures, Web resources etc.): MOOC Video Lectures

1. Lecture Notes, White Papers and online tutorials.

Evaluation Methods:

Component	Weightage (%)
Surprise Quiz	10%
Programming Assignment **	10%
Choice on Midterm exam* / Project development**	35%
Endterm	45%

*** Students are supposed to select one option from attempting midterm exam or development of a microservice (in Spring Boot) based small working project (in a team of 2-3 members). With a restriction of every member should work on every component of the project as there will be separate marking of each member of team.**

There will be two review of project work progress, in third and fourth week of course, in case of unsatisfactory progress you have to go for mid-term exam.
**** Any kind of copy-paste/ code plagiarism will result in zero marks awarded for project work and assignment.**

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