

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	BTech All (Other than CSE)
Course Code:	Service Oriented Architecture
Course Title:	3CS403IE24
Course Type:	Interdisciplinary Minor-Elective
Year of Introduction:	2024-25

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Course Learning Outcomes (CLO):

At the end of the course, the students will be able to –

1. infer the key advantages and complexities present in microservice architectures (BL2)
2. apply appropriate architectural approaches for the design of microservices (BL3)
3. choose appropriate techniques and technologies to develop microservice applications effectively (BL5)
4. interpret the deployment of microservice applications on cloud platforms. (BL5)

Unit	Contents	Teaching Hours (Total 45)
Unit-I	Introduction to Microservices: Monolithic architecture, Web Services and Service Oriented Architecture, SOA, and Microservice architecture	03
Unit-II	Microservice Architecture Concepts: Microservice software architecture: patterns and techniques, Overall topology and core architecture components, Architectural characteristics, Service components and granularity, Bounded context, Data domains, API Ecosystem for Microservice, API layer design and implementation alternatives, API Gateway, Service discovery and registration, best practices of microservice architecture.	08
Unit-III	Messaging Middleware: IPC in a microservice architecture, Synchronous and asynchronous messaging patterns, REST and gRPC-based messaging, Service bus for commands and events, Message queuing systems, Message broker, JMS, Rabbit MQ, and Kafka, Message driven microservice application.	10
Unit-IV	Managing Databases for Microservices: Distributed databases, NoSQL-based systems, CAP and BASE consistency models for microservices, CRUD operations, Shared databases, and Database per microservice pattern, Scaling and replicating databases.	06
Unit-V	Transactions and Data Streaming in Microservices: Managing transactions with Sagas: choreographed, orchestrated, Event sourcing and CQRS Pattern, CDC with Transactional outbox pattern, Transaction log tailing, Streaming data in microservices, Streaming SQL, Data streaming approaches with Apache Spark and Kafka.	08



Unit-VI	Hybrid Architectures and Deployment: Event-driven architecture for microservices, Architectural modularity, Serverless microservices architecture pattern, Caching, Load balancing, Circuit Breaker, Deployment patterns and strategies with containers, Virtual machines and clusters, Container Orchestration Approaches, Microservices deployment on Public Cloud platforms, Microservices Testing, Health check and observability, Securing Microservices	10
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Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents

Suggested Readings/ References:

1. Chris Richardson, Microservices Patterns With examples in Java, Manning publication
2. Binildas C, Practical Microservices Architectural Patterns, Apress
3. Sam Newman, Building Microservices: Designing fine-grained systems, O'Reilly Media
4. Sam Newman, Monolith to Microservices, O'Reilly
5. Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen, Microservice Architecture: Aligning Principles, Practices, and Culture, Shroff/O'Reilly
6. Susan J. Fowler, Microservices in Production, O'Reilly Media
7. Morgan Bruce, Paulo A. Pereira, Microservices in Action, Manning publication
8. Vaughn Vernon, Implementing Domain-Driven Design, Addison-Wesley
9. Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, Head First Design Patterns: A Brain-Friendly Guide, Shroff/O'Reilly
10. Jez Humble and David Farley, Continuous Delivery, Addison-Wesley Professional
11. Bill Wagner, Mike Rousos, .NET Microservices: Architecture for containerized .Net applications, Microsoft Corporation

Suggested List of Experiments: -NA-