

**NIRMA UNIVERSITY
INSTITUTE OF TECHNOLOGY
Master of Computer Application (2-Year Programme)
Semester-II**

Department Elective-I

L	T	P	C
3	0	2	4

Course Code	3MCAD253
Course Name	Micro Service Architecture and Programming

Course Learning Outcomes (CLO):

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

1. recognize the key advantages and complexities present in micro service architectures
2. apply appropriate architectural approach for the design of micro services
3. implement micro service applications effectively with the suitable techniques and technologies
4. implement data streaming approaches using suitable tools and technologies

Syllabus:

**Teaching
Hours:45**

Unit I

Introduction to micro services: monolithic architecture, distributed architecture, web services and service oriented architecture, SOA and micro-service architecture, API ecosystem for micro-service.

4

Unit II

Micro-service architecture concepts: micro-service software architecture: patterns and techniques, overall topology and core architecture components, distributed architecture considerations, service components and granularity, bounded context, data domains, architectural characteristics, API layer design and implementation alternatives, service discovery and registration, best practices of micro-service architecture.

8

Unit III

Managing databases for micro services: distributed databases, NOSQL based systems: key-value based, document based, column based and graph databases, crud and CQRS concepts, data consistency model for micro service, cap theorem, shared databases, database per micro service, scaling databases and storage services.

7



Unit IV 7

Transactions and data streaming in micro services: managing transactions with sagas: choreographed, orchestrated and interwoven, event sourcing, transaction log tailing and polling publisher, streaming data in micro services, streaming SQL, data streaming approaches with Apache Spark and Kafka.

Unit V 6

Messaging middleware: IPC in micro service architecture, synchronous and asynchronous messaging patterns, REST and gRPC based messaging, service bus for commands and events, message broker, message queuing systems, message driven micro service application.

Unit VI 7

Hybrid architectures and scalability: service-oriented architecture and micro services architecture, service-based architecture, event-driven architecture for micro services, architectural modularity, server-less micro services architecture pattern, caching, load balancing, deployment strategies for scaling with containers, virtual machines and clusters, scaling micro services with orchestration and choreography, circuit breaker.

Unit VII 6

Applications and Security: Micro services and DevOps, using DevOps tools, decomposition approaches of monolithic applications, service testing, service monitoring, continuous delivery, case studies of large scale online shopping systems, micro-service security principles, OAuth 2.0, securing data at rest, Deployment options of Micro services.

Self-Study:

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

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated that will be considered for evaluation.

Suggested Readings^:

1. Sam Newman, Building Microservices: Designing fine grained systems, O'Reilly Media
2. Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen, Microservice Architecture: Aligning Principles, Practices, and Culture, Shroff/O'Reilly
3. Susan J. Fowler, Microservices in Production, O'Reilly Media
4. Chris Richardson, **Microservices Patterns With examples in Java**, Manning publication
5. Morgan Bruce, Paulo A. Pereira, Microservices in Action, Manning publication
6. Vaughn Vernon, Implementing Domain-Driven Design, Addison-Wesley

7. Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, Head First Design Patterns: A Brain-Friendly Guide, Shroff/O'Reilly
8. Jez Humble and David Farley, Continuous Delivery, Addison-Wesley Professional
9. Scott W Ambler & Pramod Sadalage, Refactoring Databases: Evolutionary Database Design, Addison-Wesley Professional
10. Cesar de la Torre, Bill Wagner, Mike Rousos, .NET Microservices: Architecture for containerized .Net applications, Microsoft Corporation

L=Lecture, T=Tutorial, P=Practical, C=Credit

^this is not an exhaustive list

