Bethlehem University

Spring 2025

Faculty of Applied Sciences, Technology and Engineering

Technology Department, Software Engineering Major

SWER313 - Service Oriented Architecture

Instructor: Dr. Rawan Gedeon
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Office Hours: Mon: 8:30-9:30, Tue: 11:45-12:45, Wed: 9:00-10:00, Thu: 8:30-9:30.

Course Description:
This course introduces the concepts and principles of Service-Oriented Architecture (SOA) and provides hands-on experience with implementing and consuming services using Spring Boot. Students will gain a comprehensive understanding of SOA design patterns, technologies, and best practices, enabling them to develop loosely coupled, scalable, and agile software systems.

Learning Objectives:
- Define and explain the core principles of SOA.
- Identify the benefits and challenges of implementing SOA.
- Design and develop services using RESTful APIs with Spring Boot.
- Utilize key SOA technologies like Web Services, SOAP, and WSDL.
- Implement service discovery and communication mechanisms.
- Apply security best practices in SOA deployments.
- Utilize testing and monitoring tools for SOA services.

Course Topics:
Week 1: Introduction to Distributed Systems and SOA Concepts

- Distributed computing challenges
- Monolithic vs. microservices architecture
- SOA principles and benefits
- Key SOA components (services, contracts, registries)

Week 2: Introduction to Spring Boot and Web Development

- Setting up Spring Boot development environment
- Building basic Spring Boot applications
- Introduction to RESTful APIs and Spring MVC

Week 3: RESTful API Design Principles

- REST architecture and constraints
- Designing resource representations (JSON, XML)
- HTTP methods and status codes

Week 4: Implementing Services with Spring Boot

- Building RESTful endpoints with Spring MVC
- Data binding and validation
- Exception handling and security

Week 5: Service Contracts and Communication Protocols

- SOAP vs. REST: choosing the right protocol
- WSDL for service contracts
- Utilizing tools like Swagger for API documentation

Week 6: Security in SOA

- Authentication and authorization mechanisms (OAuth, JWT)
- API security best practices and threat mitigation
- Secure communication protocols (HTTPS)

Week 7: Testing and Monitoring SOA Services

- Unit testing, integration testing, and contract testing
- Monitoring performance and health metrics
- Logging and tracing for service debugging

Week 8: Microservices Architecture with Spring Boot

- Breaking down monoliths into microservices
- Inter-service communication patterns
- Containerization and orchestration with Docker and Kubernetes

Week 9: Service Discovery and Communication Mechanisms

- Service registries (Eureka, Zookeeper)
- Load balancing and routing strategies

Week 10: API Gateway and service composition

Week 11: Circuit breaker pattern and resilience strategies

Week 12 - 13: Event-driven architecture and message brokers (Apache Kafka, RabbitMQ) **(If time allows)**

Week 14: Case Studies and Real-World Applications

- Exploring SOA implementations in various industries
- Analyzing challenges and best practices in real-world scenarios

Week 15: Project Presentations and Demonstrations

- Each team presents their project and demonstrates functionalities

Assessment: (Subject to Change)

- Labs Submissions: 10%
- Lab Final Exam: 10%
- Midterm exam: 20%
- Final project: 25%
    - Step 1
    - Step 3
- Final Exam: 35%

Tools and Technologies:

- Git
- VS Code
- Maven
- Spring Boot
- Java
- Postman