Enterprise Application Integration

1. **Course number and name:** 020IAEES5/020EAIES5 Enterprise Application Integration

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours

3. **Name of course coordinator:** Rawad Assaf

4. **Instructional materials:** course slides (Moodle); lab sessions (Moodle)

   References:
   - Building Microservices, Designing fine-grained systems (O'Reilly)
   - Microservices Patterns WITH EXAMPLES IN JAVA (MANNING)
   - Designing Event-Driven Systems: Concepts and Patterns for Streaming Services with Apache Kafka
   - Restful Web Services (O'reilly)
   - Enterprise Integration Patterns (Wesley)
   - Architecting Distributed Cloud Applications (edx course)

5. **Specific course information**
   a. **Catalog description:**
      This course details the constraints and challenges of enterprise application integration, and shows the need to apply different Enterprise Integration patterns for each use case. It explains the difference between data, interface, or process integration. It explains the importance of business process automation. It describes centralized approaches with a hub-spoke architecture, using asynchronous messaging, according to the messenger pattern, as well as using an enterprise service bus. It details the microservice architecture and its deployment on the cloud through containerization/orchestration. It addresses the business complexity of microservices with Domain Driven Design and the CQRS pattern. It covers aspects related to implementing resilient cloud applications by embracing failure. Finally, it introduces the use of an event-driven architecture for the integration of data-intensive applications using Apache Kafka.

   b. **Prerequisites:** None

   c. **Required** for CCE Software Engineering Option students; **Selected Elective** for students in the CCE Artificial Intelligence and Telecommunication Networks Options.

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Evaluate the benefits, constraints and challenges of the different integration techniques and methodologies.
      - Understand business process modeling with BPMN.
      - Tackle Business Complexity in a Microservice with DDD and CQRS Patterns

- Implement, containerize, orchestrate and deploy a microservice architecture on the cloud.
- Implement resilient cloud applications by embracing failure and using the appropriate patterns (circuit breaker, retry patterns, etc...).

- Implement an Event-Driven Microservices architecture using apache Kafka.

b. PI addressed by the course:

PI	1.1	1.2	1.3	2.1	2.2	2.3	2.5
Covered	x	x	x	x	x	x	x
Assessed	x	x	x	x	x		x

7. Brief list of topics to be covered

- Evolution of enterprise application integration (2 lectures)
- Architecting Distributed Cloud Applications on the Cloud (2 lectures)
- Networking Communication (2 lectures)
- Messaging Communication (2 lectures)
- Versioning, Upgrading, and Configuration (2 lectures)
- Leader Election (2 lectures)
- Storage Services (2 lectures)
- Docker and Microservices (2 lectures)
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- DDD et CQRS (2 lectures)
- Business Process Modeling with BPMN (2 lectures)
- Kafka (2 lectures)
- Kafka (2 lectures)
- Event-driven architecture (2 lectures)