Course Syllabus

Code - Course Title	**AYG224 - Asynchronous Systems and Message Queues**
Course Type	IV. SEMESTER
Laboratory + Practice	2+1
ECTS	**3.0**
Language of Instruction	Türkçe
Course Type	Area Elective Courses
Course Instructor(s)	ÖĞR. GÖR. AHMET MÜCAHİD ARVASİ

Mode of Delivery	Face to face
Prerequisites	There are no prerequisites or corequisites for this course.

Course Syllabus

Weeks	Learning Outcomes	Topics	Teaching Methods
Week - 1		Asynchronous Communication Fundamentals: Comparison of Synchronous and Asynchronous Architectures, Message Queue Concepts	
Week - 2		Producer and Consumer Models, Differences Between Event and Message	
Week - 3		RabbitMQ Architecture 1: Working Principle, Exchange Types (Direct, Topic, Fanout, Headers), and Routing	
Week - 4		RabbitMQ Architecture 2: Message Durability, Consumer Acknowledgments, and Dead Letter Queues	
Week - 5		Introduction to the Kafka Ecosystem: Log-Based Architecture, Broker, Topic, and Partition Logic	
Week - 6		Kafka Architecture: Offset Management, Consumer Groups, and Message Replication	
Week - 7		Event-Driven Design Fundamentals: State Transfer and Event Sourcing	
Week - 8		Midterm Exam	
Week - 9		Transaction Management and Data Consistency Challenges in Distributed Systems	
Week - 10		Saga Pattern: Distributed Transaction Solutions with Choreography and Orchestration Approaches	
Week - 11		System Reliability: Design of Idempotent Transactions and Compensation Logic	
Week - 12		Schema Management: Schema Registry, Avro/Protobuf Formats, and Backward Compatibility	
Week - 13		Observability and Metrics: Monitoring Queue Metrics (Prometheus, Grafana), Latency Analysis, and Bottleneck Detection	
Week - 14		Security and Projects: Authentication/Authorization Configurations in Messaging Systems and End-of-Term Project Presentations	

Learning Outcomes

#	Learning Outcome
1	Upon successful completion of this course, students will reach the competence to grasp the fundamental components of event-driven architectures by comparing synchronous and asynchronous communication models; deeply analyze and apply the architectural structures (exchange types, partitioning, offset management) of modern messaging tools like RabbitMQ and Apache Kafka; develop advanced design patterns such as event sourcing and the Saga pattern to ensure data consistency in distributed systems; increase system reliability with idempotent transaction design and schema versioning while building high-performance and secure messaging infrastructures through monitoring queue metrics, latency analysis, and authorization configurations.

Sustainable Development Goals

No content has been provided.

Course Theme

No content has been provided.

AKTS Workload

Activity	Duration (Hour)	Count	Workload
Teorik Derse Katılım	0	0	0
Sınıf Dışı Çalışma (Ön Hazırlık & Pekiştirme Amaçlı)	0	0	0
Ödevler	0	0	0
Proje - Rapor - Sunum Hazırlama	0	0	0
Ara Sınav Hazırlığı (sınav süresi dahil)	0	0	0
Final Sınavı Hazırlığı (sınav süresi dahil)	0	0	0
Uygulama (Laboratuvar, Müzik/Enstrüman Uygulaması, Atölye/Saha Çalışması vb.)	0	0	0
Staj Uygulaması	0	0	0
		Calculated ECTS	**0**

Assessment Method and Passing Requirements

No content has been provided.