

Course Name : Advanced Distributed Programming							
Course Code	Course Type	Regular Semester	Lecture (hours/week)	Seminar (hours/week)	Lab. (hours/week)	Credits	ECTS
CMP 503	B	Fall	3.00	1.00	0.00	3.50	6.00
Lecturer Sadije Bushati, Prof. Dr							
Assistant Kleona Elezi, Msc							
Course language Albanian							
Course level Master							
Description The course “Advanced Distributed Programming” focuses on concepts and techniques for building robust, secure, and scalable distributed applications. It covers communication models, synchronization, state management, and real-world distributed environments like cloud systems, microservices, and messaging technologies.							
Objectives To understand the architecture and design of distributed systems. To apply communication and synchronization protocols in code. To develop distributed applications using modern technologies. To use best practices for performance, security, and scalability.							
Core Concepts Inter-process communication (RPC, gRPC, REST) Coordination and synchronization in distributed systems State management (stateful vs stateless architectures) Failover, replication, and fault tolerance Docker, Kubernetes, microservices Cloud-based and peer-to-peer distributed programming							
Course Outline							
Week	Topic						
1	Introduction to Distributed Programming						
2	Architectures and Communication Models						
3	Communication with RPC and gRPC						
4	Synchronization and Coordination						
5	State Management and Caching						
6	Failures and Fault Tolerance						
7	Replication and Consistency Models						
8	Midterm Exam						
9	Microservices and RESTful Interfaces						
10	Docker and Orchestration with Kubernetes						
11	Message-based and Event-driven Programming						
12	Cloud and Serverless Programming						
13	Monitoring, Logging, and Testing in Distributed Systems						
14	Security in Distributed Systems						
15	Final Project Presentations						
16	Final Exam						

Prerequisites	The student must attend the course at a minimum rate of 75%.			
Literature	<ul style="list-style-type: none"> • George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair - Distributed Systems: Concepts and Design, 5th Edition, Pearson, 2012. 			
References	<ul style="list-style-type: none"> • Tanenbaum, A. S., & Van Steen, M. - Distributed Systems: Principles and Paradigms, 2nd Edition, Pearson, 2006. • Martin Kleppmann - Designing Data-Intensive Applications, O'Reilly, 2017. • Rajkumar Buyya - High Performance Cluster Computing: Programming and Applications, Prentice Hall, 1999. 			
Course Outcome				
1	Students will understand the design and implementation of distributed applications.			
2	They will apply effective communication between components in a network.			
3	They will develop resilient systems using modern tools such as Docker and Kubernetes.			
4	They will understand the challenges of replication, synchronization, and state management.			
Course Evaluation				
	In-term Studies	Quantity	Percentage	
	Midterms	1	25	
	Quizzes	0	0	
	Projects	0	0	
	Term Projects	0	0	
	Laboratory	1	15	
	Class Participation	1	10	
	Total in-term evaluation percent		50	
	Final exam percent		50	
	Total		100	
ECTS Workload (Based on Student Workload)				
	Activities	Quantity	Duration (hours)	Total (hours)
	Course duration (Including the exam week: 16x Total hours of the course)	16	4	64
	Study hours outside the classroom (Preparation, Practice, etc.)	14	5	70
	Duties	0	0	0
	Midterms	1	10	10
	Final Exam	1	10	10
	Other	0	0	0
	Total Work Load			154
	Total Work Load / 25 (hours)			6.16
	ECTS			6.00