Course Information Form

Title	Code	Local Credit	ECTS	Lecture (hour/week)	Practical (hour/week)	Laboratory (hour/week)
Intelligent Control Systems	KOM5101	3	7.5	3	0	0

Prerequisite	None

Semester	Spring

Course Language	English
Level Of Course	Second Cycle
Course Category	Major Area Courses
Mode Of Delivery	Face-to-Face

Owner Academic Unit	Department of Control and Automation Engineering
Course Coordinator	Claudia Fernanda Yaşar
Instructor(s)	Claudia Fernanda Yaşar
Asistant(s)	

Course Objectives	To introduce intelligent-based control systems to overcome modelling difficulties and to use computationally efficient procedures for directing a complex system. Intelligent control systems include expert systems, machine learning, and deep learning, among others, and have a high-level decision-making scheme that generates the control signal based on a qualitative or heuristic understanding of the process.
Course Content	Intelligent Control Systems: Computational Thinking Tools for Control Engineers, Dynamical System Modeling, Model Predictive Control MPC, Data-driven modelling, data-driven control techniques Introduction to machine learning, Introduction to deep learning, Introduction to reinforcement learning Information-Theory Models, General Applications on Motor Control Systems, Robotic Control Systems, and Control System Reliability.
Recommended Optional Program Components	None

Course Learning Outcomes

1	To enable students to comprehend the fundamental principles underlying intelligent systems and their application in modelling, identification, and management of complex engineered systems.
2	To provide students with the skills to analyze dynamics and control systems, and to evaluate the practical considerations involved in experimental or simulated structures, employing computationally efficient tools.
3	To raise a comprehensive understanding among students of various data-driven modelling and data-driven control applications, enabling them to undertake a specific project and assess system performance effectively.

Weekly Subjects and Related Preparation Studies

Week	Subjects	Related Preparation
1	Introduction to intelligent control systems (knowledge-based vs data-driven systems)	Course Notes
2	Computational tools for Control Engineers	Course Notes

3	Dynamical systems modelling	Course Notes
4	MPC Model Predictive Control	Course Notes
5	Introduction to machine learning	Course Notes
6	Data-driven modeling	Course Notes
7	Data-driven modeling	Course Notes
8	Midterm 1 / Practice or Review	
9	Data-driven control techniques	Course Notes
10	Data-driven control techniques	Course Notes
11	Introduction to Deep Learning	Course Notes
12	Introduction to Reinforcement Learning	Course Notes
13	Applications	NA
14	Applications	NA
15	Practical Studies	Course Notes
16	Final	

Evaluation System

Activities	Number	Percentage of Grade
Attendance/Participation		10
Laboratory		
Application		
Field Work		
Special Course Internship (Work Placement)		
Quizzes/Studio Critics		
Homework Assignments	1	30
Presentations/Jury	1	10
Project	1	30
Seminar/Workshop		
Mid-Terms	1	20
Final		
Percentage of In-Term Studies		100
Percentage of Final Examination		
TOTAL		100

ECTS Workload Table

Activities	Number	Duration(Hour)	Total Workload
Course Hours	16	3	48
Laboratory			
Application			
Field Work			

Study Hours Out of Class	13	8	104
Special Course Internship (Work Placement)			
Homework Assignments			0
Quizzes/Studio Critics	3	6	18
Project	1	20	20
Presentations / Seminar	1	6	6
Mid-Terms (Examination Duration + Examination Prep. Duration)	1	18	18
Final (Examination Duration + Examination Prep. Duration)	0	0	0
		Total Workload	214
		Total Workload / 30(h)	7.13
		ECTS Credit	7

Extra Notes	None