Faculty of Electrical Engineering / AUTOMATICS AND INDUSTRIAL ELECTROTECHNICS / Design and implementation of ISAU

Course:	Design and implementation of ISAU			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
13278	Mandatory	3	5	3+1+0
Programs	AUTOMATICS AND INDUSTRIAL ELECTROTECHNICS			
Prerequisites	None			
Aims	The objectives of the course are to familiarize students with the basic concepts of intelligent automatic control systems, the characteristics of such systems, and the applications of intelligent control systems in practice.			
Learning outcomes	After passing this exam, the student will be able to: analytically and through computer simulations approach the analysis of intelligent automatic control systems; understand the principles of various techniques used in intelligent control systems (neural networks, fuzzy logic, etc.); implement complex linear or nonlinear control algorithms; identify, design, and implement an appropriate soft-computing technique to solve a specific engineering problem.			
Lecturer / Teaching assistant	Žarko Zečević, Luka Martinović			
Methodology	Lectures, exercises, consultations, independent study.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Introduction to intelligent control systems.			
I week exercises	Introduction to intelligent control systems.			
II week lectures	Basics of fuzzy sets.			
II week exercises	Basics of fuzzy sets.			
III week lectures	Fuzzy arithmetic and fuzzy relations.			
III week exercises	Fuzzy arithmetic and fuzzy relations.			
IV week lectures	Fuzzy logic and approximate reasoning.			
IV week exercises	Fuzzy logic and approximate reasoning.			
V week lectures	Fuzzy rule base. Introduction to fuzzy control.			
V week exercises	Fuzzy rule base. Introduction to fuzzy control.			
VI week lectures	Standard fuzzy controllers.			
VI week exercises	Standard fuzzy controllers.			
VII week lectures	Fuzzy PID controller.			
VII week exercises	Fuzzy PID controller.			
VIII week lectures	Modeling systems using fuzzy sets.			
VIII week exercises	Modeling systems using fuzzy sets.			
IX week lectures	Midterm exam.			
IX week exercises	Midterm exam.			
X week lectures	Basics of neural networks. Feedforward and recurrent neural networks.			
X week exercises	Basics of neural networks. Feedforward and recurrent neural networks.			
XI week lectures	Control structures based on a neural model of the process.			
XI week exercises	Control structures based on a neural model of the process.			
XII week lectures	Design of neuro-controllers.			
XII week exercises	Design of neuro-controllers.			
XIII week lectures	MRAC fuzzy controller.			
XIII week exercises	MRAC fuzzy controller.			

XIV week lectures	Neuro-Fuzzy control systems.
XIV week exercises	Neuro-Fuzzy control systems.
XV week lectures	Midterm exam (make-up).
XV week exercises	Midterm exam (make-up).
Student workload	

Per week	**Per semester**
5 credits x 40/30=6 hours and 40 minuts 3 sat(a) theoretical classes 0 sat(a) practical classes 1 excercises **2 hour(s) i 40 minuts** of independent work, including consultations	Classes and final exam: **6 hour(s) i 40 minuts x 16 =106 hour(s) i 40 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **6 hour(s) i 40 minuts x 2 =13 hour(s) i 20 minuts** Total workload for the subject: **5 x 30=150 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **30 hour(s) i 0 minuts** Workload structure: **106 hour(s) i 40 minuts (cources), 13 hour(s) i 20 minuts (preparation), 30 hour(s) i 0 minuts (additional work)**
Student obligations	Regular attendance at classes, appropriate behavior, attending knowledge tests.
Consultations	after lectures and by appointment.
Literature	Guanrong Chen, Trung Tat Pham - „Introduction to Fuzzy Sets, Fuzzy Logic, and Fuzzy Control Systems“, CRC Press, 2019. Omid Omidvar, David L. Elliott - „Neural Systems for Control“, Academic Press, 1997.
Examination methods	Project 10 points Midterm exam 40 points Final exam 50 points
Special remarks	
Comment	

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points