

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Control Systems		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Artificial Intelligence Methods		
Lecturer (for lectures)		Milojković T. Marko		
Lecturer/associate (for exercises)		Milovanović B. Miroslav		
Lecturer/associate (for OFE)		Milovanović B. Miroslav		
Number of ECTS	5	Course status (obligatory/elective)	Obligatory	
Prerequisites				
Course objectives				
Understanding the basic concepts of artificial intelligence, the work of the fuzzy logic and genetic algorithms, mathematical formulation and numerical realization of elementary types of artificial neural networks. Applications of artificial intelligence methods in systems control.				
Course outcomes				
Students will be trained in designing regulators based on artificial neural networks, genetic algorithms and fuzzy logic. Independent research will be emphasized within the appropriate Matlab toolboxes, which will be the first professional steps in the areas of artificial intelligence and intelligent control.				
Course outline				
Theoretical teaching				
Introduction to artificial intelligence. History of artificial intelligence. Intelligent agents. Basics of neural networks. Classification of neural networks. Basic properties of neural networks. Application of neural networks. Learning Algorithms for Neural Networks. Application of neural networks. Control algorithms based on neural networks. Classification of search and optimization procedures. Genetic algorithms. Minimizing the fitness function. Operators in genetic algorithms (selection, mutations, crossover). The influence of different parameters on the performance of the genetic algorithm. Fuzzy sets. Fuzzy logic. Linguistic variables. Mechanism of the fuzzy concluding phase. Fuzzification and defuzzification. Mamdani and Takagi-Sugeno fuzzy systems. Fuzzy control systems. Examples of design and implementation of the fuzzy control in industrial processes.				
Practical teaching (exercises, OFE, study and research)				
Working within the Matlab / Simulink software package and using toolbox (Neural Network Toolbox, Fuzzy Logic Toolbox, Global Optimization Toolbox) to demonstrate work, implement and test intelligent control structures.				
Textbooks/references				
1	M. Negnevitsky, "Artificial Intelligence – a Guide to Intelligent Systems", Addison Wesley, 2005.			
2	P. Subasic, "Fuzzy logic and neural networks", Technical Book, Belgrade, 1997. (in Serbian)			
3	S. V. Kartalopoulos, "Understanding Neural Networks and Fuzzy Logic: Basic Concepts and Applications", Wiley-IEEE Press, 1996.			
4	V. Rankovic, "Intelligent control", Faculty of Mechanical Engineering, Kragujevac, 2008. (in Serbian)			
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0
Teaching methods				
Lectures, Practical exercises, Laboratory computer exercises, Consultations				
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures			Written exam	30
Exercises		20	Oral exam	30
Colloquia				
Projects		20		