

Study program / course: Mechanical Engineering				
Type and level of study: Master academic studies				
Course: Intelligent control				
Lecturers: Ranković M. Vesna				
Status of course: Obligatory for module M₅, II semester				
Number of ECTS: 6				
Precondition: No				
The objective of course				
Students learn about fuzzy controllers and neural networks for control. Genetic algorithm will be used for optimization of controller parameters. On practical classes, Fuzzy Logic Toolbox and Neural Networks Toolbox will be applied in synthesis controllers. Neural network will be used in the identification and control of dynamic systems.				
The outcome of course				
This course will give students an comprehension of the fundamental principles of the intelligent control and the possible applications.				
Syllabus				
Theoretical study				
Conventional Control. Nonlinear control. Characteristics of intelligent systems. Elements of the fuzzy sets theory. Approximative reasoning. Basic structure of fuzzy controller. Inputs and outputs selection for fuzzy controller. Fuzzification. Knowledge base. Inference. Defuzzification. Takagi-Sugeno fuzzy controller. Fuzzy industrial controllers. Fuzzy P, PD, PID controllers. Examples of applications.				
Neural network. Neuron model. Network architectures and training. Perceptron architecture. Perceptron learning rule. Widrow-Hoff learning rule. Feedforward multi-layer neural networks. Backpropagation learning algorithm. Radial Basis Function (RBF) neural network. Recurrent neural networks. Hopfield network. Neural networks for process modeling, identification and control. Examples of applications.				
A basic genetic algorithm. Representation of solutions. Initialization of the population. Fitness function. Selection. Recombination. Mutation. Optimization criterium. Optimization of controller parameters based on genetic algorithm. Application expert systems to control.				
Practical Studies:				
Practical classes are carried out in computer laboratories. MATLAB is used.				
Recommended reading				
1. Subašić P., Fuzzy logic and neural networks, Technical book, Belgrade, 1997. (in Serbian)				
2. Robert E. King , Computational Intelligence in Control Engineering, Marcel Dekker, 1999.				
http://www.reking.protia.net/ci/				
The number of hours of active teaching:				Other classes:
Theory: 2	Practical classes: 1.6	Other forms of teaching: 0.4	Research study: 0	1
Methods of teaching				
Lessons, auditory and laboratorial classes, independent work.				
Evaluation of knowledge				
Pre-final exam obligations	points	Final exam	points	
Activities during the classes:	5		30	
Colloquiums(s) :	40			
Seminar(s) :	25			