DESCRIPTION OF THE COURSES

- Course code: ARR3224
- Course title: Fuzzy control
- Language of the lecturer: polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*1*		*1*		
*Number of hours/semester**	*15*		*15*		
Form of the course completion	*test*				
ECTS credits					
Total Student's Workload					

- Level of the course (basic/advanced): advanced
- Prerequisites: Control engineering, programming in Matlab
- Name, first name and degree of the lecturer/supervisor: dr inż Krzysztof Szabat
- Names, first names and degrees of the team's members: : prof. dr hab. inż. Teresa Orłowska-Kowalska, mgr inż. Marcin Kamiński
- Year:V Semester:IX
- Type of the course (obligatory/optional): optional
- Aims of the course (effects of the course): knowledge about fuzzy-control
- Form of the teaching (traditional/e-learning): traditional
- Course description: The course aims at thorough discussing of the influence of specific parameters on fuzzy model (the influence of membership functions, type of t-norm and s-norm, defuzzyfication methods and rule base). Different types of fuzzy controllers are presented. The difference between linear and fuzzy controllers is pointed out. Methods of design and tuning of fuzzy models are presented, i.a. the application of genetic algorithms. Methods of stability proof for systems with fuzzy controllers are considered. The problems of industrial applications of fuzzy control are addressed.
- Exercises with the use of computers include the application of Matlab-Simulink and Fuzzy Logic Toolbox to simulating dynamic properties of systems with classical and fuzzy logic controllers.
- Lecture:

Particular lectures contents	*Number of hours*
1. *Introduction to fuzzy control.*	*2*
2. Classical and fuzzy control. Similarity and difference.	*2*
3. The fuzzy models. Fuzzyfication, interference and defuzzyfication.	*2*
4. Tunning methods of fuzzy controllers.	*2*
5. Adaptive fuzzy control.	*2*
6. Stability analysis of systems with fuzzy controllers.	*2*
7. Industrial application of fuzzy control.	*2*

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:

1. Organizing meeting. Mathematical models of the objects. Short introduction to Matlab-Simulink.
2. Design of the Mandani-type fuzzy controller. Application of the fuzzy controller in the control structure for DC drive.
3. Adaptive fuzzy control of the one-mass system (electrical drive). Application of the neuro-fuzzy controller.
4. Position control of the electrical drive. Application on the fuzzy compensator in the case of the system uncertainties.
5. Classical and fuzzy sliding mode control.
6. Adaptive sliding mode control for the electrical drives.
7. Selected exercises.

- Project – the contents:
- Basic literature:

  1. Michels K., Klawonn F., Kruse R., Nürnberger A., Fuzzy Control – Fundamentals, Stability and Design of Fuzzy Controllers, *Springer*, 2006
- Additional literature:

  1.Yager R.R., Filev D.P., Essential of Modelling and Control, John Wiley & Sons, Inc., 1994

  2. Fuzzy Logic Toolbox, the Mathworks corp.
- Conditions of the course acceptance/credition: test

***** - depending on a system of studies