FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Komputerowo wspomagane modelowanie i projektowanie układów regulacji**
Name in English:	**Computer aided modeling and design of the control system**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	**Industrial Electrical Engineering**
Level and form of studies:	**2nd level, part-time**
Kind of subject:	**obligatory**
Subject code:	**ELR053270**
Group of courses:	**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	11		22		
Number of hours of total student workload (CNPS):	30		60		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	1		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student has a basic knowledge of automation, informatics and modeling.

SUBJECT OBJECTIVES

C1. The acquisition expanded knowledge of the design and modeling of control systems for various objects. Learning and expanding knowledge of linear control algorithms PI / PID controllers state regulators plain, fuzzy, adaptive systems, and methods of estimation of the state variables of dynamic objects.

C2. Gaining skills in modeling and design of complex buildings and industrial processes and their critical analysis.

C3. The acquisition and consolidation of social skills including creative activity.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 Student has an extended knowledge of the design and modeling of control systems for various objects using linear methods.

PEU_W02 Student has knowledge fuzzy, predictive and adaptive control structures and methods of estimation of the state variables of dynamic objects.

relating to skills:

PEU_U01 Student can model advanced control system based on the linear control theory.

PEU_U02 Student can model and analyse complex control system based on linear, non-linear and adaptive theory.

relating to social competences:

PEU_K01 Understands the needs for team work on finding and improving the methods of problem solving.

PROGRAMME CONTENT

	Form of classes - lecture	Number of hours:
Lec 1	Organizational matters. Classification of control systems. Cascade control structure.	2
Lec 2	Control structure with the state space controller.	2
Lec 3	Fuzzy Control - basic definitions, systems (Mamdani, TSK), the method for selecting the parameters.	2
Lec 4	Adaptive control – types of, design, predictive control	2
Lec 5	State variable estimators.	2
Lec 6	Summary	1
	Total hours:	**11**

Form of classes - laboratory		Number of hours:
Lab 1	Organizational matters. Modeling the basic systems in Matlab-Simulink	2
Lab 2	Modeling of the cascade control structure for the selected dynamic object. The use of different methods for selection of the parameters of the controller. Anti-windup system.	4
Lab 3	Modeling of the control structure with state-controller for the selected dynamic object	2
Lab 4	Modeling of the fuzzy control structure for the selected dynamic object.	4
Lab 5	Modeling of the adaptive control structure for selected dynamical plant	2
Lab 6	Modeling of the model predictive control structure for the selected object	4
Lab 7	Modeling of the state estimators for selected plants	3
Lab 8	Summary	1
	Total hours:	**22**

TEACHING TOOLS USED
N1. A multimedia presentation with elements of traditional lecture
N2. Consultation
N3. Writting and oral tests

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEU_W01 PEU_W02	Written tests
P(W)	P=F1	
F1(L)	PEU_U01 PEU_U02 PEU_K01	Rate of programs
P(L)	P=F1	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE:
[1] T. Kaczorek, A. Dzieliński, W Dobrowolski, R. Łopatka. Podstawy teorii sterowania, WNT, 2005 [2] Piotr Tatjewski Sterowanie zaawansowane obiektów przemysłowych. Struktury i algorytmy, Exit 2002. [3] Piegat A., Modelowanie sterowanie i rozmyte, Akademicka Oficyna Wydawnicza EXIT, 1999 [4] Rutkowska D., Piliński M., Rutkowski L., Sieci neuronowe, algorytmy genetyczne i systemy rozmyte, PWN, 1997
SECONDARY LITERATURE:
[1] K. Ogata – Modern Control Engineering [2] V. Utkin, J. Guldner, J. Shi, Sliding Mode Control in Electromechanical Systems, Taylor & Francis, 1999. [3] A.H. Glattfelder, W. Schaufelberger, Control Systems with Input and Output Constrains, Springer, 2003.

SUBJECT SUPERVISOR
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