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:	**ELR043270**
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):	81		108		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	3		4		
including number of ECTS points for practical (P) classes :			4		
including number of ECTS points for direct teacher-student contact (BK) classes:	2.10		2.80		

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 EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Student has an extended knowledge of the design and modeling of control systems for various objects using linear methods.

PEK_W02 Student has knowledge fuzzy, predictive and adaptive control structures and methods of estimation of the state variables of dynamic objects.

relating to skills:

PEK_U01 Student can model advanced control system based on the linear control theory.

PEK_U02 Student can model and analyse complex control system based on linear, non-linear and adaptive theory.

relating to social competences:

PEK_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 EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEK_W01 PEK_W02	Written tests
P(W)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_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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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR043270 - Computer aided modeling and design of the control system
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**
AND SPECIALIZATION **Industrial Electrical Engineering**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	S2ETP_W06	C.1	Lec1 Lec2	N.1 N.2
PEK_W02	S2ETP_W06	C.1	Lec3 Lec4 Lec5 Lec6	N.1 N.2
PEK_U01	S2ETP_U03	C.2	Lab1 Lab2 Lab3	N.2 N.3
PEK_U02	S2ETP_U03	C.2	Lab4 Lab5 Lab6 Lab7 Lab8	N.2 N.3
PEK_K01	K2ETK_K06	C.3	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.1 N.2 N.3