FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Podstawy modelowania systemów**
Name in English:	**Fundamentals of system modelling**
Main field of study (if applicable):	**Industrial Control Engineering**
Specialization (if applicable):	**Automation and Control in Electrical Power Systems**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**obligatory**
Subject code:	**APR012111**
Group of courses:	**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		15		
Number of hours of total student workload (CNPS):	30		30		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	1		1		
including number of ECTS points for practical (P) classes :			1		
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		0.70		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student should have the basic knowledge of fundamentals of the algebra and differential equations.
2. Student should know how to calculate parameters of the basic dynamic devices.
3. Student should know how to use MATLAB and SIMULINK for engineering calculation.

SUBJECT OBJECTIVES

C1. To provide knowledge of methods for representation of different dynamic systems.
C2. Learning how to formulate digital models of dynamic linear and nonlinear systems.
C3. To provide knowledge of modelling and analysis of dynamic systems in time and frequency domain.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 – Student gets the knowledge on description of computer simulation models: deterministic and probabilistic.
PEU_W02 Student gets the knowledge regarding application of adequate model for evaluation of the analysed system.

relating to skills:

PEU_U01 Student is able to prepare of adequate model to reproduce basic characteristic of the physical system.
PEU_U02 Student is able to apply the simulation results for adequate description of the analyed system.

relating to social competences:

PEU_K01 Student can act independently and cooperate within a group working on a complex engineering project.

PROGRAMME CONTENT

	Form of classes - lecture	Number of hours:
Lec 1	General introduction – aims of the course. Establishing conditions for passing and marking the course. Methods and tools for system modelling.	2
Lec 2	Preparation of time-dependent models. Simulation methods.	2
Lec 3	Modelling of nonlinear dynamic systems	2
Lec 4	Modelling and analysis of the nonlinear oscillations.	2
Lec 5	Event dependent models. Queue issue.	2
Lec 6	Deterministic versus stochastic models	2
Lec 7	Input-output stochastic models.	2
Lec 8	Qualified test.	1
	Total hours:	**15**

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of health and safety rules, and general regulations of the laboratory. Establishing conditions for passing and marking the project course. The lab presentation. Basic models in SIMULINK.	2
Lab 2	Modelling of nonlinear dynamic processes.	2
Lab 3	Representation of complex behaviour of simple systems. Simulation analysis of the chaotic process.	2
Lab 4	Representation of complex behaviour of simple systems. Simulation analysis of the chaotic process.	2
Lab 5	Modelling of event dependent processes. Queue issue.	2
Lab 6	Stochastic process modelling. Monte Carlo method.	2
Lab 7	Generation of random series.	2
Lab 8	Additional term.	1
	Total hours:	**15**

TEACHING TOOLS USED
N1. Informative lecture
N2. MATLAB/SIMULINK simulation program.

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	Attendance on lectures
F2(W)	PEU_W01 PEU_W02	Qualified test
P(W)	P = 0,1F1 + 0,9F2	
F1(L)	PEU_U01 PEU_U02 PEU_K01	Activity in the lab work
F2(L)	PEU_U01 PEU_U02 PEU_K01	Lab reports
P(L)	P = 0,3F1 + 0,7F2	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Materials for the cours, available in: http://www.rose.pwr.wroc.pl/
[2] ROSOŁOWSKI E., Komputerowe metody analizy elektromagnetycznych stanów przejściowych. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2009.
[3] MODZELEWSKI P., CITKO W., Modelowanie dynamiki chaotycznej w środowisku Matlab-Simulink. ZESZYTY NAUKOWE AKADEMII MORSKIEJ W GDYNI, nr 70, wrzesień 2011, s. 45-61.

SECONDARY LITERATURE:

[1] BIAŁYNICKI-BIRULA I., BIAŁYNICKA-BIRULA I., Modelowanie rzeczywistości. Wydawnictwo Naukowo-Techniczne WNT, Warszawa, 2007.
[2] Modelowanie rzeczywistości. Materiały do kursu, dostępne: http://www.neuroinf.pl/Members/danek/swps/
[3] BIRTA L.G., ARBEZ G., Modelling and Simulation. Exploring Dynamic System Behaviour., Springer-Verlag London Limited 2007.
[4] CHATURVEDI D.K., Modeling and simulation of systems using MATLAB and Simulink. CRC Press, Boca Raton, 2010.
[5] SEVERANCE F.L., System modeling and simulation. An introduction. JOHN WILEY & SONS, LTD, Chichester 2001.
[6] MORRISON F., Sztuka modelowania układów dynamicznych deterministycznych, chaotycznych, stochastycznych. WNT, Warszawa, 1996.
[7] MICHALIK M., ROSOŁOWSKI E., Simulation and analysis of power system transients. PRINTPAP, 2011.
[8] AWREJCEWICZ J., Matematyczne modelowanie systemów. WNT, Warszawa 2007.

SUBJECT SUPERVISOR

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