FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Informatyka – modelowanie cyfrowe**
Name in English:	**Computer engineering – digital modelling**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	
Level and form of studies:	**1st level, part-time**
Kind of subject:	**obligatory**
Subject code:	**ELR052163**
Group of courses:	**NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	10			10	
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 circuit theory and basics of differential calculus.
2. Student should know how to analyse steady states and transients in linear RLC circuits

SUBJECT OBJECTIVES

C1. To provide knowledge of methods for solving differential equations describing electrical circuits.

C2. Learning how to formulate digital models of electrical circuits and to conduct analyses regarding accuracy, stability and frequency characteristics.

C3. To provide knowledge of modelling a power line with distributed parameters.

C4. Familiarization with principles of using professional simulative programs, in particular with ATP-EMTP program as an example, for simulating transients in electrical circuits.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 Student gets the knowledge on description of linear electrical circuits with use of differential equations and their numerical solution applying different numerical procedures of integration.

PEU_W02 Student gets the knowledge on modelling a single phase lossless power line with distributed parameters and knows how to include a resistance into the model.

relating to skills:

PEU_U01 Student is able to model linear elements and branches conducts a simulation and analyses waveforms of signals from a modelled system.

PEU_U02 With use of the ATP-EMTP program, student is able to model linear elements and RLC branches and also a power transmission line with distributed parameters, in particular, applying a graphical editor of this program, forms a structure of a simulative model, sets simulation parameters

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. Introduction into discrete models and its application to nodal equations.	2
Lec 2	Digital models of linear RLC elements of lumped parameters. Errors of digital approximation.	2
Lec 3	Models of circuits composed of RLC elements.	2
Lec 4	Modelling of nonlinear RLC networks.	2
Lec 5	Modelling of linear network of lumped parameters using state variables method.	1
Lec 6	Qualified test.	1
	Total hours:	**10**

Form of classes - project		**Number of hours:**
Proj 1	Presentation of health and safety rules, and general regulations of the laboratory. Establishing conditions for passing and marking the project course. General familiarization with the ATPDraw graphical editor of the ATP-EMTP program.	2
Proj 2	Modelling of single-phase circuits composed of RLC elements.	2
Proj 3	Modelling of a circuit with a full-wave rectifier.	2
Proj 4	Modelling of single-phase RLC circuits with a varistor.	2
Proj 5	Simulation of circuits with distributed parameter lines.	2
	Total hours:	**10**

TEACHING TOOLS USED
N1. – Informative lecture
N2. Simulation program.
N3. Project report

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=0,1*F1+0,9*F2	
F1(P)	PEU_U01 PEU_U02 PEU_K01	Activity in the project work
F2(P)	PEU_U01 PEU_U02 PEU_K01	Project reports
P(P)	P=0,3*F1+0,7*F2	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Michalik M., Rosołowski E., Simulation and analysis of power system transients. PRINTPAP, 2011.
[2] http://zas.ie.pwr.wroc.pl/ER/przyklady_D1/index.html - przykłady niektórych modeli wraz z plikami źródłowymi do programu ATP-EMTP.

SECONDARY LITERATURE:

[1] WATSON N., ARRILAGA J., Power systems electromagnetic transients simulation. The Institution of Electrical Engineers, 2003.
[2] ROSOŁOWSKI E., Komputerowe metody analizy elektromagnetycznych stanów przejściowych. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2009.

SUBJECT SUPERVISOR

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