FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Systemy elektroenergetyczne 1**
Name in English:	**Electric Power Systems 1**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	
Level and form of studies:	**1st level, full-time**
Kind of subject:	**obligatory**
Subject code:	**ELR052504**
Group of courses:	**NO**

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student has the knowledge of analysis, matrices, differentiation, integration, matrix equations and numerical methods.
2. Student has the basic knowledge of the analysis methods of 3- and 1-phase electric circuit in the coordination set of ABC and 012.
3. Student is capable of using Ohm's and Kirchhoff's laws and matrices to solve steady and short-circuit states of linear electric circuits.
4. Student is capable of using the electrical engineering knowledge for modeling energy sources and receivers of energy.
5. Student understands the need of various knowledge to integrate.
6. Student understands the need of improving his/her skills all the time.

SUBJECT OBJECTIVES

C1. To assimilate knowledge associated with the transmission and distribution of electricity.
C2. To get to know modeling power system elements in steady and short circuit states.
C3. To become skillful at the analysis of voltage, current, active and reactive power in radial systems.
C4. To become skillful at the analysis of currents in balanced and unbalanced short-circuits.

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 Student has the knowledge concerning the steady state model creation and the load flow methods.

PEU_W02 Student has the knowledge concerning the short-circuit model creation and the methods of short-circuit analysis.

relating to skills:

relating to social competences:

PEU_K01 Student is responsible for making decisions on power systems.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours:**
Lec 1	Contemporary problems of generation and transmission electricity.	2
Lec 2	Equivalent scheme of overhead and cable lines and transformers.	2
Lec 3	Modeling and calculating the radial transmission network. Individual work no. 1.	2
Lec 4	Mathematical background of load flow in transmission networks.	2
Lec 5	Computer methods of load flow calculation.	2
Lec 6	Balanced short-circuit. Matrix equations, the equivalent voltage source of electric power systems.	2
Lec 7	Unbalanced short-circuit. The symmetrical components method.	2
Lec 8	Equivalent schemes and parameters in the symmetrical components of 012.	2
Lec 9	Short-circuit calculation according to IEC. Example short-circuit analysis. Individual work no. 2.	2
Lec 10	One-phase short-circuit in the middle voltage network.	2
Lec 11	Renewable energy sources - modeling the wind farms.	2
Lec 12	The wind farms - power system analysis.	2
Lec 13	Computer short-circuit analysis in electric power systems.	2
Lec 14	Electric power systems with the big amount of dispersed generation Computer short-circuit analysis in electric power systems.	2
Lec 15	Microgeneration in a power system.	2
	Total hours:	**30**

TEACHING TOOLS USED
N1. Information lecture and multimedia presentation.
N2. Presenting problems in the form of individual controlled work.

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	Individual work no. 1 concerning load flow in radial network.
F2(W)	PEU_W02	Individual work no. 2 concerning balanced and unbalanced short-circuits in multi-voltage system.
P(W)	P = 0.5F1 + 0.5F2	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE:
[1] Kremens Z., Sobierajski M.,Electric power system Analysis. Warsaw WNT 1996 . /in polish/ [2] Kacejko P., Machowski J., Short-circuits in electric power systems. Warsaw WNT 2002. /in polish/
SECONDARY LITERATURE:
[1] Kacejko P., Dispersed generation in electric power system. Wydawnictwa Politechniki Lubelskiej 2004. /in polish/

SUBJECT SUPERVISOR
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