

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, part-time**
 Kind of subject: **obligatory**
 Subject code: **ELR052567**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	20				
Number of hours of total student workload (CNPS):	90				
Form of crediting:	examination				
For group of courses mark (X) final course:					
Number of ECTS points:	3				
including number of ECTS points for practical (P) classes:					
including number of ECTS points for direct teacher-student contact (BK) classes:	2.10				

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.
 C5. To become skill at the analysis of the stability of radial power system.

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.
 PEU_W03 Student has the knowledge concerning the analysis of the stability of radial transmission systems.

*relating to skills:**relating to social competences:*

- PEU_K01 Student is aware of the responsibility for making decisions on power systems.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Contemporary problems of generation and transmission electricity. Equivalent scheme of overhead and cable lines and transformers.	2
Lec 2	Modeling and calculating the radial transmission network. Individual work no. 1.	2
Lec 3	Computation of load flow in transmission networks.	2
Lec 4	Balanced short-circuit. Matrix equations, the equivalent voltage source of electric power systems.	2
Lec 5	Unbalanced short-circuit. The symmetrical components method. Equivalent schemes and parameters in the symmetrical components of 012. Individual work no. 2.	2
Lec 6	Short-circuit calculation according to IEC. Example short-circuit analysis.	2
Lec 7	One-phase short-circuit in the middle voltage network.	2
Lec 8	The analysis of stability of radial transmission systems. Individual work no. 3.	2
Lec 9	Voltage and frequency control in electric power systems.	2
Lec 10	The quality of electrical energy.	2
Total hours:		20

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 <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F2(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.
F3(w)	PEU_W03	Individual work no. 3 concerning the analysis of radial transmission systems.
P(w)	P=0.4F1+0.4F2+0.2F3 Examination in case of P<3.0	

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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