

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Systemy ochrony przed zagrożeniami prądem elektrycznym**  
 Name in English: **Systems of protection against electric shock**  
 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: **ELR042401**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		30		
Number of hours of total student workload (CNPS):	30		60		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	1		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		1.40		

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Knowledge of the basic principles of electrical engineering
2. Basic knowledge of the construction of low-voltage electrical installations
3. Basic knowledge of the construction and operation of the electrical equipment and apparatus
4. Basic ability to connect the measurement circuits
5. Basic ability to use the electrical quantities meters
6. Ability to cooperate in a team
7. Ability to think and act creatively

**SUBJECT OBJECTIVES**

- C1. Knowledge of operation rules of electric shock protection systems used in low-voltage installations  
 C2. Knowledge of effectiveness criteria of electric shock protection systems in low-voltage installations  
 C3. Knowledge of principles of low-voltage electrical installations testing

**SUBJECT EDUCATIONAL EFFECTS***relating to knowledge:*

- PEK\_W01 Student has knowledge of the effects of electrical current on the human body  
 PEK\_W02 Student has knowledge of the protective systems and protective measures used in low-voltage installations as well as knowledge of criteria of effectiveness of the shock protection measures in low-voltage installation  
 PEK\_W03 Student has knowledge of the principles of testing of low-voltage electrical installations as well as knowledge of the principles of working on low-voltage electrical equipment

*relating to skills:*

- PEK\_U01 Student is able to perform the verification measurements in low-voltage electrical installations  
 PEK\_U02 Student is able to evaluate the results of measurements and make a report for verification

*relating to social competences:*

- PEK\_K01 Student can effectively cooperate in a team performing electrical verification tests

## PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Basic definitions and designations in protection against electric shock The impact of electric current on human beings	2
Lec 2	Classes of protection of electrical equipment Degrees of protection provided by enclosures	2
Lec 3	Low-voltage networks systems The criteria of protection against electric shock	2
Lec 4	Basic protection measures used in low-voltage installations	2
Lec 5	Fault protection measures used in low-voltage installations	2
Lec 6	Main and supplementary protective equipotential bonding; earthing	2
Lec 7	Initial and periodic verification of electrical low-voltage installations The principles of safe work organization on electrical equipment	2
Lec 8	Final test	1
Total hours:		<b>15</b>

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of safety rules and guidelines in the laboratory. Establish the requirements for crediting. General introduction to the stand of laboratory.	2
Lab 2	Resuscitating of persons shocked by electric current	2
Lab 3	Measurement of the resistance and the continuity of protective conductors and protective equipotential bonding conductors	2
Lab 4	Measurement of insulation resistance and electric strength test of electrical installation and electrical equipment	2
Lab 5	Examination of protection by automatic disconnection of supply with overcurrent devices - technical method for measurement of fault loop impedance	2
Lab 6	Examination of protection by automatic disconnection of supply with overcurrent devices - special meters for electrical installations	2
Lab 7	Examination of protection by automatic disconnection of supply with residual current devices	2
Lab 8	The test of potential distribution on the surface of the soil in the vicinity earthing systems	2
Lab 9	Laboratory measurement of earth electrode resistance and the resistivity of soil	2
Lab 10	Measurement of insulation resistance of floors and walls	2
Lab 11	Measurement of touch voltage	2
Lab 12	Examination of the impact of TN and TT systems parameters on the electric shock hazard	2
Lab 13	Measurements of parameters, electric shock hazard and fire hazard in IT system	2
Lab 14	Measurements of the electric field distribution on the overhead line model	2
Lab 15	Additional term Laboratory crediting	2
Total hours:		<b>30</b>

## TEACHING TOOLS USED

- N1. Multimedia presentation
- N2. Informative lecture
- N3. Introductory, short informative lecture
- N4. Basic meters of electrical quantities
- N5. Special meters for electrical installations

## EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEK_W01 PEK_W02 PEK_W03	presence at the lecture
F2(w)	PEK_W01 PEK_W02 PEK_W03	final test
P(w)	$P = 0,25F1 + 0,75F2$	
F1(L)	PEK_U01 PEK_U02 PEK_K01	activity in the laboratory
F2(L)	PEK_U01 PEK_U02	report
P(L)	$P = 0,25F1 + 0,75F2$	

## PRIMARY AND SECONDARY LITERATURE

### PRIMARY LITERATURE:

- [1] Markiewicz H.: Bezpieczeństwo w elektroenergetyce: zagadnienia wybrane. WNT, Warszawa 2009

### SECONDARY LITERATURE:

- [1] PN-IEC 60364 Instalacje elektryczne w obiektach budowlanych (norma wieloarkuszowa)  
 [2] PN-HD 60364 Instalacje elektryczne niskiego napięcia (norma wieloarkuszowa)  
 [3] Ustawa „Prawo budowlane” wraz z rozporządzeniami wykonawczymi

## SUBJECT SUPERVISOR

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### MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **ELR042401 - Systems of protection against electric shock** AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **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	K1ETK_W32	C.2	Lec1	N.1 N.2
PEK_W02	K1ETK_W32	C.1 C.2	Lec2 Lec3 Lec4 Lec5 Lec6	N.1 N.2
PEK_W03	K1ETK_W32	C.1 C.2	Lec7	N.1 N.2
PEK_U01	K1ETK_U29	C.3	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14	N.3 N.4 N.5
PEK_U02	K1ETK_U29	C.3	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.3 N.4 N.5
PEK_K01	K1ETK_K05 K1ETK_K06	C.3	Lec4 Lec5 Lec7 Lec8 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14	N.3 N.4 N.5