

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Urządzenia elektryczne 2**  
 Name in English: **Electrical Devices 2**  
 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: **ELR042302**  
 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):	60		60		
Form of crediting:	examination		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	2		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40		1.40		

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

1. Student has a knowledge of range of the basis of physics, in particular understands mechanisms of the heat conduction as well as ionization and deionization of gases and liquids, he understand functioning of the simple machines.
2. Student has a knowledge of range of the basis of electrical engineering, determines the parameters of the alternating current (AC) circuits.
3. Student knows the basic of computer service.
4. Student act in full consciousness of impend over a life and a health as well as the safely operation of electrical devices.
5. The student knows the principles of construction and operation of low voltage electrical devices.

**SUBJECT OBJECTIVES**

- C1. Acquirement of knowledge of the range of a competent classification of high voltage electrical devices and their fundamental parameters.
- C2. Acquirement of knowledge of the extinguishing manners of the electrical arc in high voltage circuit-breakers.
- C3. Acquisition of knowledge of the general principles of the classification and construction of high voltage power devices.
- C4. Acquirement of knowledge of the supplying and the distributive networks .in industrial and municipal buildings.
- C5. Acquirement of knowledge of the planning as well as the realization measurements of electrical devices and installations as well as a critical opinion of obtained results.
- C6. Acquirement and establish of know-how of safely operation at electrical devices and at installations.
- C7. Acquirement and establish of social competences which refer to the know-how of a co-operate in team, as well as a self-dependence, a responsibility and a honesty in the behaviour and consciousness in effects of the undertaken engineering activity.

## SUBJECT EDUCATIONAL EFFECTS

*relating to knowledge:*

- PEK\_W01 Student is able to describe the classification of voltages and of high voltages devices and explain the range of the constructional aspect of high voltage circuit-breakers as well as of the extinguish manners of electrical arc.
- PEK\_W02 The student should be able to describe the power supplies used for industrial and municipal facilities and basic principles of improving the reliability of power supply of various buildings.
- PEK\_W03 Student has a increased and verification in the practice knowledge of range of a construction and of a functioning various electrical power engineering devices.

*relating to skills:*

- PEK\_U01 The student should be able to carry out tests of ellectrical devices and nstallations.
- PEK\_U02 The student is able to make a report for verification and to evaluate the results of measurements.

*relating to social competences:*

- PEK\_K01 Student has a established competence for the co-operation in a team in realization of the specified task and has the sense of responsibility for their tasks.

## PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Levels of the nominal voltages in the network as well as nominal voltages of insulation of the high voltage electric power devices. Conditions of lightning protection in high voltage facilities.	2
Lec 2	DC and AC arc quenching in high voltage breakers..	2
Lec 3	Electric high voltage power switches: classification and basic parameters of switches.	2
Lec 4	Electric high voltage power breakers: rules of construction and basic parameters of switches.	2
Lec 5	Power transformers and power autotransformers. Division, vector groups, control of voltage.	2
Lec 6	General classification of electrical power substations. Division, main and auxiliary circuits in substations. High voltage electric power switchgears.	2
Lec 7	Supply and distribution of electrical energy in industrial and municipal buildings.	2
Lec 8	The reliability of the power supply. Redundant power systems. Restitution automation.	1
Total hours:		<b>15</b>

Form of classes - laboratory		Number of hours:
Lab 1	Introduction to the laboratory. Presentation of the principles of safe work on electrical equipment in the lab. To familiarize students with the location of laboratory stands and exercise program, the principles of measurement and reporting of measurements taken.	2
Lab 2	Working and short-circuit load of wiring and electrical apparatus.	2
Lab 3	Contact resistance.	2
Lab 4	DC and AC electrical arc.	2
Lab 5	Electrical lighting technology and lighting sources.	2
Lab 6	AC static switches.	2
Lab 7	The effectiveness of automatic disconnection.	2
Lab 8	Residual current protective devices (RCDs).	2
Lab 9	Low-voltage circuit breakers.	2
Lab 10	Low voltage motor protection.	2
Lab 11	Control systems of motors by contactors.	2
Lab 12	Low-voltage switchboards.	2
Lab 13	The use of programmable relays for electrical installations.	2
Lab 14	Introduction to the intelligent installation.	2
Lab 15	Additional term of classes. Rating.	2
Total hours:		<b>30</b>

## TEACHING TOOLS USED

- N1. Information lecture with audio-visual techniques.
- N2. Problema discussion.
- N3. Laboratory exercises conducted in groups of students.
- N4. Personal consultations.
- N5. Develop the reports of performed exercises.

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	Written or oral exam.
P(W)	P=F1	
F1(L)	PEK_U01	Oral or written questions (checking of preparation for classes).
F2(L)	PEK_U01 PEK_K01	Activity during classes.
F3(L)	PEK_U02 PEK_K01	Reports on implementation of exercises.
P(L)	$P = 0,6F1 + 0,2F2 + 0,2F3$	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [1] Markiewicz H., Urządzenia elektroenergetyczne, Wyd. 4, WNT, Warszawa 2015; [2] Markiewicz H., Instalacje elektryczne, Wyd. 8, WNT, Warszawa, current edition [3] Dołęga W., Klajn A., Kobusiński M., Laboratorium z urządzeń i instalacji elektrycznych, Oficyna Wydawnicza PWr, Wrocław 2004; <b>SECONDARY LITERATURE:</b> [1] Websites recommended by the Teacher.

SUBJECT SUPERVISOR
Mirosław Kobusiński, mirosław.kobusinski@pwr.edu.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
**ELR042302 - Electrical Devices 2**  
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_W28 K1ETK_W29	C.1 C.2 C.3	Lec1 Lec2 Lec3	N.1 N.4
PEK_W02	K1ETK_W28 K1ETK_W29	C.4	Lec6 Lec7 Lec8	N.1 N.4
PEK_W03	K1ETK_W28 K1ETK_W29	C.1 C.2 C.3	Lec3 Lec4 Lec5 Lec6	N.1 N.4
PEK_U01	K1ETK_U25	C.5 C.6 C.7	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.2 N.3 N.4 N.5
PEK_U02	K1ETK_U25	C.5	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.2 N.4 N.5
PEK_K01	K1ETK_K05 K1ETK_K09	C.7	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.2 N.3 N.5