

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Urządzenia i standardy sterowania instalacjami elektrycznymi**
 Name in English: **Devices and control standards of electrical installations**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable): **Automation and Control in Electrical Power Systems**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ARR042311**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30	30			
Number of hours of total student workload (CNPS):	120	60			
Form of crediting:	examination	crediting with grade			
For group of courses mark (X) final course:					
Number of ECTS points:	4	2			
including number of ECTS points for practical (P) classes :		2			
including number of ECTS points for direct teacher-student contact (BK) classes:	2.80	1.40			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses a knowledge in the field of the fundamentals of electrotechnics.
2. Has a basic knowledge in the field of the theory of electric circuits.
3. Has a basic knowledge in the field of apparatus, devices and electrical installations.
4. Can correctly and effectively apply a knowledge of linear algebra and analytical geometry to qualitative and quantitative analysis of mathematical issues connected with studied engineering branch.
5. Can apply a mathematical apparatus to analysis of linear electric circuits with sinusoidal AC force.
6. Can apply a mathematical apparatus to analysis of temporary states in linear electrical circuits.

SUBJECT OBJECTIVES

- C1. Getting to know principles of planning and designing of low voltage electrical installations in a building.
 C2. Possession a knowledge of elements of low voltage electrical installation, their selection and way of calculation of their parameters.
 C3. Possession a knowledge from range of electric energy quality in low voltage installation.
 C4. Getting to know control systems of receivers.
 C5. Acquisition of abilities to design low voltage electrical installation in a building.
 C6. Acquisition of abilities to design control and protection systems of receivers.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 Knows principles of planning and designing of low voltage electrical installations.
 PEK_W02 Knows elements of low voltage electrical installations.
 PEK_W03 Possesses a knowledge in range of selection of low voltage electrical installations and calculation of their parameters.

relating to skills:

- PEK_U01 Can design low voltage electrical installation in a building.
 PEK_U02 Can select and dimension elements of low voltage electrical installation.
 PEK_U03 Can select and dimension protection for low voltage electrical installation in a building.

relating to social competences:

- PEK_K01 Can think and act in creative and enterprising way. He/she is able to rank appropriately the priorities needed for realizing the respective task.

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Basic legal regulations concerned planning and designing of electrical installations in buildings.	2
Lec 2	Supply systems for low voltage customers.	2
Lec 3	Calculation of three-phase and one-phase short circuit currents in electrical installations.	2
Lec 4	Power demand and peak power in received installations.	2
Lec 5	Elements of installation in building. Planning of electrical installation in blocks of flats and general building industry.	2
Lec 6	Cables applied in electrical installations.	2
Lec 7	Low voltage switching apparatus.	2
Lec 8	Low voltage switchgears.	2
Lec 9	Overcurrent protection of receivers and cables in electrical installations and principles of its selection. Selectivity of overcurrent protection operation in electrical installations.	2
Lec 10	Over-voltage protection in electrical installations.	2
Lec 11	Earthing systems, principles of their selection and calculation.	2
Lec 12	Dimension and selection of electrical installation elements.	2
Lec 13	Energy quality in electrical installations.	2
Lec 14	Relay and digital control systems.	2
Lec 15	Control systems of receivers in electrical installations.	2
Total hours:		30

Form of classes - class		Number of hours:
CI 1	Calculation of three-phase short circuit currents in electrical installations.	2
CI 2	Calculation of one-phase short circuit currents in electrical installations.	2
CI 3	Planning of electrical installation elements.	2
CI 4	Selection of overcurrent protection for receivers - part 1.	2
CI 5	Selection of overcurrent protection for receivers - part 2.	2
CI 6	Overcurrent protection of cables in electrical installations.	2
CI 7	Dimensioning of electrical wiring - part 1.	2
CI 8	Dimensioning of electrical wiring - part 2.	2
CI 9	Selectivity of overcurrent protection operation in received installations.	2
CI 10	Planning and selection of switchgear, main and additional equalizer connections and building earthing - part 1.	2
CI 11	Planning and selection of switchgear, main and additional equalizer connections and building earthing - część 2.	2
CI 12	Solutions of example project tasks concerned dimensioning of electrical installation elements - part 1.	2
CI 13	Solutions of example project tasks concerned dimensioning of electrical installation elements - part 2.	2
CI 14	Examples of solutions of control and protection systems in relay technique.	2
CI 15	Test.	2
Total hours:		30

TEACHING TOOLS USED

- N1. Lecture with the use of audiovisual techniques, multimedia presentations.
 N2. Calculation exercises.
 N3. Problem exercises.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F – forming (during semester) P – concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEK_W01 PEK_W02 PEK_W03	Exam in written form.
P(w)	P=F1	
F1(c)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Activity on classes.
F2(c)	PEK_U01 PEK_U02 PEK_U03 PEK_K01	Test.
P(c)	$P=0.2 \cdot F1 + 0.8 \cdot F2$	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Dołęga W. Kobusiński M., Projektowanie instalacji elektrycznych w obiektach przemysłowych. Zagadnienia wybrane. Wyd. 2. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2012. [2] Markiewicz H., Instalacje elektryczne, Wyd. 4. WNT, Warszawa, 2002. [3] Praca zbiorowa, Poradnik inżyniera elektryka. Tom 3. Warszawa, WNT 2012.
SECONDARY LITERATURE: [1] PN-IEC 60364:2000 Instalacje elektryczne w obiektach budowlanych. [2] Markiewicz H., Bezpieczeństwo w elektroenergetyce. WNT, Warszawa, 1999. [3] Markiewicz H., Urządzenia elektroenergetyczne. WNT, Warszawa 2009.

SUBJECT SUPERVISOR
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR042311 - Devices and control standards of electrical installations
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Control Engineering and Robotics**
AND SPECIALIZATION **Automation and Control in Electrical Power Systems**

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	S2ASE_W09	C.1	Lec1 Lec2 Lec4 Lec5	N.1
PEK_W02	S2ASE_W09	C.2	Lec5 Lec6 Lec7 Lec8 Lec11	N.1
PEK_W03	S2ASE_W09	C.2 C.3 C.4	Lec3 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1
PEK_U01	S2ASE_U07	C.5	CI3 CI10 CI11 CI12 CI13 CI14	N.2 N.3
PEK_U02	S2ASE_U07	C.5	CI7 CI8 CI9 CI10 CI11 CI12 CI13 CI14	N.2 N.3
PEK_U03	S2ASE_U07	C.5 C.6	CI1 CI2 CI4 CI5 CI6 CI9 CI12 CI13 CI14	N.2 N.3
PEK_K01	K2AiR_K06	C.1 C.2 C.5 C.6	Lec5 Lec12 CI3 CI10 CI11 CI12 CI13 CI14 CI15	N.1 N.2 N.3