

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Urządzenia i stacje**
 Name in English: **Electrical Devices and Power Substations**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable):
 Level and form of studies: **1st level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ARR042301**
 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. It has a basic knowledge of electrical engineering.
2. Understands the need for training to improve professional skills, personal and social.

SUBJECT OBJECTIVES

- C1. Skilful classify electrical equipment, their construction and the basic parameters.
 C2. Acquisition of ability to distinguish between exposure: climatic, environmental and operating electrical equipment
 C3. Acquiring skills and problem solving useful in the selection of equipment in the electrical system.
 C4. Understanding the principles of operation of power stations, including the fields of distribution systems, circuits, typical distribution systems, design solutions, the needs of their own.
 C5. The acquisition of knowledge used in power stations operating the station equipment and substation automation solutions.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 The student has knowledge certainly mean exposure climatic, environmental and operating electrical power devices.
 PEK_W02 He has knowledge in the construction and operation of various electrical devices and their selection of electrical installations.
 PEK_W03 He knows the equipment and principles of operation of power stations, including: equipment and devices, circuits, typical switchgear systems, design solutions, the needs of their own.

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

- PEK_K01 The student is aware of the need to acquire and deepen self- knowledge.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Classification of electrical equipment. Climatic and environmental exposure. Class electromagnetic environment.	2
Lec 2	Short circuit in electric power systems: short-circuit current waveforms, near the generator circuit and short-circuit remote from generators.	2
Lec 3	Impedance power system components. Calculation of short-circuit currents by PNE, examples of short-circuit current calculations.	2
Lec 4	Thermal effects of operating currents.	2
Lec 5	Thermal effects of short-circuit currents.	2
Lec 6	Power connectors - classification and basic parameters of the connectors.	2
Lec 7	Switching electric arc. Terms of arc quenching.	2
Lec 8	Computing power and peak currents. Selection of the installation to the operating conditions and short-circuit. Securing the installation of circuit overload and short circuit.	2
Lec 9	Basic concepts, definitions, classifications and requirements for power stations. Overview of the basic equipment and electrical apparatus in substations.	2
Lec 10	Typical solutions of the distribution fields in substations.	2
Lec 11	Rail systems power stations (wiring diagrams, advantages and disadvantages, scope, sequence switching).	2
Lec 12	Power station without rail systems (wiring diagrams, advantages and disadvantages, scope).	2
Lec 13	Device needs its own AC and DC power.	2
Lec 14	Devices operating the station and Automatic Time Station (and lock control circuits, measurement circuits, signaling circuits, communication circuits).	2
Lec 15	Final test	2
Total hours:		30

TEACHING TOOLS USED
N1. Lecture with audio-visual technology, multimedia presentations.
N2. Consultation.

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 PEK_K01	Written test.
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Markiewicz H., Urządzenia elektroenergetyczne, Wyd. 4, WNT, Warszawa 2008. [2] Markiewicz H., Instalacje elektryczne, Wyd. 8, WNT, Warszawa 2012. [3] Dołęga W., Kobusiński M., Projektowanie instalacji elektrycznych w obiektach przemysłowych. Zagadnienia wybrane., Oficyna Wydawnicza PWr, Wrocław 2009. [4] Dołęga W., Stacje elektroenergetyczne, Wydawnictwo Politechniki Wrocławskiej, Wrocław 2007.
SECONDARY LITERATURE: [1] Praca zbiorowa, Poradnik inżyniera elektryka. Tom 3. Warszawa, WNT 2005. [2] Praca zbiorowa pod redakcją S. Kujszczyka, Elektroenergetyczne sieci rozdzielcze. Tom 1, 2. Warszawa, Oficyna Wydawnicza Politechniki Warszawskiej 2005 {Wiatr. J. Orzechowski M., Poradnik projektanta elektryka, wyd 5, Dom Wydawniczy Medium, Warszawa 2012

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**MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR042301 - Electrical Devices and Power Substations
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Control Engineering and Robotics**

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	K1AiR_W24	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec7	N.1 N.2
PEK_W02	K1AiR_W24	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec8	N.1 N.2
PEK_W03	K1AiR_W24	C.4 C.5	Lec9 Lec10 Lec11 Lec12 Lec13 Lec14	N.1 N.2
PEK_K01	K1AiR_K01	C.1 C.2 C.3 C.4 C.5	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1 N.2