

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Stacje elektroenergetyczne**  
 Name in English: **Power substations**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **optional**  
 Subject code: **ELR042307**  
 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):	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. Has a basic knowledge in the field of the theory of electric circuits.
2. Has a basic knowledge in the field of electrical apparatuses, devices and installations.
3. Understands a need and knows possibilities of continuous education, increasing of professional, personal and social competences.
4. Has awareness of responsibility for own work.

**SUBJECT OBJECTIVES**

- C1. Getting to know of principles of power substation functioning, in it: systems of branches, structures of main circuits, typical systems of switchgears, auxiliary devices.
- C2. Acquisition of knowledge of applied electrical devices and apparatuses in power substation and principles and criterions of their selection.
- C3. Acquisition of knowledge of applied devices of substation's movement and solution of station automatics in power substations.
- C4. Getting to know of computer systems of supervisory control and data acquisition in power substations.
- C5. Acquisition of knowledge in range of correct operation of power substations.

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

- PEK\_W01 Knows principles of power substation functioning, in it: systems of branches, structures of main circuits, typical systems of switchgears, auxiliary devices.
- PEK\_W02 Knows and can select electrical devices and apparatuses in power substation.
- PEK\_W03 Knows of computer systems of supervisory control and data acquisition in power substations.

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

- PEK\_K01 Has awareness of responsibility for own work and readiness of subordination in group principles of work and taking charge of commonly realized operations.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Basic information, definitions, classifications and requirements for power substations.	2
Lec 2	Review of basic electrical devices and apparatuses in power substations.	2
Lec 3	Typical solutions of branches in power substations.	2
Lec 4	Busbar systems in power substations (schemes of connection, advantages and disadvantages, range of using, sequence of switch functions).	2
Lec 5	Systems without busbars in power substations (schemes of connection, advantages and disadvantages, range of using).	2
Lec 6	Typical systems of switchgear installations: 220 kV and 400 kV switchgear installations, 110 kV switchgear installations, 20 kV switchgear installations, LV switchgear installations.	2
Lec 7	Constructional solutions of power substations and switchgear installations: outdoor stations, indoor stations, MV prefabricated stations	2
Lec 8	Constructional solutions of power substations and switchgear installations: MV switchgears, LV switchgears.	2
Lec 9	Criteria of selection of chosen devices of main circuits in power substation: selection of switching devices, selection of current and voltage transformers.	2
Lec 10	Power transformers in power substations (characteristic parameters and properties of transformers, criteria of transformers selection).	2
Lec 11	DC and AC auxiliary devices and ways of their supply.	2
Lec 12	Devices of substation's movement and station automatics (control circuits and interlocking systems, measurement circuits, signal circuits, communication circuits).	2
Lec 13	Exploitation of power substations.	2
Lec 14	SCADA systems in power substations.	2
Lec 15	Computer systems of supervisory control and data acquisition in power substations of professional energetics.	2
Total hours:		<b>30</b>

TEACHING TOOLS USED
N1. Lecture with the use of audiovisual techniques, multimedia presentations.

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	Exam in written form.
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [1] Dołęga W., Stacje elektroenergetyczne. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2007. [2] Markiewicz H., Urządzenia elektroenergetyczne. WNT, Warszawa 2009. [3] Praca zbiorowa, Poradnik inżyniera elektryka. Tom 3. WNT, Warszawa, 2012. <b>SECONDARY LITERATURE:</b> [1] Praca zbiorowa pod redakcją Adama Rynkowskiego i W. Jabłońskiego, Sieci, instalacje i urządzenia elektroenergetyczne o napięciu powyżej 1kV. Poradnik inżyniera elektryka, projektanta i inwestora. Wydawnictwo Verlag Dashofer Sp.z.o.o., Warszawa, 2011. [2] Praca zbiorowa pod redakcją S. Kujszczyka, Elektroenergetyczne sieci rozdzielcze. Tom 1, 2. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2005. [3] Praca zbiorowa pod redakcją S. Kujszczyka, Elektroenergetyczne układy przesyłowe. WNT, Warszawa, 1997.

SUBJECT SUPERVISOR
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
**ELR042307 - Power substations**  
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_EEN_W10	C.1	Lec1 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec11	N.1
PEK_W02	K1ETK_EEN_W10	C.2	Lec2 Lec9 Lec10	N.1
PEK_W03	K1ETK_EEN_W10	C.3 C.4 C.5	Lec12 Lec13 Lec14 Lec15	N.1
PEK_K01	K1ETK_K09	C.1 C.2 C.5	Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13	N.1