

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: **ELR052307**
 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):	120				
Form of crediting:	examination				
For group of courses mark (X) final course:					
Number of ECTS points:	4				
including number of ECTS points for practical (P) classes:					
including number of ECTS points for direct teacher-student contact (BK) classes:	2.80				

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 LEARNING OUTCOMES*relating to knowledge:*

- PEU_W01 Knows principles of power substation functioning, in it: systems of branches, structures of main circuits, typical systems of switchgears, auxiliary devices.
- PEU_W02 Knows and can select electrical devices and apparatuses in power substation.
- PEU_W03 Knows of computer systems of supervisory control and data acquisition in power substations.

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

- PEU_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:		30

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

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation <i>F - forming (during semester) P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEU_W01 PEU_W02 PEU_W03 PEU_K01	Exam in written form.
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [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.
SECONDARY LITERATURE: [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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