

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Zaawansowana technika wysokich napięć**
 Name in English: **Advanced High Voltage Technology**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable): **Control in Electrical Power Engineering**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ELR041120**
 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):	90		60		
Form of crediting:	examination		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	3		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	2.10		1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basics of physics and electrostatics
2. Fundamentals of materials engineering

SUBJECT OBJECTIVES

- C1. Getting to know the behavior of dielectric materials under the influence of a strong electric field
- C2. Acquiring practical skills necessary for the proper assembly of testing and measuring devices, and proper implementation and development of measurement results.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

PEK_W01 Can describe and explain phenomena and processes responsible for the behavior of insulating materials under the influence of a strong electric field

PEK_W02 Is able to describe high-voltage insulation systems

relating to skills:

PEK_U01 Knows how to properly perform measurements in high-voltage systems and then develop and interpret results.

PEK_U02 Can use the knowledge gained earlier to describe the mechanism of phenomena.

relating to social competences:

PEK_K01 Awareness of teamwork and responsibility of all members of the team for the execution of the task

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Electrostatic fundamentals	2
Lec 2	Electrification of solid and liquid materials. Electrostatic hazards. Electrostatic charge elimination techniques	2
Lec 3	Electrostatic precipitation	2
Lec 4	Electrostatic atomization and spraying	2
Lec 5	Electrostatic printing technology and electrophotography	2
Lec 6	Application of electrostatic separation	2
Lec 7	Nonthermal plasma - fundamentals and applications	2
Lec 8	High voltage generation	2
Lec 9	Electric field. Air dielectric strength.	2
Lec 10	The strength of insulating liquids.	2
Lec 11	The strength of solid dielectrics	2
Lec 12	High voltage cables	2
Lec 13	Overvoltages and its reduction	2
Lec 14	Non-destructive diagnostic methods.	2
Lec 15	Overhead high-voltage insulation.	2
Total hours:		30

Form of classes - laboratory		Number of hours:
Lab 1	Introduction, safety work regulations, subject area of the laboratory	3
Lab 2	Measurements of AC high voltage.	3
Lab 3	Test system of DC high voltage.	3
Lab 4	Surface electric strength of the post and bushing insulators under AC 50 Hz high voltage	3
Lab 5	Measurement of dielectric loss factor and partial discharges in the high voltage insulation systems	3
Lab 6	Voltage distribution on the string of disc insulators	3
Lab 7	Wave phenomena in the model long power line	3
Lab 8	Electric strength of insulation systems in the air at the AC high voltage	3
Lab 9	Generation and measurement of impulse high voltage	3
Lab 10	Last term, course acceptance	3
Total hours:		30

TEACHING TOOLS USED

- N1. traditional lecture
N2. Laboratory conducted in the traditional manner

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_K01	Written exam
P(W)	P=F1	
F1(L)	PEK_U02 PEK_K01	evaluation of preparation for laboratory classes
F2(L)	PEK_U01 PEK_U02 PEK_K01	Evaluation reports
P(L)	P=0.7*F1+0.3*F2	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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| <ul style="list-style-type: none">[1] Kuffel E., Zaengl W.S., Kuffel J., High Voltage Engineering Fundamentals. Newnes, Oxford, 2000[2] Holtzhausen J.P., Vosloo W.L., High Voltage Engineering, Practice and Theory. Stellenbosch University 2008[3] R. Arora, W. Mosch; High Voltage Insulation Engineering; New Age International (P) Limited Publishers 2008 |
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SECONDARY LITERATURE:

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| <ul style="list-style-type: none">[1] Ryan M.H., High Voltage Engineering and Testing. Institution of Electrical Engineers, London 2001[2] IEEE standard 4-1995, IEEE Standard Techniques for High-Voltage Testing[3] A. Haddad, D. Warne; Advances in High Voltage Engineering, The Institution of Engineering and Technology 2009 |
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SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR041120 - Advanced High Voltage Technology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**
AND SPECIALIZATION **Control in Electrical Power 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	S2CPE_W07	C.1	Lec1 Lec2 Lec3 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1
PEK_W02	S2CPE_W07	C.1	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1
PEK_U01	S2CPE_U08 S2CPE_U09	C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.2
PEK_U02	S2CPE_U08 S2CPE_U09	C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.2
PEK_K01	K2ETK_K07	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10	N.1 N.2