

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Energooszczędne technologie w przemyśle**  
 Name in English: **Energy-saving technologies in industry**  
 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: **ELR051204**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30		15		
Number of hours of total student workload (CNPS):	30		30		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	1		1		
including number of ECTS points for practical (P) classes :			1		
including number of ECTS points for direct teacher-student contact (BK) classes:	0.70		0.70		

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. Student has knowledge on fundamental properties of materials for electrical engineering
2. Student has knowledge on basic laws and properties of electromagnetic field

**SUBJECT OBJECTIVES**

- C1. Acquisition of knowledge on basic technological processes applied in industry, using mainly the strong DC electric fields.  
 C2. Experimental verification of physical laws in a range of chosen electrostatic phenomena and technological processes  
 C3. Consolidation of traditional academic values

**SUBJECT LEARNING OUTCOMES***relating to knowledge:*

- PEU\_W01 Student has knowledge on physical processes appearing in chosen industrial energy-save technologies  
 PEU\_W02 Student has knowledge of energy-saving technologies in industry and knows applications of phenomena appearing in the constant and low frequency electric fields used in consumer devices

*relating to skills:*

- PEU\_U01 Student has ability of carrying out measurements in electrostatics  
 PEU\_U02 Student has ability of experimental results analysis and their proper interpretation

*relating to social competences:*

- PEU\_K01 Student is able to think independently and creatively

### PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Introduction, Description of lectures program, literature, requirements of crediting. Electric field - idea and definition	2
Lec 2	Discharges in gases - chosen problems	2
Lec 3	Electrostatic precipitation	2
Lec 4	Electrostatic dispersion of liquids and painting	2
Lec 5	Powder coating	2
Lec 6	Electrostatic spraying	2
Lec 7	Other electrostatic coating processes (flocking, sands paper technology, etc.)	2
Lec 8	Electrostatic separation	2
Lec 9	Electro-spinning	2
Lec 10	Electrets - technology	2
Lec 11	Electrets - application	2
Lec 12	Application of high intensity electric fields in polygraphy (Xerox proces,s etc.)	2
Lec 13	Ionically enhanced convection (electrostatic drying)	2
Lec 14	Other technologies applying strong, dc electric fields	2
Lec 15	Final test	2
Total hours:		<b>30</b>

Form of classes - laboratory		Number of hours:
Lab 1	Introduction: requirements and method of crediting. Presentation of the BHP rules of the lab. The division into groups	1
Lab 2	Experimental studies of the basic rules in electrostatics	2
Lab 3	Investigation of non-thermal plasma processing on surface properties of polymers	2
Lab 4	Investigation of charge decay characteristics for solid dielectrics	2
Lab 5	Investigation of electrification process of liquid droplets	2
Lab 6	Preparation of electrets and investigation of their properties	2
Lab 7	Investigation of electrification process of materials	2
Lab 8	Correction and supplementing class. Crediting	2
Total hours:		<b>15</b>

### TEACHING TOOLS USED

- N1. Traditional lecture using a multimedia presentation
- N2. Consultations
- N3. Laboratory classes in student groups
- N4. Student's own work

### 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_K01	Final test
P(W)	P=F1	
F1(L)	PEU_U01 PEU_U02 PEU_K01	Checking and evaluation of students preparation for the laboratory
F2(L)	PEU_U01 PEU_U02 PEU_K01	Laboratory reports evaluation
P(L)	P=0.5F1+0.5F2	

<b>PRIMARY AND SECONDARY LITERATURE</b>
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<b>PRIMARY LITERATURE:</b>
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| <p>[1] A. Gajewski, Procesy i technologie elektrostatyczne, PWN, Warszawa-Kraków, 2000.<br/>[2] B. Hilczer, J. Małecki, Elektrety i piezopolimery, PWN, Warszawa, 1992.<br/>[3] J. Lutyński, Elektrostatyczne odpylanie gazów, WNT, Warszawa, 1965.<br/>[4] J. Simoroda, J. Staroba, Elektryczność statyczna w przemyśle, WNT, Warszawa, 1965.<br/>[5] A. D. Moore (Ed.), Electrostatics and its application, J. Wiley &amp; Sons, New York, 1973.<br/>[6] G. Luttigens, M. Glor, Understanding and controlling Static Electricity, Springer Ver., 1989.</p> |
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<b>SECONDARY LITERATURE:</b>
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Current publications and standards connected with electrostatics.
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<b>SUBJECT SUPERVISOR</b>
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Ryszard Kacprzyk, ryszard.kacprzyk@pwr.edu.pl
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