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:	**ELR041204**
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 EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Student has knowedge on physical processes appearing in chosen industrial energy-save technologies

PEK_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:

PEK_U01 Student has ability of carrying out measurements in electrostatics

PEK_U02 Student has ability of experimental results analysis and their proper interpretation

relating to social competences:

PEK_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:	**30**

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:	**15**

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 EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEK_W01 PEK_W02 PEK_K01	Final test
P(W)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_K01	Checking and evaluation of students preparation for the laboratory
F2(L)	PEK_U01 PEK_U02 PEK_K01	Laboratory reports evaluation
P(L)	P=0.5F1+0.5F2	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] A. Gajewski, Procesy i technologie elektrostatyczne, PWN, Warszawa-Kraków, 2000.
[2] B. Hilczer, J. Małecki, Elektrety i piezopolimery, PWN, Warszawa, 1992.
[3] J. Lutyński, Elektrostatyczne odpylanie gazów, WNT, Warszawa, 1965.
[4] J. Simoroda, J. Staroba, Elektryczność statyczna w przemyśle, WNT, Warszawa, 1965.
[5] A. D. Moore (Ed.), Electrostattics and its application, J. Wiley & Sons, New York, 1973.
[6] G. Luttigens, M. Glor, Understanding and controlling Static Electricity, Springer Ver., 1989.

SECONDARY LITERATURE:

Current publications and standards connected with electrostatics.

SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR041204 - Energy-saving technologies in industry
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_ETP_W05	C.1	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14	N.1 N.2 N.4
PEK_W02	K1ETK_ETP_W05	C.1	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14	N.1 N.2 N.4
PEK_U01	K1ETK_ETP_U03	C.2	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2 N.3 N.4
PEK_U02	K1ETK_ETP_U03	C.2	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2 N.3 N.4
PEK_K01	K1ETK_K06	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8	N.1 N.2 N.3 N.4