

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Ochrona przed polem elektromagnetycznym**  
 Name in English: **Protection against electromagnetic fields**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, part-time**  
 Kind of subject: **optional**  
 Subject code: **ELR042462**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	20		10		
Number of hours of total student workload (CNPS):	54		27		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	2		1		
including number of ECTS points for practical (P) classes :			1		
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40		0.70		

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

1. Student knows elementary rules and properties of the electromagnetic field.
2. Student has knowledge of the latest measure techniques.
3. Student can adapt the theory of electromagnetic field to the qualitative and quantitative estimation of the physical sizes characterizing the electromagnetic field.
4. Student can measure the electric sizes using the analogue, digital instrument and oscilloscope
5. Student is able to work in a team.
6. Student is able to think and act in a creative way.

**SUBJECT OBJECTIVES**

- C1. Acquaintance students with the sources of electromagnetic field in industry and power engineering and with the ways of protection against it.
- C2. Acquaintance students with the legal regulations, norms and recommendations in the area of protection against impact of the electromagnetic fields and influence of it on living organisms.
- C3. Acquiring skills of measuring of the electric and magnetic fields' strength and measuring of the radiations' power density.

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

- PEK\_W01 Student knows the types of the electromagnetic fields' sources of high and low frequency in the industry and power engineering.
- PEK\_W02 Student knows the legal regulations, norms and recommendations in the area of protection against impact of the electromagnetic fields.
- PEK\_W03 Student has knowledge about the protection against the impact of the electromagnetic fields and about the influence of the electromagnetic fields on the environment, living organisms and on human body.

*relating to skills:*

- PEK\_U01 Student can measure the electric and magnetic fields' distribution under the overhead line.
- PEK\_U02 Student can calculate the electric and magnetic fields' distribution for various source's configurations.
- PEK\_U03 Student can measure the radiations' power density in surrounding of the microwave devices and electromagnetic fields' distribution in surrounding of the inducting and capacitive ovens

*relating to social competences:*

- PEK\_K01 Student is able to think in creative and initiative way. Student is able to think in creative and initiative way and has awareness of responsibility of his own work and readiness to submit to the team works' rules and readiness to take responsibility of the jointly realized activities.

## PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	The sources of electromagnetic fields of low frequency.	2
Lec 2	The sources of electromagnetic fields of middle and high frequency.	2
Lec 3	The measuring and calculating methods of the electromagnetic fields' distribution of various frequency.	2
Lec 4	The electromagnetic fields' distribution in surrounding of the electrical power objects.	2
Lec 5	The influence of the electromagnetic fields on the biological structures and on human body.	2
Lec 6	The types and effects of the electromagnetic fields' impact on the environment.	2
Lec 7	The border permitted values of the fields' intensities – the established legal regulations in Poland and foreign countries.	2
Lec 8	Protection against the impact of the electromagnetic fields in the environment exposition- legal regulations, norms and recommendations.	2
Lec 9	The limiting of the fields generating by the electric power devices.	2
Lec 10	Tendencies of the protection against electromagnetic fields' impact in theory and technique. Crediting with grade	2
Total hours:		<b>20</b>

Form of classes - laboratory		Number of hours:
Lab 1	Presentation of the Rules of Procedure Health and Safety Laboratory. Establish rules for passing. Rules for the drafting of reports from	2
Lab 2	Making a computer simulation of the electric fields' distribution for various source's configurations of the field.	2
Lab 3	Making a computer simulation of the magnetic fields' distribution for various source's configurations of the field.	2
Lab 4	Measuring of the electromagnetic field in surrounding of the microwave devices.	2
Lab 5	Measuring of the electromagnetic field in surrounding of the inducting and capacitive devices	2
Total hours:		<b>10</b>

## TEACHING TOOLS USED

- N1. Multimedia presentation.
- N2. Lecture information.
- N3. Preparation in the form of reports.
- N4. Measuring devices presentation

## 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_W03	Test
F1(w)	PEK_W01 PEK_W02 PEK_W03	Attendance a lecture meeting
P(w)	$P = 0,1 F1 + 0,9 F2$	
F1(L)	PEK_U01 PEK_U02 PEK_U03	Activity in laboratory classes.
F1(L)	PEK_U01 PEK_U02 PEK_U03	Laboratory report
P(L)	$P = 0,25 F1 + 0,75 F2$	

## PRIMARY AND SECONDARY LITERATURE

### PRIMARY LITERATURE:

PSE S.A.: Linie i stacje elektroenergetyczne w środowisku człowieka. Informator – wyd. 4, Warszawa, 2008.  
Korniewicz H.: Elektrotermia. Higiena pracy w polach wielkiej częstotliwości. WNT, Warszawa 1979.

### SECONDARY LITERATURE:

Pola elektromagnetyczne 50 Hz w środowisku człowieka. Mat. Konferencyjne, Poznań 2003.

**SUBJECT SUPERVISOR**

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
**ELR042462 - Protection against electromagnetic fields**  
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_W05	C.1	Lec1 Lec2 Lec3 Lec4	N.1 N.2
PEK_W02	K1ETK_EEN_W05	C.2	Lec7 Lec8	N.1 N.2
PEK_W03	K1ETK_EEN_W05	C.1	Lec5 Lec6 Lec9 Lec10	N.1 N.2
PEK_U01	K1ETK_EEN_U03	C.3	Lab2 Lab3	N.1 N.2 N.4
PEK_U02	K1ETK_EEN_U03	C.3	Lab2 Lab3	N.3
PEK_U03	K1ETK_EEN_U03	C.3	Lab4 Lab5	N.3
PEK_K01	K1ETK_K06	C.3	Lab1 Lab2 Lab3 Lab4 Lab5	N.3