

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, full-time**
 Kind of subject: **optional**
 Subject code: **ELR052402**
 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 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 LEARNING OUTCOMES*relating to knowledge:*

- PEU_W01 Student knows the types of the electromagnetic fields' sources of high and low frequency in the industry and power engineering.
- PEU_W02 Student knows the legal regulations, norms and recommendations in the area of protection against impact of the electromagnetic fields.
- PEU_W03 Student has knowledge about the influence of the electromagnetic fields on the environment, living organisms and on human body and about the protection against the impact of the electromagnetic fields.

relating to skills:

- PEU_U01 Student can measure the electric and magnetic fields' distribution under the overhead line.
- PEU_U02 Student can calculate the electric and magnetic fields' distribution for various source's configurations.
- PEU_U03 Student can measure the radiations' power density in surrounding of the microwave devices and can measure the electromagnetic fields' distribution in surrounding of the inducting and capacitive devices.

relating to social competences:

- PEU_K01 Student is able to think in creative and initiative way.

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	The sources of electromagnetic fields of the low frequency.	2
Lec 2	The sources of electromagnetic fields of the middle and high frequency.	2
Lec 3	The measuring and calculating methods of the electromagnetic fields' distribution of the low frequency.	2
Lec 4	The measuring and calculating methods of the electromagnetic fields' distribution of the high frequency.	2
Lec 5	The electromagnetic fields' distribution in surrounding of the electrical power objects.	2
Lec 6	The border permitted values of the fields' intensities – the established legal regulations in Poland and foreign countries.	2
Lec 7	The limiting of the fields generating by the electric power devices - part 1	2
Lec 8	Protection against the impact of the electromagnetic fields at the work posts – legal regulations and norms. Working on voltage.	2
Lec 9	The influence of the electromagnetic fields on the biological structures and on human body.	2
Lec 10	The types and effects of the electromagnetic fields' impact on the environment.	2
Lec 11	The limiting of the fields generating by the electric power devices - Part 2	2
Lec 12	Protection against the impact of the electromagnetic fields at the work posts – legal regulations and norms. Working on voltage - Part 2	2
Lec 13	The testing methods of the electromagnetic fields' impact on human body.	2
Lec 14	Tendencies of the protection against electromagnetic fields' impact in theory and technique.	2
Lec 15	Crediting with grade	2
Total hours:		30

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 the laboratory. Discussion of the laboratory exercises.	2
Lab 2	Measuring of electric and magnetic fields' distribution under the overhead line.	3
Lab 3	Making a computer simulation of the electric and magnetic fields' distribution for various source's configurations of the field.	3
Lab 4	Measuring of the electromagnetic field in surrounding of the microwave devices.	3
Lab 5	Measuring of the electromagnetic field in surrounding of the inducting and capacitive devices	3
Lab 6	Assessment and complementary laboratory backlogs.	1
Total hours:		15

TEACHING TOOLS USED

- N1. Multimedia presentation
- N2. Information lecture
- N3. Measuring position

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	Class attendance
F1(W)	PEU_W01 PEU_W02 PEU_W03	Test
P(W)	$P = 0,1F1 + 0,9F2$	
F1(L)	PEU_U01 PEU_U02 PEU_U03	Activity in laboratory classes
F1(L)	PEU_U01 PEU_U02 PEU_U03	Laboratory reports
P(L)	$P = 0,25F1 + 0,75F2$	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

<p>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.</p>

SECONDARY LITERATURE:

<p>Pola elektromagnetyczne 50 Hz w środowisku człowieka. Mat. Konferencyjne, Poznań 2003.</p>

SUBJECT SUPERVISOR

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