

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Kompatybilność elektromagnetyczna**
 Name in English: **Electromagnetic Compatibility**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable): **Automation of Machines, Vehicles and Apparatus**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **optional**
 Subject code: **ARR041102**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		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. Basic knowledge of electrical engineering

SUBJECT OBJECTIVES

- C1. Gaining the knowledge base about electromagnetic interference
 C2. The acquisition of ability to measure the properties suppression and surge protection devices

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 The student has knowledge about sources of interference in low-voltage installations
 PEK_W02 The student knows protection methods against interference in installations and low-voltage devices

relating to skills:

- PEK_U01 The student can designate the characteristics of dynamic and static overvoltage protection elements
 PEK_U02 The student can perform the measurements of noise levels in different drive systems

relating to social competences:

- PEK_K01 The student is aware about the importance and non-technical aspects of an control engineer activities, i.e. influence on environment, therefore takes responsible actions

PROGRAMME CONTENT

Form of classes - lecture		Number of hours:
Lec 1	Introduction, basic problems and EMC requirements. External sources of the electromagnetic interference.	2
Lec 2	Lightning and overvoltage protection of the installations and devices in buildings.	2
Lec 3	Elements and surge protection systems	2
Lec 4	Electrostatic discharge: the phenomenon, parameters, threats, remedies.	2
Lec 5	The issue of shielding the electromagnetic field. New materials and techniques in shielding electromagnetic field.	2
Lec 6	Power converters as a sources of the electromagnetic interference.	2
Lec 7	Filtering and compensation systems in converters drive systems.	2
Lec 8	Final test	1
Total hours:		15

Form of classes - laboratory		Number of hours:
Lab 1	Preface, knowing with the rules of laboratory work, health and safety training	2
Lab 2	The study of static characteristics of surge protection elements.	2
Lab 3	The study of dynamic characteristics of surge protection elements.	2
Lab 4	Research of the surge arresters for medium voltage lines.	2
Lab 5	The survey conducted noise level in the propulsion system of controlled rectifiers of different types.	2
Lab 6	The survey conducted noise level in the propulsion system of frequency converters.	2
Lab 7	Studying the effects of passive filters and active on the level of generated conducted interference in adjustable frequency drives.	2
Lab 8	Credit lab	1
Total hours:		15

TEACHING TOOLS USED
N1. Traditional lecture using multimedia presentation N2. Student's own work N3. Measurement Laboratory conducted in the traditional manner in student groups exercises N4. Reports of the laboratory exercises

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(W)	PEK_W01 PEK_W02 PEK_K01	Test
P(W)	P=F1	
F1(L)	PEK_U01 PEK_U02 PEK_K01	Checking and evaluation of the preparation to laboratory exercises
F2(L)	PEK_U01 PEK_U02 PEK_K01	Evaluation of the reports from performed researches
P(L)	P = 0,5F1 + 0,5F2	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Charoy A., Zakłócenia w urządzeniach elektronicznych, t. 1-4, WNT, Warszawa 1999. [2] Sowa A., Kompleksowa ochrona odgromowa i przepięciowa, Biblioteka COSiW SEP, Warszawa, 2005. [3] Frąckowiak L., Energoelektronika, Cz. 2, Wyd. Politechniki Poznańskiej, Poznań, 2000.
SECONDARY LITERATURE: [1] Więckowski T., Badania kompatybilności elektromagnetycznej urządzeń elektrycznych i elektronicznych, Oficyna Wydawnicza PWR, Wrocław, 2001. [2] Praca zbiorowa pod red. D.J. Bena, Impulsowe narażenia elektromagnetyczne, Wyd. Politechniki Wrocławskiej, Wrocław, 1994. [3] Haase P., Overvoltage protection of low voltage systems, IEE, London, 2000. [4] Prasad Kodali V., Engineering Electromagnetic Compatibility, IEEE Press, New York, 1996.

SUBJECT SUPERVISOR
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ARR041102 - Electromagnetic Compatibility
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Control Engineering and Robotics**
AND SPECIALIZATION **Automation of Machines, Vehicles and Apparatus**

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	S2AMPU_W13	C.1	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1 N.2
PEK_W02	S2AMPU_W13	C.1	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1 N.2
PEK_U01	S2AMPU_U12	C.1 C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2 N.3 N.4
PEK_U02	S2AMPU_U12	C.1 C.2	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.2 N.3 N.4
PEK_K01	K2AiR_K03	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7	N.1 N.2 N.3 N.4