

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Kompatybilność elektromagnetyczna**  
 Name in English: **Electromagnetic Compatibility**  
 Main field of study (if applicable): **Industrial Control Engineering**  
 Specialization (if applicable): **Automation of Machines, Vehicles and Apparatus**  
 Level and form of studies: **2nd level, full-time**  
 Kind of subject: **optional**  
 Subject code: **APR011102**  
 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 LEARNING OUTCOMES***relating to knowledge:*

- PEU\_W01 The student has knowledge about sources of interference in low-voltage installations  
 PEU\_W02 The student knows protection methods against interference in installations and low-voltage devices

*relating to skills:*

- PEU\_U01 The student can designate the characteristics of dynamic and static overvoltage protection elements  
 PEU\_U02 The student can perform the measurements of noise levels in different drive systems

*relating to social competences:*

- PEU\_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:		<b>15</b>

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:		<b>15</b>

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 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	Test
P(W)	P=F1	
F1(L)	PEU_U01 PEU_U02 PEU_K01	Checking and evaluation of the preparation to laboratory exercises
F2(L)	PEU_U01 PEU_U02 PEU_K01	Evaluation of the reports from performed researches
P(L)	P = 0,5F1 + 0,5F2	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [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.
<b>SECONDARY LITERATURE:</b> [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.

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