

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Energoelektronika 2**  
 Name in English: **Power electronics 2**  
 Main field of study (if applicable): **Control Engineering and Robotics**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **obligatory**  
 Subject code: **ARR043208**  
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):			30		
Number of hours of total student workload (CNPS):			30		
Form of crediting:			crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:			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		

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

1. He can explain the principle of operation and has a basic knowledge of models of power semiconductor devices.
2. It has a basic knowledge of the topology and the principle of operation of power electronic converters. Understand the physical principles of operation of static converters.
3. Able to perform basic measurements of electrical devices using analog and digital oscilloscope.
4. He can verify the results of laboratory measurements with theoretical knowledge.
5. He can elaborate laboratory test results.

**SUBJECT OBJECTIVES**

- C1. The acquisition by the student practical ability to combine power electronics systems.  
 C2. To acquaint the student with real parameters selected, the basic power semiconductor devices.  
 C3. Acquiring basic skills to apply the measurement technique for determining the characteristics of static power converters.  
 C4. To acquaint the student with the characteristics of the real power electronics converters.  
 C5. Acquiring the ability to develop research results, their interpretation and critical evaluation.

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

- PEK\_U01 He can combine basic measurement systems for power converters.  
 PEK\_U02 It can determine the basic static characteristics of the selected power converters.  
 PEK\_U03 He can verify the results of the measurements with theoretical knowledge and critically evaluate the knowledge of the mathematical models of converters.

*relating to social competences:*

- PEK\_K01 It shows concern for the execution of his duties.

PROGRAMME CONTENT		
Form of classes - laboratory		Number of hours:
Lab 1	Introduction. The organization of classes. Conditions of gaining credit. Health and safety instructions. Acquaint students with the basic apparatus.	2
Lab 2	The test parameters of thyristors.	2
Lab 3	The test of one-phase regulators AC.	2
Lab 4	The test of three-phase regulators AC.	2
Lab 5	Research thyristor chopper DC.	2
Lab 6	Study one-pulse rectifier.	2
Lab 7	Study 2-pulse rectifier.	2
Lab 8	The study three-pulse and a six-pulse rectifier.	2
Lab 9	The study of resonant inverter.	2
Lab 10	Test of the three-phase thyristor inverter with phase commutation.	2
Lab 11	The test three-phase source voltage inverter in cooperation with the AC mains.	2
Lab 12	Research the step-down converter.	2
Lab 13	Research of three -phase inverter with pulse width modulation.	2
Lab 14	Test of systems control and triggering for thyristors.	2
Lab 15	Summary of the laboratory. Credit classes.	2
Total hours:		<b>30</b>

TEACHING TOOLS USED
N1. Laboratory exercises performed on specialized laboratory positions.
N2. Self-preparation for laboratory classes.
N3. Consultation.

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(L)	PEK_U01 PEK_K01	Check preparation for classes.
F2(L)	PEK_U02 PEK_U03 PEK_K01	Activity in the conduct of laboratory measurements.
F3(L)	PEK_U02 PEK_U03 PEK_K01	Grade for the reports performed.
P(L)	$P=0,25F1+0,25F2+0,2F3$	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [1] L. Pawlaczyk, Z. Załoga Energoelektronika. Ćwiczenia laboratoryjne. Oficyna Wydawnicza Politechniki Wrocławskiej 2005. [2] Barlik R., Nowak M.: Technika tyrystorowa. Warszawa WNT 1994. [3] Januszewski S., Świątek H., Zymmer K.: Półprzewodnikowe przyrządy mocy. Warszawa WKŁ 1999. [4] Frąckowiak L., Januszewski S.,: Energoelektronika część 1. Wydawnictwo Politechniki Poznańskiej.2001. [5] Frąckowiak L.: Energoelektronika część 2. Wydawnictwo Politechniki Poznańskiej.1998.
<b>SECONDARY LITERATURE:</b> [1] Piróg S.: Energoelektronika. Kraków Wydawnictwo AGH 2006. [2] Tunia H., Winiarski B.: Podstawy energoelektroniki. Warszawa WNT 1987. [3] Barlik R., Nowak M. :Poradnik inżyniera energoelektronika. Warszawa WNT 2013.

SUBJECT SUPERVISOR
Leszek Pawlaczyk, leszek.pawlaczyk@pwr.edu.pl

**MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT  
ARR043208 - Power electronics 2  
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Control Engineering and Robotics**

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_U01	K1AiR_U24	C.1	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14	N.1 N.2 N.3
PEK_U02	K1AiR_U24	C.1 C.2	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14	N.1 N.2 N.3
PEK_U03	K1AiR_U24	C.1 C.2 C.3 C.4	Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14	N.1 N.2 N.3
PEK_K01	K1AiR_K05	C.1 C.2 C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.1 N.2 N.3