

FACULTY OF ELECTRICAL  
ENGINEERING**SUBJECT CARD**

Name in Polish: **Energoelektronika 2**  
 Name in English: **Power electronics 2**  
 Main field of study (if applicable): **Electrical Engineering**  
 Specialization (if applicable):  
 Level and form of studies: **1st level, full-time**  
 Kind of subject: **obligatory**  
 Subject code: **ELR052304**  
 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):			60		
Form of crediting:			crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:			2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:			1.40		

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

1. Basic knowledge of the behavior of the basic elements of electrical circuits with various types of current and voltage stimulus.
2. It has a basic knowledge of a Fourier series . Unable to correctly apply the knowledge in the metrology of electrical quantities in nonlinear circuits

**SUBJECT OBJECTIVES**

- C1. Familiarize students with the basic topology and characteristics of power electronic systems.  
 C2. Familiarize students with research methodology of nonlinear systems.  
 C3. Student awareness of the positives and negatives from the use of power electronic systems  
 C4. The sophistication of the ability to apply measurement techniques in nonlinear circuits.  
 C5. Deepening skills of execution of complex measurements in the team

**SUBJECT LEARNING OUTCOMES***relating to knowledge:**relating to skills:*

- PEU\_U01 He can use the theoretical knowledge about the topology and characteristics of power electronic systems  
 PEU\_U02 Is able perform appropriate tests model power electronics systems.  
 PEU\_U03 It can determine the negative effects of the power electronic systems on the AC network.

*relating to social competences:*

- PEU\_K01 It has a ability to work in a team.

PROGRAMME CONTENT		
Form of classes - laboratory		Number of hours:
Lab 1	Introduction to laboratory. Safety regulations. Rules for laboratory passing. Exercises plan. Familiarizing with the positions of laboratory stands. Principles of measurement of electrical quantities in linear and nonlinear circuits. Overview of typical system monitoring voltage and current waveforms. Discussion of harmonic measurements with analyzers.	2
Lab 2	Control circuits and trigger of SCR thyristors.	2
Lab 3	1- and 2- pulse uncontrolled rectifier.	3
Lab 4	1- and 2- pulse controlled rectifier.	2
Lab 5	3- and 6- pulse uncontrolled rectifier.	2
Lab 6	3- and 6- pulse controlled rectifier.	2
Lab 7	Single phase AC power regulator.	2
Lab 8	The McMurray inverter.	2
Lab 9	Step-down DC/DC regulator.	2
Lab 10	Step-up DC/DC regulator.	2
Lab 11	Examination the effects of the negative impact of converters on the AC network.	2
Lab 12	Examination the effectiveness of passive filters. TCAD Computer simulation.	2
Lab 13	PWM inverter.	2
Lab 14	Systems with a reduced negative impact on the AC network.	2
Lab 15	Conclusions.	1
Total hours:		<b>30</b>

TEACHING TOOLS USED
N1. Check the predisposition in the form of short tests N2. Discussion of the scope of research N3. Discussion of the measurement methods and physical model N4. Implementation of the Protocol of the research N5. Execution of test reports including analysis of results.

EVALUATION OF SUBJECT LEARNING OUTCOMES 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(L)	PEU_U01 PEU_U02 PEU_U03 PEU_K01	Activity
F2(L)	PEU_U01 PEU_U02 PEU_U03	Short tests
F3(L)	PEU_U01 PEU_U02 PEU_U03 PEU_K01	Test reports
P(L)	P=0,2 F1 + 0,6 F2 + 0,2 F3	

PRIMARY AND SECONDARY LITERATURE
<b>PRIMARY LITERATURE:</b> [[1] Borecki J., Stosur M., Szkółka S.: Energoelektronika. Podstawy i wybrane zastosowania, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2008; [2] Tunia H., Winiarski B.: Podstawy energoelektroniki, WNT, Warszawa 1987; [3] Barlik R., Nowak M.: Technika tyrystorowa, WNT Warszawa 1997; [4] Piróg S.: Energoelektronika - negatywne oddziaływania układów energoelektronicznych na źródła energii i wybrane sposoby ich ograniczania, AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków 1998;
<b>SECONDARY LITERATURE:</b> [1] Piróg S.: Układy o komutacji sieciowej i o komutacji twardej, AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków 2006; [2] Barlik R., Nowak M.: Poradnik inżyniera energoelektronika Tom 1 i 2, Wydawnictwo Naukowe PWN (WNT), Warszawa 2019;

SUBJECT SUPERVISOR
Małgorzata Bielówka, malgorzata.bielowka@pwr.edu.pl