



Subject card

Subject name and code	Power Engineering Electronics, PG_00038095						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2023/2024		
Education level	first-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Electrified Transportation -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Leszek Jarzębowicz				
	Teachers		dr hab. inż. Leszek Jarzębowicz				
			dr inż. Sławomir Judek				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		6.0		39.0	75
Subject objectives	Gaining knowledge about power electronic devices and power converters.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W05] has basic knowledge of the principles of operation of basic electronic, energy and power electronic components and systems		Can explain the operation of power converters.		[SW1] Assessment of factual knowledge		
	[K6_K05] can think and act in an entrepreneurial way		Selects power devices and converters for given applications.		[SK5] Assessment of ability to solve problems that arise in practice		
	[K6_W04] has basic knowledge of methods of analysis of direct and alternating current circuits		Has the ability to analyze basic power converters.		[SW1] Assessment of factual knowledge		
	[K6_U04] has the ability to self-educate, among other things, in order to improve professional qualifications		Has the ability to use previously learned programs to analyze the operation of converter systems.		[SU4] Assessment of ability to use methods and tools		
Subject contents	Fundamental mathematical relations. Introduction to power electronics. Printed circuit boards. Measurement equipment. Passive elements. Diodes. Uncontrolled rectifiers. SCR thyristors. Controlled rectifiers. GTO thyristors. BJT, IGBT and MOSFET transistors. DC/DC converters. DC/AC converters (voltage inverters). Gate drivers. SiC and GaN transistors. Cooling of power devices. Electromagnetic disturbances in power converters. Servo drives. "Intelligent" IPM and ASIPM power modules. Microprocessor control of power converters.						
Prerequisites and co-requisites	Basic knowledge on electrical engineering and electronics.						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Reports and tests from laboratory exercises		60.0%		30.0%		
	Written exam		60.0%		70.0%		

Recommended reading	Basic literature	<p>[1] Barlik R., Nowak M.: Energoelektronika. Elementy, podzespoły, układy. Oficyna Wyd. PW, 2014.</p> <p>[2] Januszewski S., Świątek H., Zymmer K.: Przyrządy półprzewodnikowe mocy. Właściwości i zastosowania. WKiŁ, Warszawa, 1999.</p> <p>[3] Nowak M., Barlik R.: Poradnik inżyniera energoelektronika. WNT, Warszawa, 1998.</p> <p>[4] Szczęsny R.: Komputerowa symulacja układów energoelektronicznych. Wyd. Politechniki Gdańskiej, Gdańsk, 1999.</p> <p>[5] Kaźmierkowski M. P., Matysik T. J.: Wprowadzenie do elektroniki i energoelektroniki. Oficyna Wyd. PW, 2005.</p>
	Supplementary literature	<p>[6] Mohan N.: Power electronics: a first course. John Wiley & Sons Inc. 2012.</p> <p>[7] Januszewski S., Pytlak A., Rosnowska-Nowaczyk M., Świątek H.: Energoelektronika. WSiP, Warszawa 2012.</p>
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. AC/DC converters - types, operation controlled rectifier. 2. DC/AC inverters - voltage inverter topologies, PWM control. 3. Properties of various power devices. 	
Work placement	Not applicable	

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