GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modeling of converter electric drive systems, PG_00054496						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2021		Academic year of realisation of subject	2023/2024			
Education level	first-cycle studies		Subject group				
Mode of study	Part-time studies		Mode of delivery	at the university			
Year of study	3		Language of instruction	Polish			
Semester of study	6		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Controlled Electric Drives -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Marcin Morawiec				
	Teachers						
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		5.0	15.0	50	
Subject objectives	The aim of the course is to introduce the modeling of basic converter systems supplying electric machines, renewable energy sources and cooperating with smart grids.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U05	The student is able to comply with the rules of occupational health and safety	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
K6_W11	knows the principles of designing electrical installations and electric lighting, controlling electrical devices	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
K6_W10	knows the basics of processing, use and rational use of electricity, including the principles of electric traction	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
K6_K01	The student knows the need for self-education.	[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
K6_K05	The student knows the health and safety rules for the use of electrical devices	[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work
K6_U10	The student knows how to model the power electronics system.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
K6_U09	The student is able to choose the electrical equipment for long-term load	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
K6_W09	The student knows the methods of management and transmission of electricity	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation

Subject contents

Transformation of multiphase systems into orthogonal systems. Spatial vector. Methods of generating the output voltage of a voltage inverter. Voltage inverter output current control systems. Structures of field-oriented control systems and direct torque control of an induction motor. Induction motor control according to the constant U / f ratio. High-power drive systems with an induction motor. Double-sided machine regulation systems. Synchronous machine control systems. Permanent magnet motor control systems. Construction of motors with switched reluctance. Switching reluctance motor power systems. Start-stop and synchronous control of stepper motors. Principles of operation of regulators based on fuzzy logic. The use of neural networks and fuzzy logic in controlling drives. Modeling of converter systems: circuit breaker, H bridge, voltage inverter, current inverter.

Prerequisites and co-requisites

Basic of electric drive, electric machines.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratory exercises	60.0%	100.0%

Recommended reading

Basic literature	R. Barlik, M. Nowak, Poradnik inżyniera energoelektronika, WNT 2003. A. Dębowski, Automatyka. Napęd elektryczny, Wydawnictwo Naukowe PWN 2017.
Supplementary literature	-
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Modeling of the DC chopper 2. Modeling of the H bridge 3. SVM for voltage and current inverter 4. Control of an induction motor supplied by a voltage source inverter 5. Modeling of a converter for photovoltaics system 6. MPPT algorithm
Work placement	Not applicable