GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Design of Electric Systems, PG_00038368						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2024/2025			
Education level	second-cycle studies		Subject group				
Mode of study	Part-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Grzegorz Kostro					
	Teachers	dr inż. Filip Kutt dr hab. inż. Michał Michna dr inż. Łukasz Sienkiewicz dr inż. Roland Ryndzionek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	10.0	10.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22422						
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	The aim of the course is to introduce students with the methods of analysis, modeling and design of electromechanical drive systems						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W07] has an in-depth, theoretically grounded knowledge of electromechanical systems and their electromechanical systems and their design, electrotraction systems power supply and electrical energy storage devices	design a simple electromechanical system	[SW3] Assessment of knowledge contained in written work and projects
[K7_K04] correctly identifies and resolves dilemmas associated with the exercise of the profession, in particular relating to responsibility for his own safety and the safety of others	applies the health and safety rules that apply when working with electrical devices	[SK5] Assessment of ability to solve problems that arise in practice
[K7_U07] is able to analyse, calculate, design, program and test converters, drive systems, control systems and state observers	analyzes the operating states of an electromechanical system powered by a power converter	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K7_U06] is able to analyse, model, simulate and design electrical systems	performs analysis analysis, develops a model and performs simulation of basic operating states of the system is able to perform a design of an electrical system	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W06] has in-depth knowledge of industrial electronics, microprocessor control systems, programmable logic systems and printed circuit design and prototyping computer-aided prototyping	configures basic power electronics and drive systems, applies control and diagnostic methods for power electronics systems	[SW1] Assessment of factual knowledge
[K7_K03] can interact and work in a group assuming various roles and identify priorities for the achievement of a specific task	cooperates with others in order to complete a given task	[SK3] Assessment of ability to organize work [SK1] Assessment of group work skills

Subject contents

Lecture Structures and components of modern electromechanical drive systems. Calculation of equivalent parameters and modelling of complex electromechanical drive systems. Thermal and Electromagnetic analysis of electromechanical transducers using analytical and numerical methods. Analysis of the motion equations and calculation of mechanical transient processes in complex electromechanical drive systems. Design principles of electromechanical drive systems. Selection rules of the required power and drive parameters of different types of electromechanical drive systems.

Laboratory Identification of mechanical and electromagnetic parameters of electromechanical drive system. Study of selected states of a electromechanical system with BLDC motor. Study of selected states of a electromechanical system with induction motor fed by power converter. Study of selected states of a electromechanical system with DC motor fed by DC converter.

Exercises Issues related to project management. Design calculations for the selected electromechanical drive system and the development of a numerical model with the use of CAD programs (thermal and electromagnetic calculations). Modelling of elements of the electromechanical system with the use of programs for calculations using the finite element method. Analysis of selected system operating states based on the results of simulation tests.

Prerequisites and co-requisites

Knowledge in the range of electrical machines and analysis methods of electric and magnetic circuits. Extended knowledge in the field of power electronics. Knowledge in the range of design, programming and diagnostics of power converters.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	60.0%	60.0%
Practical exercise	60.0%	40.0%

Recommended reading	Basic literature	1. Bisztyga K.: Sterowanie i regulacja silników elektrycznych. WNT, Warszawa, 1989. 2. Orłowska-Kowalska T.: Bezczujnikowe układy napędowe z silnikami indukcyjnymi. 3. Praca zbiorowa pod red. Z. Grunwalda: Napęd elektryczny, WNT, Warszawa,1987. 4. Kałuża E.: Zbiór zadań i ćwiczeń projektowych z trakcji elektrycznej. Skrypt Politechniki Śląskiej nr 1848, Gliwice, 1994. 5. Praca zbiorowa pod red. T. Orłowskiej-Kowalskiej: Napęd elektryczny. Ćwiczenia laboratoryjne. Oficyna Wydawnicza Politechniki. Wrocławskiej, Wrocław, 2002. 6. Tunia H., Kaźmierkowski M.P.: Automatyka napędu przekształtnikowego. PWN, Warszawa, 1989. 7. Kaczmarek T., Zawirski K.: Układy napędowe z silnikiem synchronicznym. Wydawnictwa Politechniki Poznańskiej, Poznań, 2001. 8. Jagiełło A.,S.: Systemy elektromechaniczne dla elektryków, Politechnika Karakowska, Kraków, 2008. 9. Leonard W., "Control of Electrical Drives", Springer-Verlag, Berlin, 1985. 10. Ronkowski M., Michna M., Kostro G., Kutt F.: Maszyny elektryczne wokół nas: zastosowanie, budowa, modelowanie, charakterystyki, projektowanie. (e-skrypt). Wyd. PG, Gdańsk 2011.
	Supplementary literature	1. Michna M: Designing of brushless permanent magnet motor. Auxiliary materials. 2. Kostro G: Designing of squirrel cage induction motor. Auxiliary materials.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Calculation of the operation point of a permanent magnet. 2. The choice of the motor to the drive system. 3. The choice of the gear box to the drive system. 4. Calculation of basic parameters of the gear box. 5. Design calculations of electric machines.	
Work placement	Not applicable	

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