GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Design of Electromechanical Systems, PG_00068318		
Field of study	PROJEKTOWANIE SYSTEMÓW ELEKTROMECHANICZNYCH		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Faculty of Electrical and Control Engineering -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Filip Kutt	
	Teachers	dr inż. Filip Kutt dr hab. inż. Michał Michna dr inż. Łukasz Sienkiewicz dr hab. inż. Roland Ryndzionek	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	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	3.0	17.0	50

Subject objectives	The aim of this course is to provide students with a mastery of methods for analyzing, modeling, and designing electromechanical drive systems. Students will learn the principles of selecting and designing electromechanical system components.

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] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[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 H&S rules when working with electrical devices	[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce
[K7_U06] is able to analyse, model, simulate and design electrical systems	performs 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] Ocena umiejętności korzystania z metod i narzędzi [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu
[K7_W06] has an in-depth knowledge of industrial electronics, microprocessor control systems and in the field of power electronics and drive systems, their control and diagnostic methods	configures basic power electronics and drive systems, applies control and diagnostic methods for power electronics systems	[SW1] Ocena wiedzy faktograficznej
[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] Ocena umiejętności organizacji pracy [SK1] Ocena umiejętności pracy w grupie
[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] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU2] Ocena umiejętności analizy informacji

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. Possibility of a virtual tour inside the nacelle of a wind turbine and manipulating components of real electric machines using VR goggles and the application available on the eNauczanie platform.

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
Exercises	60.0%	50.0%
Written quiz	60.0%	50.0%

Recommended reading

Basic literature	1. Pyrhönen J., Jokinen T., Hrabovcová V.: Design of Rotating Electrical Machines. 2014 John Wiley & Sons, Ltd 2. Gieras J. F.: Advancements in Electric Machines. Springer 2010 3. Gieras J. F.:Axial Flux Permanent Magnet Brushless Machines. Springer 2014
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	

Example issues/ example questions/ tasks being completed

1. Calculation of the operation point of a permanent magnet.
2. Selection of a motor for a given drive system.
3. Selection of the gearbox for a given drive system.
4. Calculation of basic parameters of a gearbox.
5. Design calculations of electric machines

Practical activites within the subject

Not applicable

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