GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electromechanical Systems, PG_00038474		
Field of study	Electrical Engineering		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2023/2024
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	1	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Andrzej Wilk	
	Teachers	dr hab. inż. Michał Michna dr hab. inż. Andrzej Wilk	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	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	60	10.0	30.0	100

Subject objectives	To familiarize the student with: general structure and elements functions of electromechanical systems; construction, performance and modelling of generator sets with variable speed driven by combustion engine; construction, performance and modelling of drive systems applied in electrical and hybrid vehicles; construction, performance and modelling of ES using piezoelectric machines; construction, performance and modelling of ES using electromechanical storage devices; the construction, performance of ES based on nanotechnology; analyses ES using measurement techniques.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_U06	The student is able to model electromechanical systems and conduct computer simulations	[SU1] Assessment of task fulfilment
	K7_W04	The student has in-depth knowledge of electromechanical systems	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	General structure and elements functions of electromechanical systems (ES). Development tendencies in modern ES. Structures of ES applied in practice. Drive systems applied in electrical and hybrid vehicles. ES using piezoelectric machines. Electromechanical storage devices. Basics of modelling, simulation and design ES using CAD. Methods of modelling based on energy approach. Application of Lagrange"s equations and bond graphs. Applications of CAD packages: SPICE, MATLAB/SIMULINK, DYMOLA, SYNOPSYS/SABER, FLUX, AutoCAD, INVENTOR for modelling, simulation and design of elements of ES. Simulation of ES considering systems with bruhsed and brushless dc motors with permanent magnets, and induction motors.

Prerequisites and co-requisites	General knowledge of the subjects of Electrical circuits, Electrodynamics and Electrical machines, ability to analyse electrical and magnetic circuits in steady and dynamic states, ability to analyse electrical machines in steady states.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	60.0%
	Practical exercise	60.0%	40.0%

Recommended reading	Basic literature	1. Cichy M.: Modelling of energy systems (textbook in Polish). Wyd. PG, Gdańsk 2001. 2. Gieras J.: Advancements in electric machines. Springer Netherlands, 2008. 3. Kaczmarek T., Zawirski K.: Układy napędowe z silnikiem synchronicznym. Wyd. PP, Poznań 2000. 4. Lyshevski S. E., Nano- and micro-electromechanical systems: Fundamental of micro- and nano-engineering. CRC Press, 2000. 5. Meisel J.: Zasady elektromechanicznego przetwarzania energii. WNT, Warszawa 1970.

	Supplementary literature	1. Karnopp D. C., Margolis D. L., Rosenberg R. C.: System dynamics, modeling and simulation of mechatronic systems. John Wiley Inc, 2000. 2. Lyshevski S. E.: Electromechanical systems, electric machines, and applied mechatronics. CRC Press, 2000. 3. Puchała A.: Electromechanical transducers (textbook in Polish). KOMEL, Katowice 2002. 4. Szymanowski A.: Fundamentals of hybrid vehicle drives. Instytut Technologii Eksploatacji, Warsaw-Radom 2000.
	eResources addresses	Adresy na platformie eNauczanie: SYSTEMY ELEKTROMECHANICZNE [2023/24]-sem.letni - Moodle ID: 37136 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37136
Example issues/ example questions/ tasks being completed	Draw and describe a general structure of electromechanical system. Draw and describe the physical and dynamic circuit models, and dynamic characteristics of dc motor. Calculate the circuit model parameters and time constant of dc motor using its manufacturing data sheet.	
Work placement	Not applicable	