



## Subject card

Subject name and code	Electromechanical Systems, PG_00038346						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Part-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. Andrzej Wilk dr inż. Filip Kutt					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	10.0	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	12.0		58.0		100
Subject objectives	The main objective of the course is to learn of student of principles of electromechanical energy conversion and modeling of electromechanical systems with electric machines described in natural, alfa-beta and d-q axes.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_W04	Student knows methods for formulation of mathematical models of electromechanical systems with electric machines described in natural, alpha-beta and d-q axes.			[SW2] Assessment of knowledge contained in presentation		
	K7_U06	Student can simulate transient and steady states of electromechanical systems. Student is able to analyse waveforms of electromechanical quantities. Student can design of electromechanical systems.			[SU1] Assessment of task fulfilment		
Subject contents	General structure and functionality of electromechanical system. Mathematical model of general electromechanical system formulated in natural axes. Mathematical model of electromechanical system with induction machine. Mathematical model of electromechanical system with synchronous machine. Mathematical model of electromechanical system with DC machine. Clarke and Park transformations. Mathematica models of electromechanical systems with machine described in alpha-beta and d-q axes.						
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		
	Practical exercise	60.0%			40.0%		
	Written exam	60.0%			60.0%		

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 [Niestacjonarne][2023/24] - Moodle ID: 28963 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28963">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28963</a>
Example issues/ example questions/ tasks being completed	<p>Draw and describe a general structure of electromechanical system.</p> <p>Draw and describe the physical and dynamic circuit models, and dynamic characteristics of dc motor.</p> <p>Calculate the circuit model parameters and time constant of dc motor using its manufacturing data sheet.</p>	
Work placement	Not applicable	