



Subject card

Subject name and code	Electromechanical Systems, PG_00038474						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2024/2025		
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 inż. Filip Kutt 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	The main objective of the subject is to develop mathematical models of electromechanical systems. Partial objectives include developing metamatic models of such transducers as: induction machine, synchronous machine, direct current machine, synchronous machine excited by permanent magnets.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W07] has an in-depth, theoretically grounded knowledge of electromechanical systems and their design, electrotraction systems power supply and electrical energy storage devices	Designs electromechanical systems using electric machines			[SW3] Assessment of knowledge contained in written work and projects		
Subject contents	[K7_U06] is able to analyse, model, simulate and design electrical systems	Models and analyzes electromechanical transducers			[SU1] Assessment of task fulfilment		
	Lecture: MMF of winding. Equivalent diagrams of windings of electromechanical converters. Equations of electromagnetic circuit: induced voltage of transformation, induced voltage of rotation, voltage drops on resistances. Electromagnetic torque and mechanical equation. Clarke and Park transformation. Model of induction machine in natural axes, alpha-beta and d-q. Model of synchronous machine in natural axes, alpha-beta and d-q. Model of PMSM machine in natural axes, alpha-beta and d-q. Model of DC machine.Lab: Study of steady and transient states of electric machines.Project: Simulation of steady and transient states of electric machines						
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:
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	

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