



## Subject card

Subject name and code	Electromechanical Systems, PG_00038346						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2026/2027	
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 -> Faculties of Gdańsk University of Technology						
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	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_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		He/She develops mathematical models of electromechanical systems. He/She determines the electromechanical couplings in the design of electromechanical systems			[SW3] Assessment of knowledge contained in written work and projects	
	[K7_U06] is able to analyse, model, simulate and design electrical systems		He/She simulates transient and steady states of electromechanical systems. He/She determines the parameters of lumped elements of electromechanical system			[SU1] Assessment of task fulfilment	

Subject contents	<p>Course content – lecture LECTURES:</p> <p>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.</p> <p>LABORATORY:</p> <p>Start-up test of DC commutator motor and determination of the circuit parameters. Start-up test of induction motor and determination of the circuit parameters. Short-circuit test of synchronous motor and determination of the circuit parameters. Inrush test of transformer.</p>											
Prerequisites and co-requisites	<p>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.</p>											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 642 794 674">Subject passing criteria</th> <th data-bbox="794 642 1139 674">Passing threshold</th> <th data-bbox="1139 642 1482 674">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 674 794 705">Written exam</td> <td data-bbox="794 674 1139 705">60.0%</td> <td data-bbox="1139 674 1482 705">60.0%</td> </tr> <tr> <td data-bbox="453 705 794 741">Practical exercise</td> <td data-bbox="794 705 1139 741">60.0%</td> <td data-bbox="1139 705 1482 741">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Written exam	60.0%	60.0%	Practical exercise	60.0%	40.0%
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Written exam	60.0%	60.0%										
Practical exercise	60.0%	40.0%										
Recommended reading	<p>Basic literature</p>	<ol style="list-style-type: none"> <li>1. Cichy M.: Modelowanie systemów energetycznych. Wyd. PG, Gdańsk 2001.</li> <li>2. Gieras J.: Advancements in electric machines. Springer Netherlands, 2008.</li> <li>3. Kaczmarek T., Zawirski K.: Układy napędowe z silnikiem synchronicznym, Wyd. PP, Poznań 2000.</li> <li>4. Lyshevski S. E., Nano- and micro-electromechanical systems: Fundamental of micro- and nano-engineering. CRC Press, 2005.</li> <li>5. Meisel J.: Zasady elektromechanicznego przetwarzania energii. WNT, Warszawa 1970.</li> </ol>										
	<p>Supplementary literature</p>	<ol style="list-style-type: none"> <li>1. Karnopp D. C., Margolis D. L., Rosenberg R. C.: System dynamics, modeling and simulation of mechatronic systems. John Wiley Inc, 2000.</li> <li>2. Lyshevski S. E.: Electromechanical systems, electric machines, and applied mechatronics. CRC Press, 2000.</li> <li>3. Puchała A.: Elektromechaniczne przetworniki energii. KOMEL, Katowice 2002.</li> <li>4. Szymanowski A.: Fundamentals of hybrid vehicle drives. Instytut Technologii Eksploatacji, Warsaw-Radom 2000.</li> </ol>										
	<p>eResources addresses</p>											
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>											
Practical activities within the subject	<p>Not applicable</p>											

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