GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electromechanical Systems, PG_00038346		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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 inż. Filip Kutt dr hab. inż. Andrzej Wilk	

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_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 developes mathematical models of electromechanical systems. He/She deterimnes 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 electromechnical systems. He/She determines the parameters of lumped elements of electromechnical system	[SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>LECTURES:

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.

LABORATORY:

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 od synchronous motor and determination of the circuit parameters. Inrush test of transformer.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>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.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>Practical exercise</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Cichy M.: Modelowanie systemów energetycznych. 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, 2005.
5. Meisel J.: Zasady elektromechanicznego przetwarzania energii. WNT, Warszawa 1970.</td></tr>
<tr><td>Supplementary literature</td><td>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.: Elektromechaniczne przetworniki energii. KOMEL, Katowice 2002.
4. Szymanowski A.: Fundamentals of hybrid vehicle drives. Instytut Technologii Eksploatacji, Warsaw-Radom 2000.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>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.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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