GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Electrical Energy Conversion, PG_00066976		
Field of study	Smart Renewable Energy Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Specialty subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	English
Semester of study	2	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
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. Michał Michna	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	20.0	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	4.0	16.0	50

Subject objectives

The student will learn the general structure and function of the members of the electromechanical system:
- construction, operation and modeling of generator and drive assemblies.
- construction, operation and modeling of power electronic converter systems
- construction and modeling and algorithms of regulation

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K02] recognizes technological innovations in the field of wind energy, is ready to adapt to and implement new technologies in energy systems	The student is able to model electromechanical systems and perform computer simulations	[SK2] Assessment of progress of work
[K7_U02] is capable of creating and analyzing digital models of renewable energy systems, including wind power systems, and utilizes digital tools for project analysis, evaluation, supervision, and optimization	The student has in-depth knowledge of electromechanical systems	[SU2] Assessment of ability to analyse information
[K7_W04] knows the specifics of designing, constructing, and operating onshore/offshore wind farms, as well as the technical and logistical challenges involved in their implementation, including measurement and diagnostic technologies	The student has the ability to interpret and correctly analyze the results of simulation and experimental studies.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture
Definition and functions of an electromechanical system (EMS). SE components and their functions. Trends in SE development. Practical SE structures. Machine assemblies used in wind power. Fundamentals of SE modelling, simulation and design using CAD techniques. SE modelling methods from an energy perspective.

Prerequisites and co-requisites

General knowledge of the subjects Electrical Machines, Electronics, ability to analyze electric and magnetic circuits in steady and transient states, ability to analyze the operation of electrical machines in steady states.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratory</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Test</td><td>60.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Gieras J.: Advancements in electric machines. Springer Netherlands, 2008.
2. Lyshevski S. E., Nano- and micro-electromechanical systems: Fundamental of micro- and nano-engineering. CRC Press, 2000.</td></tr>
<tr><td>Supplementary literature</td><td>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.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">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>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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