GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Drive Automatics and Servomechanisms, PG_00038107		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Electric Drives and Energy Conversion -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Arkadiusz Lewicki	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	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	8.0	57.0	125

Subject objectives	The aim of the course is to demonstrate the principles of operation and industrial applications of automated drive systems with electric machines, including the principles of operation of these machines, to familiarise students with the physics of motion control and energy processes, and to learn methods of servomechanism control.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W08	The student is able to determine the requirements for the drive system for a given application. They know which control method is appropriate.	[SW1] Assessment of factual knowledge
[K6_U05] can use analytical and simulation methods to solve tasks in the field of automation and robotics and use various techniques to carry out engineering tasks related to automation and robotics devices and systems	The student, using the knowledge acquired in the course, is able to correctly perform the task using simulation tools and technical devices. The student is able to process and analyse measurement results and present them in the form of a report.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_K05] can think and act in an entrepreneurial way	The student is able to plan the method and sequence of activities to complete a laboratory task. The student is able to deal with real technical problems. The student is able to	[SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness [SK2] Assessment of progress of work [SK1] Assessment of group work skills
K6_U05	The student, using the knowledge acquired in the course, is able to correctly perform the task using simulation tools and technical devices. The student is able to process and analyse measurement results and present them in the form of a report.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_W08] knows the basics of equipment selection and control of electrical machines and servos	The student is able to determine the requirements for the drive system for a given application. They know which control method is appropriate.	[SW1] Assessment of factual knowledge
K6_K05	The student is able to plan the method and sequence of activities to complete a laboratory task. The student is able to deal with real technical problems. The student is able to	[SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness [SK3] Assessment of ability to organize work [SK1] Assessment of group work skills

Subject contents

Course content – lecture

Machines as executive elements in control systems, principles of position, speed and torque control of electric machines, motion equations. Types of electric machine operation, types of loads, drive system operating point, static characteristics. Types of electric machines and their special features. Control system structure. Selection of the type and parameters of controllers, technical implementation of the control system, measurement of electrical and mechanical quantities. Brake energy recovery.
Impact of limitations on control quality. Principles of scalar and vector control of an alternating current machine
. Servomechanisms: machines, control structures, disturbances, influence of friction, potential forces, moment of inertia and load on control quality. Analysis of selected industrial applications
: lift, winch, rewinder, traction drive, robot arm.

Prerequisites and co-requisites

knowledge of the basics of power electronics, electrical engineering, including transient states in electrical circuits
mechanics and control theory

<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>lab grade</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>exam</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. Teaching materials for laboratory and lectures on the course Drive Automation and Servomechanisms on eLearning
2. Zawirski K, Deskur J.: Electric Drive Automation, 2012.
3. Collective work: Siemens Servo Drives in Engineering Practice, 2020, published by BTC, ISBN 978-83-64702-19-8</td></tr>
<tr><td>Supplementary literature</td><td>1. Krzemiński Z.: Digital control of asynchronous machines, Gdańsk, PG Publishing House, 2003.
2. Orłowska-Kowalska T.: Sensorless drive systems with asynchronous machines, Wrocław University of Technology Publishing House, 2005.
3. Zawirski K.: Drive systems with synchronous machines, Poznań University of Technology Publishing House, Poznań, 2005.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. equation of dynamics in rotational motion,
2. electric machine model
3. principles of selecting regulator settings in an electric drive
4. structure of a servomechanism control system
5. control of an asynchronous machine according to U/f</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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