GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Components of mechatronic systems, PG_00055456						
Field of study	Mechatronics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2028/2029			
Education level	first-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	Full-time studies		Mode of delivery	at the university			
Year of study	3		Language of instruction	Polish			
Semester of study	5		ECTS credits	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Ryszard Jasiński				
	Teachers						

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	30.0	0.0	45
	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	45	2.0	28.0	75

Subject objectives	Familiarize students with the elements used in mechatronic devices

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U10] is able - while formulating and solving mechatronic engineering tasks - to notice their systemwide and non-technical aspects	Student describes the structure and principle of operation of control elements, actuators and sensors in mechatronic systems. Student selects the basic elements for the mechatronic system. When formulating and solving mechatronics engineering tasks, the student is able to see their systemic and non-technical aspects.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K6_U07] is able to design elements of mechatronic systems taking into consideration given application and economic criteria, using appropriate methods, techniques and tools	Student builds hydraulic and pneumatic systems. Student takes measurements. Student analyzes the results of the measurements. Student calculates measurement errors.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K6_W03] has organized and theoretically supported, advanced knowledge in the field of automation and control theory of stationary , continuous and discrete mechatronic systems, mechatronic design, developments and exploitation of mechatronic systems	Student builds hydraulic and pneumatic systems. student takes measurements. Student analyzes the results of the measurements. Student calculates measurement errors.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U06] is able to identify and formulate specification of simple, practical engineering tasks, distinctive for mechatronics	Student describes the structure and principle of operation of control elements, actuators and sensors in mechatronic systems. Student selects the basic elements for the mechatronic system. Student is able to identify and formulate the specification of simple engineering tasks of a practical, characteristic of mechatronics.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

Lecture:Pneumatic, electric and hydraulic elements and sensors in mechatronic systems. Construction and operation of actuators. Signal analysis and processing. Electromagnetic actuators. Servo drives, stepper motors and their comparison. Hydraulic actuators. Classification of members of hydraulic systems. Pneumatic actuators. Control elements of mechatronic systems: electric, pneumatic and hydraulic and their comparison. Sensors. Requirements for sensors.

Course content – project
Part 1 of the project
Sequential control in pneumatic systems. Systems with time relays, pneumatic control. Electropneumatic control. Electropneumatic control - systems with time relays, systems with counters. Design and selection of a pneumatic actuator. Computer-aided design of fluid systems. Analysis of the pneumatic system of the mechatronic MAS 200 system.
Part 2 of the project
Design of a station or device with a three-axis pneumatic manipulator.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	56.0%	40.0%
	56.0%	60.0%

Recommended reading	Basic literature	Heiman B., Gerth W., Popp K.: Mechatronika, metody, przykłady, tł. Gawrysiak M., Wydawnictwo Naukowe PWN, Warszawa, 2001 Gawrysiak M.: Mechatronika i projektowanie mechatroniczne, Polit. Białostocka, Białystok, 1997 Giergiel J., Uhl T.: Identyfikacja układów mechatronicznych, PWN, Warszawa, 1990 Afonin A., Szymczak P.: Mechatronika, Skrypt Politechniki Szczecińskiej, Szczecin, 2001 Schmid D.: Mechatronika. Podręcznik dla uczniów średnich i zawodowych szkół technicznych. Rok wydania 2002, wydawnictwo: REA Osiecki A.: Hydrostatyczny napęd maszyn. WNT, Warszawa 1998 Stryczek S.: Napęd hydrostatyczny. Tom 1 i 2. WNT, Warszawa 1992 Szenajch W.: Napęd i sterowanie pneumatyczne, PWN, Warszawa, 2016 Niegoda J., Pomierski W., Sterowanie pneumatyczne. Ćwiczenia laboratoryjne, Wydawnictwo Politechniki Gdańskiej, Gdańsk 1998 Vademecum Hydrauliki, wyd. Bosch Rexroth
	Supplementary literature	-
	eResources addresses	
Example issues/ example questions/ tasks being completed	Design of a station or device with a three-axis pneumatic manipulator. Design and operation of rodless actuators. Design and operation of hydraulic actuators. Damping in actuators. Design and operation of pneumatic and hydraulic pendulum actuators. Design and operation of vacuum elements (elements generating and using vacuum). Pneumatic system with a compressed air generation system, air preparation unit, and actuator system.	
Practical activites within the subject	Not applicable	

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