GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Hydraulics and Pneumatics, PG_00055441		
Field of study	Mechatronics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Załuski	
	Teachers	dr inż. Paweł Załuski dr inż. Daniel Piątek	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	15.0	0.0	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

The aim of the course is to introduce issues and problems related to hydrostatic and pneumatic drives. The aim is to get to know the physical basis of the systems' operation, learn about the elements' construction and develop the ability to read hydraulic and pneumatic diagrams. Upon completion of the course, the student should be able to design a simple hydraulic or pneumatic system.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U05] is able to use properly choosen tools to compare design solutions of elements and mechatronics systems according to given application and economic crtierions (e.g. power demand, speed, costs)	Students will understand hydraulic and pneumatic diagrams and be able to compare the operation of different systems.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_W04] has organized and theoretically supported knowledge in terms of general mechanics, strength of materials, theory of mechanisms and machine dynamics, fluid dynamics, hydraulics and pneumatics, machine construction and engineering graphics	The student is able to make calculations of a simple hydraulic system. They will be able to determine flow resistance and select elements for a given system.	[SW1] Assessment of factual knowledge
[K6_U06] is able to identify and formulate specification of simple, practical engineering tasks, distinctive for mechatronics	The student is able to design a hydraulic system meeting the given requirements.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>Hydraulics

• Fundamentals of hydraulic propulsion. Conservation of mass, energy. Linear and local resistance to flow. Flow through gaps, constrictions.
• Hydraulic fluid. Types. Mineral oils. Dynamic and kinematic viscosity. Fluid requirements.
• Hydraulic elements. Hydraulic pumps. Constructional variants. Performance, power, efficiency. Construction of hydraulic cylinders. Seals.
• Manifolds, control. Throttle valves and pressure valves.
• Hydraulic accumulators.
• Graphic symbols. Principles of creation. Reading a hydraulic diagram
• Basic hydraulic systems. Throttle and displacement systems

Pneumatics

• Properties of pneumatics. Properties of compressed air. Compressors. Filtration and drying of compressed air. Purity classes.
• Basic pneumatic components and systems.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of materials engineering, mechanics, strength of materials, fundamentals of machine construction and the ability to read technical drawings. Basic knowledge of physics describing the flow of liquids and gases</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>lecture test</td><td>56.0%</td><td>70.0%</td></tr><tr><td>lab test</td><td>56.0%</td><td>15.0%</td></tr><tr><td>exercise test</td><td>56.0%</td><td>15.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>• Osiecki A.: Hydrostatyczny napęd maszyn. WNT Warszawa 1998
• Stryczek S.: Napęd hydrostatyczny. Tom I Elementy. Tom II Układy. WNT Warszawa 1990</td></tr><tr><td>Supplementary literature</td><td>• Szenajch W.: Napęd i sterowanie pneumatyczne. WNT Warszawa 1997
• Niegoda J., Pomierski W.: Sterowanie pneumatyczne. Skrypt PG. Gdańsk 1998.
• Huścio T., Kulesza Z., Kuźmierowski T: Napędy i sterowanie pneumatyczne. Oficyna Wydawnicza Politechniki Białostockiej. Białystok 2013
• Sobczyk P.,Hydraulika siłowa. Zbiór zadań z rozwiązaniami
• Rexroth Vademecum hydrauliki</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Determine the maximum cylinder force for position B of the distributor (based on the drawing)2. Hydraulic oil with a viscosity of v=40 cSt flows through a circular pipe of internal diameter ø10 mm at a rate of 10 l/min. What is the velocity of the flow?3. Describe the flow through a plane gap (formula)4. Basic functions and requirements for working fluids in power hydraulics5. Draw a diagram of a series throttle system with throttling at the outlet of a double acting cylinder. On what does the extension velocity of the actuator depend?6. Draw a pneumatic system with two actuators A and B, where actuator A is a single acting actuator and B is a double acting actuator. Both actuators start moving simultaneously when the START button is pressed and both return simultaneously when they both occupy the extreme extended position.Translated with www.DeepL.com/Translator (free version)</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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