



Subject card

Subject name and code	Hydraulics and Pneumatics, PG_00050266						
Field of study	Mechatronics, Mechatronics						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
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	3	ECTS credits			4.0		
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. Marcin Bąk					
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						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17816 Adresy na platformie eNauczanie: Hydraulika i Pneumatyka, W, M, sem.03, zimowy 21/22 (PG_00050266) - Moodle ID: 17816 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17816 Hydraulika i Pneumatyka, W, M, sem.03, zimowy 21/22 (PG_00050266) - Moodle ID: 17816 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17816 Hydraulika i Pneumatyka, W, M, sem.03, zimowy 21/22 (PG_00050266) - Moodle ID: 17816 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=17816						
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	5.0	50.0	100		
Subject objectives	The aim of this course is to introduce issues and problems related to hydrostatic and pneumatic drives. The aim is to learn the basics of the physical operation of systems, to learn the structure of elements and to learn how to read hydraulic and pneumatic schemes. After completing 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	The student is able to understand hydraulic and pneumatic diagrams and to be able to compare the functioning of different systems.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information		
	K6_W04	The student is able to calculate a simple hydraulic system. He can determine the flow resistance and select elements for a specific system			[SW1] Assessment of factual knowledge		
	K6_U06	The student is able to design a hydraulic system that meets the given demands			[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment		

Subject contents	<p>Hydraulics</p> <ul style="list-style-type: none"> Basics of hydraulic drive. The principle of mass preservation, energy. Linear and local flow resistance. Flow through gaps, constrictions. Hydraulic fluid. Types. Mineral oils. Dynamic and kinematic viscosity. Requirements for working fluids. Hydraulic elements. Hydraulic pumps. Constructional variants. Performance, power, efficiency. Construction of hydraulic cylinders. Seals. Directional valves, control. Throttle valves and pressure valves. Hydraulic accumulators Graphical symbols. Creation rules. Reading the hydraulic diagram Basic hydraulic systems. Throttle systems and volumetric systems <p>Pneumatics</p> <ul style="list-style-type: none"> Properties of pneumatics. Properties of compressed air. Compressors. Filtration and drying of compressed air. Cleanliness classes. Basic pneumatic components and systems 														
Prerequisites and co-requisites	Basic knowledge of material engineering, mechanics, strength of materials, fundamentals of machine construction and ability to read technical drawings. Basic knowledge of physics sections describing the flow of liquids and gases														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th>Subject passing criteria</th> <th>Passing threshold</th> <th>Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Passing the colloquium at the end of the lectures</td> <td>56.0%</td> <td>70.0%</td> </tr> <tr> <td>Passing the exercise colloquium</td> <td>56.0%</td> <td>15.0%</td> </tr> <tr> <td>Passing the laboratories</td> <td>56.0%</td> <td>15.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Passing the colloquium at the end of the lectures	56.0%	70.0%	Passing the exercise colloquium	56.0%	15.0%	Passing the laboratories	56.0%	15.0%
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Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> Determine the maximum force of the actuator for position "B" of the directional spool valve (from the drawing) Through a round tube with an inner diameter of $\varnothing 10$ mm, hydraulic oil with a viscosity of $\nu = 40$ cSt flows at a rate of 10 l/min. What is the flow rate? Describe the flow through the flat gap (pattern) Basic functions and requirements for working fluids in power hydraulics Draw a diagram of a series throttling system with throttling at the outlet of the double acting actuator. What does the actuator's extension speed depend on? Draw a pneumatic system with two actuators A and B, where actuator A is a single-acting actuator and B a double-acting actuator. Both actuators start moving at the same time when the START button is pressed and both return at the same time when they both reach the extreme extension position 														
Work placement	Not applicable														