



Subject card

Subject name and code	Vehicle Hydraulics, PG_00040105						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Konstrukcji Maszyn i Inżynierii Medycznej -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Załuski					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	22.0	0.0	0.0	0.0	0.0	22
	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	22	5.0		23.0	50	
Subject objectives	The aim of the course is to introduce students to the application of hydraulic and electro-hydraulic drive and control in the construction of automobiles, especially steering, braking and suspension systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W08] possesses basic knowledge including the methodology of designing machine parts, mechanical devices, selection of construction materials, manufacturing and operation, with the lifetime cycle	The student has knowledge of hydraulic drive and control in automobile construction. The student explains the application of hydraulic power steering in steering gears with kinematic, hydraulic and electric feedback. The student is able to design and select the components of a full-hydraulic steering gear. The student describes the design of components and operation of a hydraulic braking system with power assist and brake force corrector. The student calculates the operating parameters of the hydraulic braking system. The student understands the operation of a braking system equipped with ABS valves and the operation of ESP. The student describes the construction of hydraulic and pneumohydraulic components of the suspension system with height and lateral tilt correction in automobiles.			[SW3] Assessment of knowledge contained in written work and projects		
	[K6_U05] is able to plant an experiment within the range of measuring the basic operating parameters of mechanical devices using a specialized equipment, interpret the results and reach the correct conclusions	The student is able to perform calculations and solve design tasks for steering, braking and suspension systems used in automobiles.			[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	Development of automotive hydraulics. Application of hydraulics in passenger cars. Varieties and requirements for steering servos. Hydromechanical and full-hydraulic steering servos. Electrohydraulic steering servos. Requirements and components of the braking system in automobiles. Hydraulic braking system circuits and components. Electrohydraulic braking systems ABS, ASR. Vehicle suspension components. Hydropneumatic suspension. Vehicle hydropneumatic leveling systems. Electronic stability control system of the vehicle ESP.		
Prerequisites and co-requisites	Fundamentals of general mechanics, hydraulics and electrical engineering		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test	56.0%	100.0%
Recommended reading	Basic literature	Szydelski Z.: Napęd i sterowanie w pojazdach i samojezdnych maszynach roboczych. WNT Warszawa 1980	
		Reński A.: Budowa samochodów. Układy hamulcowe i kierownicze oraz zawieszenia. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 2004	
	Supplementary literature	Leiter R.: Hamulce samochodów osobowych i motocykli. Wydawnictwa Komunikacji i Łączności. Warszawa 198	
		Katalogi firm: Danfoss, Bosch-Rexroth	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Full-hydraulic steering servo design.Principle of operation of ABS, ESP systemOperation and application of retarder		
Work placement	Not applicable		