



Subject card

Subject name and code	Vehicle Hydraulics, PG_00040105						
Field of study	Mechanical Engineering, Mechanical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject				2022/2023	
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 Hydrauliki i Pneumatyki -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor						
	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 familiarise students with the application of hydraulic and electro-hydraulic drive and control in the construction of automobiles, particularly 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 use of hydraulic assistance in steering gears with kinematic, hydraulic and electric feedback. The student is able to design and select elements of a full hydraulic steering gear. The student describes the structure of the elements and operation of a hydraulic braking system with a brake force booster and corrector. The student is able to calculate working parameters of hydraulic braking system. The student understands the operation of a braking system equipped with ABS valves and the operation of ESP. The student will describe the construction of the hydraulic and pneumohydraulic elements of the suspension system with height and lateral tilt corrector 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 carry out calculations and solve design tasks related to 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. Electro-hydraulic steering servos. Requirements and components of the automotive braking system. Circuits and hydraulic components of the braking system. Electrohydraulic braking systems ABS, ASR. Elements of vehicle suspension. Hydropneumatic suspension. Hydropneumatic levelling systems. Electronic stability control system 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
	project task	56.0%	20.0%
	test	56.0%	80.0%
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		
Example issues/ example questions/ tasks being completed	Full-hydraulic steering servo design.Principle of operation of ABS, ESPOperation and application of retarder		
Work placement	Not applicable		