GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of Modelling Systems, PG_00055497						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2027/2028			
Education level	first-cycle studies		Subject group	Optional subject group 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	4.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department Of Machine Design And Vehicles -> Faculty Of Mechanical Engineering And Ship Technology -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Wojciech Owczarzak				
	Teachers						
Lesson types and methods of instruction	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		6.0	49.0		100
Subject objectives	General introduction to the methods of creating, simulating the actions and actual properties of hydraulic drive systems, and pneumatic drive systems with internal combustion engines and propulsion systems of vehicles.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W11] possesses knowledge on design, technology and manufacturing of machine parts, metrology, and quality control; knows and understands methods of measuring and calculating values describing the operation of mechanical systems, knows calculating methods applied to analyse the results of experiments	Student describes: methods of creation and system simulation hydraulic drives and pneumatic systems propulsion with engines combustion and systems propulsion vehicles. calculates these systems.	[SW3] Assessment of knowledge contained in written work and projects
[K6_W08] possesses knowledge including the methodology of designing machine parts, mechanical devices, selection of construction materials, manufacturing and operation, with the lifetime cycle	Student describes: methods of creation and system simulation hydraulic drives and pneumatic systems propulsion with engines combustion and systems propulsion vehicles. calculates these systems.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U11] is able to analyse the operation of devices and compare the construction solutions applying usage, safety, environmental, economic and legal criteria	Student describes: methods of creation and system simulation hydraulic drives and pneumatic systems propulsion with engines combustion and systems propulsion vehicles. calculates these systems.	[SU1] Assessment of task fulfilment
[K6_U03] is able to identify, formulate and develop the documentation of a simple design or technological task, including the description of the results of this task in Polish or in a foreign language and to present the results using computer software or other aiding tools	Student describes: methods of creation and system simulation hydraulic drives and pneumatic systems propulsion with engines combustion and systems propulsion vehicles. calculates these systems.	[SU1] Assessment of task fulfilment

Subject contents

LECTURE Application of computer aidet modeling of pneumatic and hydraulic drive systems. Modeling of flow in the gaps. Modeling of fuel consumption of spark ignition engine. Modeling of torque of internal combustion engine. Simulation of operation of vehicle propulsion system with internal combustion engine for selected operating conditions. Construction of dry friction vehicle clutch, driving torque and friction work criteria, pressures, friction materials, plate spring dimensions, clutch steering system. Axle shafts: unloaded, semi-loaded and loaded. LABORATORY 1. Creation and analysis of the performance of the hydraulic drive system. 2. Creation and analysis of the performance of the pneumatic drive system. 3. Construction of electro hydraulic sequential control system. 4. Control of speed in pneumatics. 5. Modeling of fuel consumption of spark ignition engine. 6. Modeling of torque of internal combustion engine. 7. Simulation of operation of vehicle propulsion system with internal combustion engine for selected operating conditions. 8. Dry friction vehicle clutch modeling, driving torque and friction work criteria, estimation of pressures, choice of friction materials, plate spring dimensions modeling, calculations of clutch steering system. Axle shafts modeling: unloaded, semi-loaded and loaded.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	50.0%
Project	75.0%	50.0%

Recommended reading

Basic literature	1. Balawender i zespół. Laboratorium napędów hydraulicznych. Cz I. Podstawy hydrauliki. 2. J. Niegoda, W. Pomierski: Sterowanie pneumatyczne. Ćwiczenia laboratoryjne. 3. M. Bernhardt, S. Dobrzyński, E. Loth: Silniki samochodowe. WKiŁ, Warszawa 1988. 4. M. Cichy: Modelowanie systemów energetycznych. Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2001. 5. Z. Jaśkiewicz i In.: Poradnik inżyniera samochodowego, elementy i materiały. WKiŁ, Warszawa, 1990. 6. Z. Jaśkiewicz: Projektowanie układów napędowych pojazdów samochodowych WKiŁ, Warszawa, 1982.
Supplementary literature	No requirements
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

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Work placement

Not applicable