GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Vehicle Dynamics Theory, PG_00055496						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2023		Academic year of realisation of subject	2025/2026			
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	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Machine Design and Vehicles -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Ryszard Woźniak					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	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		3.0	27.0	75	
Subject objectives	Issues presentation related to the kinematics and dynamics of car movement with particular emphasis of the drag movement, and overcoming them by the drive system aquipped with an internal combustion engine.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W08] possesses knowledge including the methodology of designing machine parts, mechanical devices, selection of construction materials, manufacturing and operation, with the lifetime cycle	The student describes the characteristics engines. Discusses team performance car propulsion system. Describes tire grip. He chooses the engine for the car. Calculates the value of gears in car propulsion system on the lowest gears. Calculates the value of gear ratios in car propulsion system.	[SW1] Assessment of factual knowledge
[K6_U06] is able to use mathematical and physical models for analysing the processes and phenomena occurring in mechanical devices within the range of material strength, thermodynamics and fluid mechanics	The student describes the characteristics engines. Discusses team performance car propulsion system. Describes tire grip. He chooses the engine for the car. Calculates the value of gears in car propulsion system on the lowest gears. Calculates the value of gear ratios in car propulsion system.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[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	The student describes the characteristics engines. Discusses team performance car propulsion system. Describes tire grip. He chooses the engine for the car. Calculates the value of gears in car propulsion system on the lowest gears. Calculates the value of gear ratios in car propulsion system.	[SU1] Assessment of task fulfilment

Subject contents

LECTURE Throttle by tyred wheel: slip rolling, rolling with tyre strain, vertical and lateral surface reactions, traction, energetic looses, forcen in contact path. Drugs of movement: air, gradient, inertia and towing. Forces ant torques acting to vehicle in straight movement. Limiting values of reaction forces. Different power trains - comparision of possibilities. Engine cooperation with power train of traction vehicle. Efficiency of power train. Vehicle traction posibilities: power balance, force balans, dynamic ratio and dynamic figures, distance and time of acceleration. Selection of transmission ratios. Influence of hydrokinetic power train on tvehicle raction possibilities. Vehicle braking. EXERCISES Drugs of movement: calculations of: air drug, gradient drug, inertia drug, cornering drug, towing drug, forces and torques acting to the vehicle going straight or turning. Calculations of imiting values of reaction forces. Calculations of efficiency of power train. Calculations of: power balance, forces balance, dynamic ratios, distance and time of acceleration. Calculations of transmission ratios in power train. Calculations of braking force balance on each vehicle wheel during braking.

LABORATORY Determination of rolling tyre radius. Determination of rolling ressistance coefficient of the car. Determination ofdrag coefficient of the car.

Prerequisites and co-requisites

Knowledge from subjects: mathematics I i II i III (07000W0 i 07000C0) and physics I i II (07001W0 i 07001C0).

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	50.0%	100.0%

Recommended reading

Basic literature	1. Prochowski L.: Mechanika ruchu. WKiŁ, Warszawa, 2005. 2. Arczyński S.: Mechanika ruchu samochodu. WNT, Warszawa, 1993. 3. Lanzendoerfer J., Szczepaniak C.: Teoria ruchu samochodu. WKiŁ, Warszawa, 1980. 4. Mitschke M.: Dynamika samochodu. WKiŁ, Warszawa, 1977. 5. Dębicki M.: Teoria samochodu - teoria napędu. WNT, Warszawa, 1969.
Supplementary literature	No requirements
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

1. Drive train efficiency coefficients
2. Drags of vehicle movement
3. The choice of engine for vehicle
4. Selection of gear in the drive train of the car on the lowest gears
5. Selection of gear in the drive train of the car on the highest gear
6. Passenger car tires

Work placement

Not applicable