GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Vehicle dynamics, PG_00064831						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2025		Academic year of realisation of subject	2025/2026			
Education level	second-cycle studies		Subject group	Specialty 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	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	4.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Department of Machine Design and Vehicles -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Grzegorz Ronowski				
	Teachers						
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						
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		9.0	46.0	100	
Subject objectives	Gaining basic knowledge of braking and cornering of vehicles.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] demonstrates a structured and theoretically grounded knowledge of the key topics in Mechanical Engineering enabling the analysis and modelling of mechanical systems, processes and devices	The student presents the coefficient of adhesion. Describes the braking of a two-axle vehicle. Presents the distribution of braking forces. Describes braking on an incline and a decline. Defines braking deceleration. Explains the phenomenon of lateral tire slip. Determines the movement of a vehicle on a curve without the phenomenon of lateral tire slip. Explains the movement of a vehicle on a curve with the phenomenon of lateral tire slip. Measures the braking forces and the braking distance.	[SW1] Assessment of factual knowledge
[K7_U04] creatively designs or modifies devices, processes or systems specific to Mechanics and Mechanical Engineering, using computer-aided design systems in the form of technical documentation, taking into account aspects of economic analysis, using appropriate tools and techniques	The student calculates the reactions acting on the vehicle during acceleration and braking. Uses these reactions to correctly calculate the brakes and drive system of vehicles.	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_U02] formulates and solves technical problems specific to Mechanics and Mechanical Engineering using appropriate tools including CAD and MES systems, and prepares technical documentation	The student designs a brake caliper for a vehicle of his choice. For this purpose, he uses CAD and MES software.	[SU1] Assessment of task fulfilment
[K7_W11] interprets social, economic, legal (including industrial and intellectual property laws), and other non-technical aspects of engineering activities, and includes them into engineering practice	The student conducts research on the patent purity of his/her proposed design solution for a vehicle brake caliper.	[SW1] Assessment of factual knowledge

Subject contents

LECTURE Friction coefficient. Two axle vehicle braking. Front axle braking. Rear axle braking. Braking forces distribution. Braking on gradiend (up and down). Braking deceleration. Side slipping of tyres. Vehicle cornering without side slipping of tyres. Vehicle cornering taking side slipping of tyres into account. LABORATORY Braking forces measurement. Braking distance measurement. Vehicle rolling radius measurement. Vehicle rolling resistance coefficient measurement. Vehicle air drug coefficient measurement.

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%	50.0%
Practical exercise	75.0%	50.0%

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.
Supplementary literature	No requirements
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

1. Give quantitative indicators of steerability.

2. Give quantitative indicators of stability.

3. Draw a kinematic diagram of a wheeled vehicle moving on a curved track, taking into account the phenomenon of lateral tire drift.

4. Give the conditions for: oversteering, understeering and neutrality of the vehicle.

5. Discuss the critical speeds of a vehicle moving on a curved track.

Work placement

Not applicable

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