GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|---|---|---|---|
| Subject name and code | Vehicle dynamics, PG_00064831 | | | | | | |
| Field of study | Mechanical Engineering | | | | | | |
| Date of commencement of studies | February 2027 | | Academic year of realisation of subject | 2027/2028 | | | |
| Education level | second-cycle studies | | Subject group | Specialty subject group<br>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 -> Faculties of Gdańsk University of Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Grzegorz Ronowski | | | | |
| | Teachers | | | | | | |
| Lesson types | 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**

Course content – lecture

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**

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|---|---|
| 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 | |

**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.

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| Practical activites within the subject | Not applicable |

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