



Subject card

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| Subject name and code | Vehicle Dynamics, PG_00052230 | | | | | | |
| Field of study | Mechanical Engineering | | | | | | |
| Date of commencement of studies | October 2022 | Academic year of realisation of subject | | | 2024/2025 | | |
| Education level | first-cycle studies | Subject group | | | | | |
| Mode of study | Full-time studies | Mode of delivery | | | at the university | | |
| Year of study | 3 | Language of instruction | | | English | | |
| Semester of study | 6 | ECTS credits | | | 3.0 | | |
| Learning profile | general academic profile | Assessment form | | | assessment | | |
| Conducting unit | Institute of Mechanics and Machine Design -> 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 | 15.0 | 15.0 | 15.0 | 15.0 | 0.0 | 60 |
| | 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 | 60 | | 0.0 | | 0.0 | 60 |
| 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 equipped with an internal combustion engine. | | | | | | |

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| Learning outcomes | Course outcome | Subject outcome | Method of verification |
| | [K6_W12] possesses basic knowledge necessary to understand the ex-technical conditions of engineering activity, possesses basic knowledge on management, including quality management and running commercial enterprise, within the range of protection of intellectual property and patent law; knows general principles of creating and developing forms of individual entrepreneurship and basic HSE rules applicable to machine industry | The student gains knowledge about the resistance to motion of the vehicle. He acquaints himself with the selection of an engine for a car and the selection of gear ratios in the vehicle drive system. He gets acquainted with the problems related to the braking of the vehicle and with selected issues related to the construction of the car. | [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge |
| | K6_U07 | The student gains knowledge about the resistance to motion of the vehicle. He acquaints himself with the selection of an engine for a car and the selection of gear ratios in the vehicle drive system. He gets acquainted with the problems related to the braking of the vehicle and with selected issues related to the construction of the car. | [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment |
| | K6_U01 | The student gains knowledge about the resistance to motion of the vehicle. He acquaints himself with the selection of an engine for a car and the selection of gear ratios in the vehicle drive system. He gets acquainted with the problems related to the braking of the vehicle and with selected issues related to the construction of the car. | [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment |
| | K6_W08 | The student gains knowledge about the resistance to motion of the vehicle. He acquaints himself with the selection of an engine for a car and the selection of gear ratios in the vehicle drive system. He gets acquainted with the problems related to the braking of the vehicle and with selected issues related to the construction of the car. | [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge |
| Subject contents | <p>Lecture: Throttle by tyred wheel: slip rolling, rolling with tyre strain, vertical and lateral surface reactions, traction, energetic losses, forces in contact path. Drags of movement: rolling, air, gradient, inertia, cornering and towing. Forces and torques acting to vehicle in straight movement. Limiting values of reaction forces. Different power trains - comparison of possibilities. Engine cooperation with power train of traction vehicle. Efficiency of power train. Vehicle traction possibilities: power balance, force balance, dynamic ratio and dynamic figures, distance and time of acceleration. Vehicle braking.</p> <p>Classes: Drags of movement: calculations of: rolling drag, air drag, gradient drag, inertia drag, cornering drag, towing drag, forces and torques acting to the vehicle going straight or cornering. Calculations of limiting values of reaction forces. Calculations of efficiency of power train. Calculations of: power balance, force 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.</p> <p>Laboratory: Determination of rolling tyre radius. Determination of dynamic tyre radius. Determination of vertical tyre stiffness. Balancing car wheels with tyres. Determination of wheels with tyres inertia moments. Determination of rolling resistance coefficient of the car. Determination of air drag coefficient of the car.</p> <p>Project: Design of a dry, friction clutch for a passenger car (including calculations and technical drawings).</p> | | |
| Prerequisites and co-requisites | | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | Tests during the semester | 50.0% | 50.0% |
| | Project evaluation | 80.0% | 50.0% |

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| Recommended reading | Basic literature | <ol style="list-style-type: none"> 1. Vehicle Dynamics. Theory and Application. Reza N. Jazar, Springer (all editions). 2. Fundamentals of Vehicle Dynamics. Thomas D. Gillespie. SAE International; 1 edition (October 17, 2019). 3. Race Car Vehicle Dynamics - Problems, Answers and Experiments. William F. Miliken, Douglas L. Miliken, Edward M Kasprzak, L. Daniel Metz. SAE International; Pap/Cdr edition (May 30, 2003). 4. Dynamik der Kraftfahrzeuge. Zweite, völlig neubearbeitete Auflage. Band A: Antrieb und Bremsung. Manfred Mitschke. Springer-Verlag, Berlin Heidelberg New York 1982. |
| | Supplementary literature | Absence |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | <ol style="list-style-type: none"> 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. Design of a dry, friction clutch for a passenger car | |
| Work placement | Not applicable | |

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