



Subject card

|   |  |  |                         |                                     |  |            |     |
|---|--|--|-------------------------|-------------------------------------|--|------------|-----|
| Subject name and code                       | Fundamentals of Modelling Systems, PG_00055497   |  |                         |                                     |  |            |     |
| Field of study                              | Mechanical Engineering   |  |                         |                                     |  |            |     |
| Date of commencement of studies             | October 2024   | Academic year of realisation of subject                  |                         |                                     | 2026/2027  |            |     |
| Education level                             | first-cycle studies  | Subject group  |                         |                                     | Optional 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                               | 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   |  |                         |                                     |  |            |     |
| 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   | 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. |  |                         |                                     |  |            |     |

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| Learning outcomes  | Course outcome  | Subject outcome   | Method of verification  |
|  | [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   |
|  | [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_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.   | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |
| [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  |   |
| Subject contents   | LECTURE Application of computer aided 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   |
|  | Project   | 75.0%   | 50.0%   |
|  | Midterm colloquium  | 50.0%   | 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 eNauczenie:  |   |
| Example issues/<br>example questions/<br>tasks being completed   | -   |   |   |
| Work placement   | Not applicable  |   |   |

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