



Subject card

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|---|--|---|--|--|------------|---|---------|-----|
| Subject name and code | | Hydraulic Drive Control, PG_00055515 | | | | | | |
| Field of study | | Mechanical Engineering | | | | | | |
| Date of commencement of studies | | October 2021 | Academic year of realisation of subject | | | 2023/2024 | | |
| 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 | | 6 | ECTS credits | | | 5.0 | | |
| Learning profile | | general academic profile | Assessment form | | | exam | | |
| Conducting unit | | Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology | | | | | | |
| Name and surname of lecturer (lecturers) | | Subject supervisor | | dr hab. inż. Paweł Śliwiński | | | | |
| | | Teachers | | dr inż. Agnieszka Maczyszyn dr hab. inż. Paweł Śliwiński | | | | |
| Lesson types and methods of instruction | | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | | Number of study hours | 30.0 | 15.0 | 30.0 | 0.0 | 0.0 | 75 |
| | | 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 | 75 | 5.0 | | 45.0 | | 125 |
| Subject objectives | | Knowledge of operation and design principles of hydrostatic drive and control systems. Knowledge of properties of system components. | | | | | | |
| Learning outcomes | | Course outcome | | Subject outcome | | Method of verification | | |
| | | [K6_U05] is able to plant an experiment within the range of measuring the basic operating parameters of mechanical devices using a specialized equipment, interpret the results and reach the correct conclusions | | Student is able to plan an experiment to measure the basic operating parameters of a hydraulic system. | | [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools | | |
| | | [K6_W08] possesses basic knowledge including the methodology of designing machine parts, mechanical devices, selection of construction materials, manufacturing and operation, with the lifetime cycle | | Student has knowledge of the design of basic hydraulic systems. | | [SW1] Assessment of factual knowledge | | |
| | | [K6_U07] is able to design a typical construction of a mechanical device, component or a testing station using appropriate methods and tools, adhering to the set usage criteria | | Student is able to design typical hydraulic systems. | | [SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools | | |

| Subject contents | <p>LECTURE:</p> <ol style="list-style-type: none"> 1. W1 (2h) throttling systems 2. W2 (2h) volumetric systems 3. W3 (2h) basic design calculations of the hydraulic system 4. W4 (2h) oil tanks and coolers 5. W5 (2h) power supplies, pipelines, hoses, connections and couplings 6. W6-1 (1h) first start-up of the system 7. W6-2 (1h) liquid purity 8. W6-3-(1h) liquid filtration and system rinsing 9. W7 (2h) system with a proportional distributor, proportional valves 10. W8 (2h) hydraulic servo drive 11. W9 (2h) Load Sensing systems 12. W10 (2h) systems with power recovery 13. W11-2 (1h) pumps for open systems and pump controllers 14. W12-1 (1h) closed systems 15. W12-2 (1h) pumps and motors for closed systems 16. W13 (2h) logical elements, lift valves 17. W14 (2h) selected vehicle drive systems 18. W15 (2h) repetition of the material <p>LABORATORY:</p> <ol style="list-style-type: none"> 1. L1 System with a throttle valve and system with a flow regulator 2. L2 Determination of the cavitation characteristics of the pump 3. L3 Determination of the characteristics of the hydraulic motor 4. L4 Determination of the characteristics of the proportional distributor 5. L5 Sequential control (including electric) of actuators 6. L6 Hydrostatic transmission test 7. L7 Actuator testing determination of friction forces in the actuator 8. L8 Actuator differential connection 9. L9 Hydraulic accumulators 10. L10 Measurement of liquid contamination 11. L11 Measurement of liquid viscosity 12. L12 Air in the oil 13. 13 Pumping units (power supplies) and liquid tanks 14. L14 Pipelines, hoses, connections and couplings 15. L15 Final pass or improving laboratory excercises | | | | | | | | | | | | |
|---------------------------------|---|-------------------------------|-------------------|-------------------------------|-----------|-------|-------|------|-------|-------|------------|-------|-------|
| Prerequisites and co-requisites | Hydraulics and pneumatics - subject completed in semester IV | | | | | | | | | | | | |
| Assessment methods and criteria | <table border="1"> <thead> <tr> <th data-bbox="456 1093 794 1122">Subject passing criteria</th> <th data-bbox="799 1093 1137 1122">Passing threshold</th> <th data-bbox="1142 1093 1481 1122">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1128 794 1158">Exercises</td> <td data-bbox="799 1128 1137 1158">56.0%</td> <td data-bbox="1142 1128 1481 1158">15.0%</td> </tr> <tr> <td data-bbox="456 1164 794 1193">Exam</td> <td data-bbox="799 1164 1137 1193">56.0%</td> <td data-bbox="1142 1164 1481 1193">70.0%</td> </tr> <tr> <td data-bbox="456 1200 794 1229">laboratory</td> <td data-bbox="799 1200 1137 1229">56.0%</td> <td data-bbox="1142 1200 1481 1229">15.0%</td> </tr> </tbody> </table> | Subject passing criteria | Passing threshold | Percentage of the final grade | Exercises | 56.0% | 15.0% | Exam | 56.0% | 70.0% | laboratory | 56.0% | 15.0% |
| Subject passing criteria | Passing threshold | Percentage of the final grade | | | | | | | | | | | |
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| Exam | 56.0% | 70.0% | | | | | | | | | | | |
| laboratory | 56.0% | 15.0% | | | | | | | | | | | |

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| Recommended reading | Basic literature | <p>[1] Osiecki A. "Hydrostatyczny napęd maszyn, WNT, W-wa 2014.</p> <p>[2] Balawender A. i inni Laboratorium napędów hydraulicznych. Część 1. Podstawy hydrauliki, Wyd. IMP PAN, Gdańsk 1996.</p> <p>[3] Sobczyk P. Hydraulika i pneumatyka. Zbiór zadań z rozwiązaniami, PWN, W-wa, 2021.</p> <p>[4] Szydelski Z. Napęd i sterowanie hydrauliczne. Pojazdy samochodowe, WKŁ, W-wa 1999.</p> <p>[5] Stryczek S. "Napęd hydrostatyczny. Tom I elementy", WNT, W-wa 1997.</p> <p>[6] Stryczek S. Napęd hydrostatyczny. Tom II układy", WNT, W-wa 1997.</p> <p>[7] Dindorf R. Napędy płynowe. Podstawy teoretyczne i metody obliczania napędów hydraulicznych i pneumatycznych, Wydawnictwo Politechniki Świętokrzyskiej. Kielce 2009.</p> <p>[8] Vademecum hydrauliki, tom 1. Hydraulika. Podstawy, elementy konstrukcyjne i podzespoły. Rexroth Bosch Group.</p> <p>[9] Vademecum hydrauliki, tom 2 Technika hydraulicznego sterowania zaworami proporcjonalnymi i serwozaworami. Rexroth Bosch Group.</p> <p>[10] Vademecum hydrauliki, tom 3. "Projektowanie i konstruowanie układów hydraulicznych". Rexroth Bosch Group.</p> <p>[11] Hydraulics Trainer, Volume 4. Logic element technology. Rexroth Bosch Group.</p> <p>[12] Hydraulics Trainer, Volume 6. Hydrostatic drives with control of the secondary unit. Rexroth Bosch Group.</p> <p>[13] Lipski J., Zwolak E., Balas W. "Hydrauliczne urządzenia środków transportu", WKŁ Warszawa, 1980.</p> |
| | Supplementary literature | worth it: https://www.lunchboxsessions.com/explore/hydraulics |
| | eResources addresses | Adresy na platformie eNauczanie: Napęd i sterowanie hydrauliczne, PG_00055515 - Moodle ID: 37710 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37710 |
| Example issues/ example questions/ tasks being completed | <ol style="list-style-type: none"> 1. Principles of selecting pumps and motors for a hydraulic system. 2. Methods of selecting a tank for a system. 3. Principles of selecting a cooler for a system. 4. First start-up of a system. 5. Methods of measuring fluid purity. 6. Selection of a proportional distributor for a system. 7. The idea of a Load Sensing system. 8. Systems with power recovery. | |
| Work placement | Not applicable | |

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