COURSE DESCRIPTION CARD - SYLLABUS

Course name
Design and simulation of hydraulic and pneumatic systems [S1Mech2>PiSUHiP]

Course

Field of study
Mechatronics

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

KNOWLEDGE: Knowledge in the field of hydraulics and pneumatics, fundamentals of machine construction, fluid mechanics, basic automation, and electrical engineering. SKILLS: Basic skills in solving problems related to hydraulics and pneumatics, fundamentals of machine construction, fluid mechanics, basic automation, and electrical engineering. SOCIAL COMPETENCIES: Understanding the need to expand one's competencies, willingness to collaborate within a team.

Course objective

Learning the fundamentals of designing hydraulic and pneumatic systems. Familiarizing with computer programs that support the design process of hydraulic and pneumatic systems.

Course-related learning outcomes

Knowledge:
He/She has an extended basic knowledge in the design of hydraulic and pneumatic systems.
He/She has an expanded knowledge of standardized rules for the notation of symbols and graphic elements of hydraulic and pneumatic drives and controls.
He/She is familiar with the latest trends in fluid power drive construction, such as automation,

mechatronics, and methods of designing fluid systems.

Skills:
He/She is able to carry out the design process of uncomplicated hydraulic and pneumatic systems, including microprocessor control systems.
He/She can create system diagrams, select components, and perform calculations using ready-made software packages for hydraulic and pneumatic drive systems of machines.
He/She is able to manually draw the standardized symbol of a fluid component as well as the schematic of a hydraulic and pneumatic system.

Social competences:
He/She understands the need for and is aware of the possibilities of continuous self-improvement.
He/She is aware of the importance and understands the non-technical aspects and consequences of a mechanical engineer's work, its impact on the environment, and the responsibility for the decisions made.
He/She is aware of the importance of maintaining professionalism, adhering to professional ethics, and respecting cultural diversity.
He/She is aware of the responsibility for their own work and is ready to comply with the principles of teamwork and take responsibility for tasks carried out together.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam from the lecture. Completion of laboratory exercises based on reports, individual design tasks, and direct work results at laboratory stations.

Programme content

Design of hydraulic and pneumatic systems, work cycle diagrams, operation of hydraulic and pneumatic systems, safety and maintenance of hydraulic and pneumatic systems, calculations for hydraulic and pneumatic systems, control, simulation of hydraulic and pneumatic systems, construction and testing of hydraulic and pneumatic systems.

Course topics

General procedure for designing hydraulic and pneumatic systems. Defining output data. Establishing basic system parameters. Work cycle diagrams. Operating conditions, regulations regarding system construction and safety of operation. System calculations: kinematic, force, thermal. Design of control systems. Speed control, force control, and positioning of hydraulic and pneumatic actuators. Software programs for computer-aided system design. Laboratory exercises: Testing, simulation, and design of actuating and control systems using specialized software. Construction and testing of hydraulic and pneumatic systems on specialized testing stations, manipulators with cartesian and parallel kinematics, construction of a conveyor belt system, construction of a positioning system with a toothed belt, construction of a positioning system with a ball screw.

Teaching methods

1. Lecture with multimedia presentation
2. Laboratory session

Bibliography

Basic:
1. Osiecki A.: Hydrostatyczny napęd maszyn. WNT, Warszawa , 2004.
2. Szenajch W.: Napęd i sterowanie pneumatyczne. WNT, Warszawa, 2003.
3. Świder J. (red.): Sterowanie i automatyzacja procesów technologicznych i układów mechatronicznych, Wydawnictwo Politechniki Śląskiej, Gliwice, 2002.
4. Świder J., Wszołek G.: Metodyczny zbiór zadań laboratoryjnych i projektowych ze sterowania procesami technologicznymi, Wydawnictwo Politechniki Śląskiej, Gliwice, 2003.

Additional:

1. Stryczek St.: Napęd hydrostatyczny - elementy. WNT, Warszawa, 2003.
2. Stryczek St.: Napęd hydrostatyczny - układy. WNT, Warszawa, 2003.
3. Szydelski Z.: Pojazdy samochodowe - napęd i sterowanie hydrauliczne. WKŁ, W-wa,1999.
4. Świder J., Wszołek G.: Metodyczny zbiór zadań laboratoryjnych i projektowych ze sterowania procesami technologicznymi, Wydawnictwo Politechniki Śląskiej, Gliwice, 2003.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00