

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Design of Hydraulic and Pneumatic Systems		Code 1010641261010642512
Field of study Mechanical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 6
Elective path/specialty Mechatronics	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 1 Classes: - Laboratory: 1 Project/seminars: 1		No. of credits 2
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 2 100% 2 100%
Responsible for subject / lecturer: dr inż. Damian Frackowiak email: damian.frackowiak@put.poznan.pl tel. 61 224-4516 Machine Design and Transportation Piotrowo 3, 60-965 Poznań		Responsible for subject / lecturer: mgr inż. Mateusz Kukla email: mateusz.kukla@put.poznan.pl tel. 61 224 44 54 Machine Design and Transportation Piotrowo 3, 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	The knowledge acquired in framework of the subject of "hydraulic and pneumatic drives". Knowledge of the basics of machine design, fluid mechanics, basic automation, electrical engineering and computer science.
2	Skills	The skills acquired in framework of the subject of "hydraulic and pneumatic drives". Basic problem solving skills in the field of fluid mechanics and the basics of machine design
3	Social competencies	Understanding the need to expand their competence, willingness to work together as a team.
Assumptions and objectives of the course:		
<ol style="list-style-type: none"> 1. Understanding the design principles of hydraulic and pneumatic systems. 2. Getting Acquainted with calculations of hydraulic and pneumatic drive systems. 3. Getting Acquainted with the construction and design of control systems. 4. Getting Acquainted with computer programs supporting the process of designing hydraulic and pneumatic systems. 		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
<ol style="list-style-type: none"> 1. Has a basic knowledge of the basics of machine design and the theory of machines and mechanisms, including mechanical vibration - [K1A_W5] 2. Has a basic knowledge of the standardized principles of engineering drawing and engineering graphics. - [K1A_W6] 3. Has a basic knowledge of technical fluid mechanics (ideal gases and ideal fluids), Newtonian and non-Newtonian viscous fluids, heat and fluid flow machinery - [K1A_W7] 4. Is up-to-date with the latest trends in mechanical engineering, automation, mechatronization, machine design and construction processes automation, increase in safety and ease of operation, use of modern construction materials. - [K1A_W18] 5. Has an expanded knowledge necessary for understanding specialized subjects and expertise in construction, design and manufacturing methods and operation of a selected group of machines, in particular: - [K1A_W24] 		
Skills:		

<p>1. Is able to plan and carry out the process of constructing simple assemblies or machines and formulate requirements for electronic and automatic control systems for industry professionals in mechatronic systems. - [K1A_U19]</p> <p>2. Is able to create a diagram of a system, select its items and perform basic calculations using ready-made computational packages for mechanical, hydrostatic and electric or hybrid propulsion of a machine - [K1A_U09]</p> <p>3. Is able to prepare technical documentation (descriptive and graphic) of an engineering task. - [K1A_U04]</p> <p>4. Is able to hand draw a simple schematic or a machine component in accordance with the principles of technical drawing - [K1A_U14]</p> <p>5. Is able to use acquired mathematical theories to create and analyze simple mathematical models of machines, their components and simple technical systems. - [K1A_U07]</p> <p>6. Is able to perform rudimentary technical calculations in fluid mechanics and thermodynamics, such as heat and mass balance, pressure loss in pipes, selected parameters of blowers and fans in ventilation and transportation systems, calculate the thermodynamic flows in thermal machines - [K1A_U17]</p>
<p>Social competencies:</p> <p>1. Has a knowledge of mathematics, including algebra, analysis, differential equations theory, probability theory and analytic geometry necessary to: describe discrete mechanical systems, understand the methods of computer graphics, describe the operation of electrical and mechatronics systems. - [K1A_K01]</p> <p>2. Has a knowledge of physics, including the basics of classical mechanics, optics, electricity and magnetism, solid state physics, quantum and nuclear physics, necessary to understand the specialized lectures on the theory of structural materials and materials science, the theory of machines and mechanisms, theory of electrical drives and mechatronic systems. - [K1A_K02]</p> <p>3. Has a basic knowledge in chemistry, in the construction of the periodic table and properties of the elements, the theory of chemical bonding, organic and inorganic compounds, types of chemical reactions, chemical analysis. - [K1A_K03]</p> <p>4. Has a structured knowledge in the main branches of technical mechanics: statics, kinematics and dynamics of a particle and rigid body. - [K1A_K04]</p>

Assessment methods of study outcomes	
<p>-Written exam of the course.</p> <p>- Assessment of laboratory exercises based on assessments of the reports and short entrance tests.</p>	
Course description	
<p>General procedure for the design of hydraulic and pneumatic systems. The term output data. Determination of the basic parameters of the system. Cyclograms work. Operating conditions, provisions concerning the construction of the systems and safe operation of the system. Calculations of systems: kinematics, statics, dynamics, thermal. Designing control systems. The logical control system (PLC). Control speed, strength and positioning of hydraulic and pneumatic motors. Programs for computer-aided design systems. Laboratory exercises: study, simulation and design of actuators and controls in specialized computer programs. Construction and testing of hydraulic and pneumatic systems on specialized research positions.</p>	
Basic bibliography:	
<p>1. Osiecki A.: ?Hydrostatyczny napęd maszyn?. WNT, Warszawa , 2004.</p> <p>2. Szenajch W.: ?Napęd i sterowanie pneumatyczne?. WNT, Warszawa, 2003.</p> <p>3. Świder J. (red.): Sterowanie i automatyzacja procesów technologicznych i układów mechatronicznych, Wydawnictwo Politechniki Śląskiej, Gliwice, 2002.</p>	
Additional bibliography:	
<p>1. Pizoń A.: ?Elektrohydrauliczne analogowe i cyfrowe układy automatyki?, WNT, W-wa 1995.</p> <p>2. Stryczek St.: ?Napęd hydrostatyczny ? elementy. WNT, Warszawa, 2003.</p> <p>3. Szydelski Z.: Pojazdy samochodowe ? napęd i sterowanie hydrauliczne. WKŁ, W-wa,1999.</p> <p>4. Świder J., Wszolek G.: Metodyczny zbiór zadań laboratoryjnych i projektowych ze sterowania procesami technologicznymi, Wydawnictwo Politechniki Śląskiej, Gliwice, 2003.</p>	
Result of average student's workload	
Activity	Time (working hours)

1. Participation in lectures	15	
2. Preparation to getting a pass	2	
3. Participation in getting a pass in lecture	2	
4. Participation in laboratory	15	
5. Consolidation of exercises content, report	2	
6. Consultation regarding material given on laboratories	2	
7. Participation in getting a pass on laboratories	2	
8. Participation in project activities	15	
9. Consultation regarding material given on project activities	2	
10. Preparation to getting a pass	2	
11. Participation in getting a pass on project activities	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	61	2
Contact hours	55	2
Practical activities	42	2