

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Hydraulic and Pneumatic Drives</b>		Code <b>1010611261010642493</b>
Field of study <b>Mechanical Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>3 / 6</b>
Elective path/specialty <b>Motor Vehicles</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>2</b> Classes: <b>-</b> Laboratory: <b>1</b> Project/seminars: <b>-</b>		No. of credits <b>4</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>4 100%</b> <b>4 100%</b>
<b>Responsible for subject / lecturer:</b>  dr inż. Damian Frackowiak email: damian.frackowiak@put.poznan.pl tel. 61 665 2054 Faculty of Transport Engineering ul. Piotrowo 3, 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Knowledge of the basics of machine design, fluid mechanics, automation and electrical engineering basics.
2	<b>Skills</b>	Ability to solve problems in the field of fluid mechanics and base of machines design.
3	<b>Social competencies</b>	Understanding the need to expand their competence, willingness to work together as a team.
<b>Assumptions and objectives of the course:</b> - Understanding the structure and principles of hydraulics and pneumatics. - Familiarizing yourself with the basic propulsion systems and controls. - Getting to know the basics of design for hydraulic and pneumatic systems.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. Has basic knowledge in the construction and design of hydraulic and pneumatic drives and systems, which are the area of machine construction. - [K1A_W05]		
2. Has basic knowledge of standardized rules for recording symbols and graphical elements of hydraulic and pneumatic drives and controls. - [K1A_W06]		
3. Has basic knowledge in the field of statics and dynamics of liquids and gases directed to hydraulic and pneumatic drives. - [K1A_W07]		
4. He is familiar with the latest trends in the construction of fluid drives, ie automation, mechatronics and fluid systems design methods. - [K1A_W18]		
<b>Skills:</b>		
1. Can use the acquired mathematical theories to create simple mathematical models of elements and hydraulic and pneumatic systems. - [K1A_U07]		
2. Is able to perform elementary technical calculations in the field of fluid mechanics in relation to hydraulic and pneumatic drives. - [K1A_U17]		
3. He can create a circuit diagram, select elements and perform basic calculations using ready-made computational packages of the hydraulic and pneumatic drive system of the machine. - [K1A_U09]		
4. He can draw the standardized symbols and diagrams of hydraulic and pneumatic elements and systems. - [K1A_U14]		

<b>Social competencies:</b>
1. Understands the need and knows the possibilities of lifelong learning. - [K1A_K01]
2. Is aware of and understands the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment and responsibility for own decisions. - [K1A_K02]
3. Is aware of the importance of behavior in a professional manner, compliance with the rules of professional ethics and respect for cultural diversity. - [K1A_K03]
4. Has a sense of responsibility for one's own work and is willing to comply with the principles of teamwork and taking responsibility for collaborative tasks. - [K1A_K04]

<b>Assessment methods of study outcomes</b>
- Written exam of the course.
- Assessment of laboratory exercises based on assessments of the reports and short entrance tests.

<b>Course description</b>
The principle of operation and ownership of hydraulic drives. Application of hydrostatic and hydrodynamic drives. Hydraulic fluids. Hydraulic components: pumps, valves, motors, actuators, accumulators, hydraulic power units. Hydrostatic systems. Systems with multiple receivers. Hydrostatic transmissions, hydraulic servo drives. The structure of the pneumatic drive and control. Pneumatics applications. Systems of preparation of compressed air. Elements of pneumatic systems. General principles for design of hydraulic and pneumatic drives and controls. Programs for computer-aided design of hydraulic and pneumatic systems.

<b>Basic bibliography:</b>
1. Osiecki A.: Hydrostatyczny napęd maszyn. WNT, Warszawa , 2004.
2. Stryczek St.: Napęd hydrostatyczny elementy. WNT, Warszawa, 2003.
3. Stryczek St.: Napęd hydrostatyczny układy . WNT, Warszawa, 2003.
4. Szeniaich W.: Napęd i sterowanie pneumatyczne. WNT, Warszawa, 2003.

<b>Additional bibliography:</b>
1. Szydelski Z.: Pojazdy samochodowe napęd i sterowanie hydrauliczne. WKŁ, W-wa,1999.
2. Pr. zb. pod red. J. Świdra: Sterowanie i automatyzacja procesów technologicznych i układów mechatronicznych. Wyd. Politechniki Śląskiej, Gliwice, 2002.

<b>Result of average student's workload</b>	
<b>Activity</b>	<b>Time (working hours)</b>
1. Preparation for classes	15
2. Participation in classes	45
3. Consolidation of the content of classes / report	12
4. Consultations	2
5. Preparation for the exam / pass	24
6. Udział w egzaminie / zaliczeniu	2

<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	100	4
Contact hours	49	2
Practical activities	49	2