

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Hydraulic and Pneumatic Systems of Means of transport</b>		Code <b>1010621361010642397</b>
Field of study <b>Transport</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>3 / 6</b>
Elective path/specialty <b>Railway Transport</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 field of fluid mechanics directed to hydraulic and pneumatic drives - [K1A_W04] 2. Has basic knowledge of the construction and operation of hydraulic and pneumatic drives and systems, which are the area of ??machine construction - [K1A_W13]		
<b>Skills:</b> 1. He can plan and perform measurements in hydraulic and pneumatic systems, and interpret results and draw conclusions - [K1A_U07] 2. He can draw the basic elements and schematics of hydraulic and pneumatic systems in accordance with the principles of technical drawing, according to European standards - [K1A_U12] 3. He can design the technology of making a simple hydraulic and pneumatic system - [K1A_U14]		
<b>Social competencies:</b> 1. He understands the need and knows the possibilities of continuous training, knows the need to acquire new knowledge for professional development - [K1A_K01] 2. He can think and act in an entrepreneurial way, make decisions, act for the development of the employer and society - [K1A_K07] 3. Is aware of the transfer of acquired knowledge to the public, makes efforts to make this information understandable - [K1A_K08]		

<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.		
<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. Szenajch W.: ?Napęd i sterowanie pneumatyczne?. WNT, Warszawa, 2003.		
<b>Additional bibliography:</b>		
1. 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>		
Activity	Time (working hours)	
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. Participation in the exam / pass	2	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	100	4
Contact hours	49	2
Practical activities	49	2