

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Hydraulic and Pneumatic Systems of Means of transport</b>		Code <b>1010621271010642397</b>
Field of study <b>Transport</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>4 / 7</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>2</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>		ECTS distribution (number and %) <b>2 100%</b>
<b>Responsible for subject / lecturer:</b>  dr inż. Damian Frąckowiak email: damian.frackowiak@put.poznan.pl tel. 48 61 2244516 Faculty of Working Machines and Transportation 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 a structured knowledge in the main branches of technical mechanics: statics, kinematics and dynamics of a particle and rigid body. - [K1A_W04] 2. Has an elementary knowledge of the fundamentals of computer science, i.e. computer architec., binary, decimal, and hexadecimal counting system, the representation of numbers and graphic signs in the computer memory, types of variables, general knowledge of the low, medium and high level programming languages, operating systems, databases, RAD environment and typical engin. applic. - [K1A_W13]		
<b>Skills:</b> 1. Is able to use acquired mathematical theories to create and analyze simple mathematical models of machines, their components and simple technical systems. - [K1A_U07] 2. Is able to use popular packages for technical drawings edition and 3D modeling in sufficient detail to enable the creation of documentation in accordance with the applicable standards and models of virtual machines in three-dimensional space. - [K1A_U12] 3. Is able to hand draw a simple schematic or a machine component in accordance with the principles of technical drawing. - [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]

<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. Pizoń A.: ?Elektrohydrauliczne analogowe i cyfrowe układy automatyki?, WNT, W-wa 1995. 2. Szydelski Z.: Pojazdy samochodowe ? napęd i sterowanie hydrauliczne. WKŁ, W-wa,1999.		
<b>Result of average student's workload</b>		
Activity	Time (working hours)	
1. Participation in lectures	30	
2. Consultation on the material given in lectures	1	
3. Exam Preparation	8	
4. Participation in the exam	2	
5. Participation in laboratory exercises	15	
6. Reports of laboratory exercises	3	
7. Consultation on the material submitted to the laboratory exercises	2	
8. Participation in the completion of the course	1	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	62	2
Contact hours	51	2
Practical activities	20	1