

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Pumps		Code 1010632121010630278
Field of study Mechanical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 2
Elective path/specialty Thermal Engineering	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 1 Classes: 1 Laboratory: - Project/seminars: -		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		ECTS distribution (number and %) 100 2%
Responsible for subject / lecturer: dr inż. Mateusz Grzelczak email: mateusz.grzelczak@put.poznan.pl tel. x Maszyn Roboczych i Transportu Piotrowo 3, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	The student has a basic knowledge about the location of pumps in the system of sciences and the relationship with other areas of knowledge. The student knows and understands the complex methods and practical tools in the field of pumps. The student knows the main tasks in the area of operation of the pump and the economic development of enterprises and the state.
2	Skills	The student is able to use the concepts and methods of design and operating pumps. Student is able to use the acquired knowledge to analyze specific physical phenomena and thermodynamic processes and flow occurring in the pumps. The student is able to solve specific problems in the design and operational issues pumps.
3	Social competencies	The student is able to work in a group, taking in her various roles. Student is able to prioritize important in solving the tasks posed in front of him. The student demonstrates self-reliance in solving problems, acquire and improve their knowledge and skills.
Assumptions and objectives of the course: The aim of the course is to provide students with knowledge of pumps: definitions, concepts and issues thermodynamic and flow with respect to the pumping process. Students gain knowledge and skills in the construction, design methods and ways of operating pumps.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. The student has an extended knowledge of thermodynamics and fluid mechanics to the extent necessary for an understanding of the principles and calculations of thermodynamic processes and flow occurring in pumps - [K2A_W04] 2. He knows the modern methods of computer graphics engineering and theoretical basis for the calculation finite - [K2A_W06] 3. The student has a general understanding of the types of tests and test methods pumps using modern measurement techniques and data acquisition - [K2A_W20]		
Skills:		
1. The student can obtain information from the literature, the Internet, databases and other sources, in Polish and foreign, can integrate the information obtained to interpret and draw conclusions from them, and create and justify opinions.. - [K2A_U01] 2. The student can use the assimilated knowledge of thermodynamics and fluid mechanics simulation of thermodynamic processes and flow occurring in the pump, using a specialized computer program. - [K2A_U04] 3. Student is able to perform basic measurements of mechanical and thermodynamic such as height, volume flow, mechanical power, rotor speed on the test pump with modern measurement systems.- [K2A_U07] 4. The student is able to plan and carry out experimental studies of flow phenomena occurring in the non-stationary pumps and basic research such that the stationary machines - [K2A_U08]		

Social competencies:
1. The student understands the need and knows the possibilities of continuous training, knows the need to acquire new knowledge for professional development. - [K2A_K01]
2. Student is able to determine the priorities for implementing the tasks undertaken - [K2A_K04]
3. Student is able to think and act in an entrepreneurial manner, make decisions, work for the development of the employer and society - [K2A_K05]
4. The student is aware of the knowledge gained from the subject on the pumps to the public, shall endeavor to ensure that information can be understood. - [K2A_K06]

Assessment methods of study outcomes

The written examination, final test, project
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Course description

Analysis of basic flow phenomena occurring in the pumps. Numerical Methods for one-dimensional and design of pumps, physical interpretation of indicators and indicators of work flow. Knowledge and physical interpretation of the definition of efficiency pumps and methods of lifting. Qualitative and quantitative evaluation of flow phenomena occurring in the pump based on the analysis of one-dimensional and three-dimensional nature of the flow on the basis of numerical calculations of fluid flow and the actual research methods. Methods for selection of pumps running in series and parallel - analysis and flow characteristics of the pumps. Selection of pumps for hydraulic systems. Methods for determining losses and leakage wading in centrifugal pumps and positive displacement.
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Basic bibliography:

1. Jędrał W., Pompy wirowe, Wydawnictwo Naukowe PWN, Warszawa 2001
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Additional bibliography:

1. Fodemski T.R. i inni, Pomiar ciepłoty cz.II, Badania ciepłoty maszyn i urządzeń, WNT, Warszawa 2000
2. Walczak J., Inżynierska mechanika płynów, Wydawnictwo Politechniki Poznańskiej, Poznań 2006.

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lecture	15
2. Consultation	4
3. Exam preparation	10
4. Participation in the exam	2
5. Preparation in class exercises	15
6. Consultation	4
7. Preparing to pass	7

Student's workload

Source of workload	hours	ECTS
Total workload	57	2
Contact hours	42	2
Practical activities	0	0