

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Boilers and Heaters		Code 1010634161010630451
Field of study Mechanical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 6
Elective path/specialty Thermal Engineering	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) part-time	
No. of hours Lecture: 18 Classes: 8 Laboratory: - Project/seminars: -		No. of credits 3
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 %) 3 100% 3 100%
Responsible for subject / lecturer: Dr hab. inż. Jarosław Bartoszewicz, prof. nadzw. email: jaroslaw.bartoszewicz@put.poznan.pl tel. 2215 Wydział Maszyn Roboczych i Transportu http://www.fwmt.put.poznan.pl/		Responsible for subject / lecturer: mgr inż. Robert Kłosowiak email: robert.klosowiak@put.poznan.pl tel. 061 665-2331 Wydział Maszyn Roboczych i Transportu http://www.fwmt.put.poznan.pl/
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of technical thermodynamics, fluid mechanics and heat transfer. Basic knowledge of construction and news with the mechanics.
2	Skills	Basic knowledge of technical thermodynamics, fluid mechanics and heat transfer. Basic knowledge of construction and news with the mechanics.
3	Social competencies	The Student is able to work in a group, taking in her different roles in order to solve the posed in front of him.
Assumptions and objectives of the course: Knowledge of heating and boiler equipment, components, principles of calculation; familiarizing yourself with the construction and types of transmission networks; knowledge of issues related to the selection of equipment and their operation.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Has a basic knowledge of the fundamentals of machine design and theory of machines and mechanisms, including mechanical vibration - [K1A_W05]		
2. . Has a basic knowledge in the field of technical thermodynamics. the theory of thermodynamic transformation, heat flow, thermal machines and equipment for heating, drying and cooling - [K1A_W07]		
Skills:		
1. Has the ability of self-study using modern teaching tools, such as remote lectures, Web pages and database programs, electronic books - [K1A_U06]		
2. It can perform calculations in the field of technical thermodynamics and fluid mechanics, such as for example. heat balances and pressure losses in pipes. - [K1A_U19]		
3. Can competently advise in the selection of the machines for the application in the industry covered by the chosen speciality on the basis of acquired knowledge about the flu shot machines - [K1A_U27]		
Social competencies:		
1. Is aware of and understands the non-technical aspects and effects for mechanical engineer and its impact on the environment and responsibility for decisions - [K1A_K02]		
2. Is aware of responsibility for own work and willingness to comply with the principles of cooperation and responsibility for common tasks - [K1A_K04]		

Assessment methods of study outcomes		
exam		
Course description		
<p>General messages about the construction of boilers and heating equipment. Basic concepts. Fuel base. Classification of boiler equipment. The principle of making determinations of boilers. Boiler constructions. General characteristics of the combustion of fuels. The main features of the structural components of the boiler equipment. The basics of energy calculations in boiler equipment. Energy balance. Heat losses. The process of heat transfer in the furnace Chamber and in the boiler. Resistance to the flow of exhaust gas and air. The types and kinds of burners for combustion of oil and gas. Characteristics of materials used in the construction of the boiler equipment. General rules for preparation of water to power boilers. The construction of pipelines. Classification of thermal networks. Connection systems. Used fittings, accessories, thermal insulation. Hydraulic calculation of heat networks. The design of the pressure chart. The rules for the implementation of the network documentation.</p>		
Basic bibliography:		
<ol style="list-style-type: none"> 1. P. Orłowski, W. Dobrzański, E. Szwarz, Kotły parowe konstrukcja i obliczenia, WNT, Warszawa 1979. 2. S. Kruczek, Kotły. Konstrukcja i obliczenia, Wydawnictwo Politechniki Wrocławskiej. Wrocław 2001. 3. J. Jarosiński, Techniki czystego spalania, WN-T, Warszawa 1996. 		
Additional bibliography:		
<ol style="list-style-type: none"> 1. P. Orłowski, Kotły parowe w energetyce przemysłowej. Zagadnienia eksploatacyjne, WNT, Warszawa 1976 2. K. Krygier, T. Klinger, J. Sewerynik, Ogrzewnictwo, wentylacja, klimatyzacja, Wydawnictwo Szkolne i Pedagogiczne, Warszawa 1997. 		
Result of average student's workload		
Activity	Time (working hours)	
1. Preparing for a lecture	3	
2. Participation in the lecture	36	
3. Fixation of the lecture	10	
4. Consultation	1	
5. Preparation to the exam	10	
6. Participation in the exam	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	62	3
Contact hours	39	2
Practical activities	0	0