

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Heating Systems		Code 1010634171010630282
Field of study Mechanical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 4 / 7
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: 16 Classes: - 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 %) 2 100%
Responsible for subject / lecturer: dr hab. inż. Tomasz Dobski, prof. PP email: tomasz.dobski@put.poznan.pl tel. 61 665-2218 Wydział Maszyn Roboczych i Transportu ul. Piotrowo 3, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of technical thermodynamics, fluid mechanics and construction of energetic devices
2	Skills	The Student can prepare thermodynamic and fluid mechanic calculation and know how to analyze the complex technological systems in heat production
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: To acquaint students with the basic theoretical and practical aspects related to the construction and operation of conventional and non-conventional heating systems		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. 1. 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]		
2. 2. Has a basic knowledge of machines and technology impact on the natural environment and global energy balance - [K1A_W20]		
3. 3. Has an expanded knowledge necessary for understanding specialized subjects and expertise in construction, design and manufacturing methods and operation of a selected group of energetic machines - [K1A_W24]		
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]		
3. Is able to think and act in an entrepreneurial manner - [K1A_K05]		

Assessment methods of study outcomes		
Lecture ? the written examination		
Course description		
Industrial heating systems, home heating systems, construction of low-temperature boilers fueled by fossil fuels, biomass boilers, condensing boilers, combined heat and power, trigeneration, Organic Rankine Cycle systems, solar collectors, heat pumps, geothermal, heat exchangers, ground heat exchangers, energy balances of buildings, energy balances of heating devices,		
Basic bibliography:		
1. 1. Dobski, T.: Combustion Gases in Modern Technologies, 2scd Ed., Wydawnictwo Politechniki Poznańskiej		
2. 2. Skorek J.: Gazowe układy kogeneracyjne, WNT, Warszawa 2005		
3. 3. Praca zbiorowa: Pomiary cieplne, Badania cieplne maszyn i urządzeń. Część I i II, Wydawnictwa Naukowo Techniczne, Warszawa 1993		
4. 4. Szargut J., Ziębik A.; Podstawy energetyki cieplnej. Wydawnictwo Naukowe PWN. Warszawa 2000		
Additional bibliography:		
1. 6. Józef Jarosiński: Techniki czystego spalania		
2. 7. S.Kruczek ? Kotły. Konstrukcja i obliczenia. Wydawnictwo Politechnika Wroclawska, Wroclaw 2001		
3. 8. Kowalski C., Kotły gazowe centralnego ogrzewania wodne niskotemperaturowe, Wydawnictwo Naukowo Techniczne, Warszawa 1992		
4. 9. S. Wiśniewski: Wymiana ciepła		
Result of average student's workload		
Activity	Time (working hours)	
1. Preparing for a lecture	10	
2. Participation in the lecture	30	
3. Fixation of the lecture	10	
4. Consultation	3	
5. Preparation to the exam	15	
6. Participation in the exam	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	70	2
Contact hours	35	0
Practical activities	0	0