

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Construction of industrial gas facilities		Code 1010632221010635537
Field of study Mechanika i budowa maszyn	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 2
Elective path/specialty Gas technology and renewable energy	Subject offered in: English	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: - Laboratory: - Project/seminars: -		No. of credits 1
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 %) 1 100% 1 100%
Responsible for subject / lecturer: dr inż. Rafał Ślefarski email: rafa.slefarski@put.poznan.pl tel. 616652218 Faculty of Machines and Transport ul. Piotrowo 3 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge from fluid mechanics, thermodynamics and energy processes. Knowledge of construction machinery and energy equipment.
2	Skills	Can solve engineering problems with the use of scientific methods and find relevant information in literature, on the Internet, in data bases, and in other sources.
3	Social competencies	Knows the limitations of his or her own knowledge and skills, understands the non-technical aspects and results of engineering activity and their importance.
Assumptions and objectives of the course: To acquaint students with the theoretical and practical problems related to constructions of energetic boilers, furnace and flares.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Has comprehensive knowledge about physics, thermodynamics, and the burning of gas fuels, necessary for solving engineering and scientific problems within his or her area of study [K2A_W04] - [-]		
2. Has current knowledge about the developments in the gas energy sector [K2A_W04] - [-]		
3. Has a general knowledge of the principles and methods of constructing energetic equipment and machines, [K2A_W19] - [-]		
4. Has detailed knowledge about Polish gas system [K2A_W12] - [-]		
5. Has general knowledge in the field of standardization, recommendations and EU directives, national, international and industry standards [K2A_W09] - [-]		
Skills:		
1. Understands the need for lifelong learning; is able to inspire and organize the learning process of others. [K2A_K02] - [-]		
2. Is able to interact in a group taking on the different roles. [K2A_K03] - [-]		
3. Can perform typical energy balances of power machines - [K1A_U08] - [-]		
Social competencies:		
1. 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. - [K2A_K02] - [-]		
2. Is able to set priorities for realization of undertaken tasks. ? [K2A_K04] - [-]		
3. Is able to think and act in an entrepreneurial manner. [K2A_K05] - [-]		

Assessment methods of study outcomes		
Lecture ? the written examination The evaluation of student knowledge will be held based on an answers on 5 questions from the material presented during the lectures.		
Course description		
Designing and construction of energetic boilers, Boiler construction, the main parts of boiler, burners, Heat transfer in the combustion chamber and boiler units, Pressure losses in main flue gases ducts, Energy balance, Heat losses, types of industrial furnace, glass bath, construction of flares, Heat recuperators, regenerators		
Basic bibliography:		
1. Szargut J., Ziębik A.; Podstawy energetyki cieplnej. Wydawnictwo Naukowe PWN. Warszawa 2000		
2. Joachim G. Wunning: Handbook of Burner Technology for Industrial Furnaces		
3. hmielniak T. Maszyny Przepływowe. Wydawnictwo Politechniki Śląskiej, Gliwice 1997		
4. S.Kruczek ? Kotły. Konstrukcja i obliczenia. Wydawnictwo Politechnika Wroclawska, Wrocław 2001		
5. Dobski, T.: Combustion Gases in Modern Technologies, 2scd Ed., Wydawnictwo Politechniki Poznańskiej		
Additional bibliography:		
1. Dobski T.: Spalanie gazów ziemnych o dużej zawartości azotu w urządzeniach przemysłowych, Wydawnictwo Politechniki Poznańskiej, Poznań 2001		
2. Jarosiński J.: Techniki czystego spalania, WN-T W-wa 1996		
3. Kowalski C., Kotły gazowe centralnego ogrzewania wodne niskotemperaturowe, Wydawnictwo Naukowo Techniczne, Warszawa 1992		
Result of average student's workload		
Activity	Time (working hours)	
1. Preparation for the lecture	5	
2. Participation in the lecture	15	
3. Fixing the lecture	15	
4. Consultation for the lecture	2	
5. Preparing to pass the lecture	10	
6. Participation in the completion of the lecture	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	49	1
Contact hours	19	0
Practical activities	0	0