

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Protection of Environment		Code 1010632221010630271
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: 1 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 Technical sciences		ECTS distribution (number and %) 2 100% 2 100%
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 of thermodynamics, mathematics and biology. Has the knowledge of the surrounding environment and the construction of power machines.
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 knowledge and analysis of the problems of environmental protection in the gas fuel sector of the energy industry		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Has knowledge about safety and ergonomics in the design and operation of the energetic machines and the risks that machines create for the environment. ? [K2A_W08] - [-]		
2. Has general knowledge in the field of standardization, recommendations and EU directives, national, international and industry standards in environmental protection technologies ? [K2A_W09] - [-]		
3. Has the knowledge about the current developments in ecological technologies? [K2A_W12] - [-]		
Skills:		
1. Is able to obtain information from the literature, internet, databases and other sources. Can integrate the information to interpret and learn from them, create and justify opinions. - [K1A_U03] - [-]		
2. Is able to freely use an international language in contacts with professionals from the same field of study.- [K2A_U01] - [-]		
3. Is able to use a common numerical computations system for programming a simple simulation - [K2A_U02] - [-]		
Social competencies:		
1. 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. 2. Is able to set priorities for realization of undertaken tasks. ? [K2A_K04] - [-]		
3. 3. Is able to interact in a group taking on the different roles. ? [K2A_K03] - [-]		

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. Classes - - final test and rewarding knowledge necessary for the accomplishment of the problems in the area of the subject,		
Course description		
Formation of toxic components and pollutants during combustion process, high efficiency and low emission combustion gas technology, alternative fuel gases, regulations on environmental protection, methods of destruction process of VOC, flameless combustion, primary and secondary methods of reduction of toxic compounds during the combustion processes, zonal volumetric combustion, emission from agriculture, local emission,		
Basic bibliography:		
1. Molenda J. Steczko K. Ochrona środowiska w gazownictwie i użytkowaniu gazu 2. Józef Jaroński: Techniki czystego spalania 3. John C. Mycock: Handbook of air pollution control engineering and technology 4. Hiroshi T., Gupta A.: High Temperature Air Combustion 5. Joachim G. Wunning: Handbook of Burner Technology for Industrial Furnaces		
Additional bibliography:		
1. Jerzy Merkiusz, Ireneusz. Pielecha: Alternatywne paliwa i układy napędowe 2. Warych Jerzy: Oczyszczanie przemysłowych gazów odlotowych		
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	5	
5. Preparing to pass the lectur	10	
6. Participation in the completion of the lectur	2	
7. Preparation of practical classes	5	
8. Participation in the classe	15	
9. Consultation for the classes	5	
10. Preparing to pass the classes	5	
11. Participation in the completion of the classes	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	84	2
Contact hours	44	0
Practical activities	15	0