STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Protection of Environment		**1010632221010630271**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mechanical Engineering	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Gas technology and renewable energy	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours					No. of credits
Lecture: **1**	Classes: **-**	Laboratory: **1**	Project/seminars: **-**		**2**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**2 100%**
Technical sciences	**2 100%**

Responsible for subject / lecturer:

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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 Basic knowledge about standardization, norms and EU directive, domestic and international industrial directives. - [M2_W09]
2. Has extended knowledge in selected fields in mechanical engineering thermal processes, combustion processes and heat transfer. - [M2_W14]
3. Has knowledge about new trends in enviromenthal protection technologies - [M2_W20]

Skills:

1. Is able to estimate potential threats to the natural environment and people from designed - [M2_U06]
2. Is able to prepare basic measurements of thermodynamics parameters during study of energetic machines with using of modern investigation techniques - [M2_U10]

Social competencies:

1. Understood the importance of knowledge in solving cognitive and practical problems and the need to consult with experts in case of difficulties in solving the problem yourself - [K2A_K02]
2. Student is ready to fulfil social obligations, inspire and organize activities for the social environment - [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 Jarosiński: 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 Merkisz, 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	1
Practical activities	15	1