STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Thermodynamic properties of flammable gases		**1010632211010635534**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mechanika i budowa maszyn	**(brak)**	**1 / 1**
Elective path/specialty	**Subject offered in:**	**Course (compulsory, elective)**
Gas technology and renewable energy	**English**	**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: **1** Laboratory: **-** 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%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowladge in the field of fluid mechanics, physics, thermodynamics, chemistry and fluid and knowledge about combustion processes of natural gases
2	**Skills**	Can critically evaluate the results of experiments, observations, and calculations, and discuss measurements errors
3	**Social competencies**	Knows the limitations of his or her own knowledge and skills, can formulate relevant questions, understands the need for lifelong education

Assumptions and objectives of the course:

To present knowledge about main thermodynamics parameters of flammable gases. Presentation of the thermodynamic quantities that describe the combustion process of gaseous fuels.

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 an extended knowledge in the area of information technology concerning computer programming and software for engineering calculations and simulation of physical systems ? [K2A_W05] - [-]

3. He has in-depth knowledge of the basics of combustion of gaseous fuels ? [K2A_W14 - [-]

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 the acquired knowledge about thermodynamic properties of flammable gases for the simulation of thermodynamic processes in technological equipment,. - [K2A_U05] - [-]

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] - [-]

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

Thermodynamic quantities describing the of gaseous fuels, Thermodynamic quantities describing the combustion process of gaseous fuels, Joule-Thompson phenomena, Flammability limits, methane number, low and high heating value, Adiabatic flame temperature, laminar and turbulent flame speed, kinetic reaction of combustion process, laminar premixed flames, laminar diffusion flames, turbulent premixed flames, flame acoustic interaction, laser-otical method for combustion processes

Basic bibliography:

1. Thierry Poinsot: Theoretical and numerical combustion
2. John Carrol:Natural Gas Hydrates
3. Andrzej Kowalkiewicz: Podstawy procesów spalania
4. Józef Jarosiński: Techniki czystego spalania
5. N. Swaminathan: Turbulent premixed flames

Additional bibliography:

1. J. Odgers: Gas turbine fuels and their influence on combustion
2. T. Lieuwen: Synthesis gas combustion
3. R. Probstein: Synthetic Fuels

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 classe	2

Student’s workload

Source of workload	hours	ECTS
Total workload	84	2
Contact hours	44	0
Practical activities	0	0