STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Thermodynamics		**1011101221010402915**
Field of study	Profile of study (general academic, practical)	Year /Semester
Safety Engineering - Full-time studies - First-	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **15** Classes: **15** Laboratory: **-** Project/seminars: **-**		**3**
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		**3 100%**
Technical sciences		**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of general physics and chemistry at the level of high school. Knowledge of mathematic course at technical university
2	**Skills**	Ability to solve basic physical problems of experimental physic on the level of high school and course of mathematics and physics at technical university
3	**Social competencies**	Ability to work in a group, active attitude to problem solving

Assumptions and objectives of the course:

In terms of knowledge to provide students with the knowledge of thermodynamic problems of various systems from theoretical and practical point of views.

In terms of mastering the basics skills of thermodynamic processes; measurement methods of thermodynamic parameters such as temperature, pressure; calculation of heat engines and heat pumps; skills of heat flow, radiation and convection calculations.

In terms of social skills, teamwork skills for solving thermodynamic problems.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student has a knowledge of fundamental problems within phenomenological and statistical thermodynamic - [K1A_W07]

2. Student knows basic methods, techniques, properties of typical materials (thermodynamic phases) used in modern engineering techniques - [K1A_W23]

Skills:

1. Student has ability to use analytical methods for solving engineering problems in field of heat flow, work and internal energy of thermodynamic systems - [K1A_U09]

2. Student has ability to find and specified series of basic technical problems important from applied science and engineering characteristic for Safety Engineering - [K1A_U14]

3. Student is skilled at dealing with different routine methods and tools to solve basic engineering problems which are typical for Safety Engineering and is able to find the optimal way to find solution of the problem - [K1A_U15]

Social competencies:

1. Student has ability to recognized relation between the cause and the effect (Causality) in main goals which should to be achieved - [K1A_K04]

Assessment methods of study outcomes

Forming Score:

a) in the lecture: on the basis of answers to questions concerning the material discussed during the lectures

b) in the classes: on the base of written tests

Summary score :

a) in the lecture: on the basis of a written exam

b) in the classes: the results of the written tests

Course description

Lecture:

The subject of this lectures is connected with: meaning of thermal equilibrium of thermodynamic systems, what thermometers measure, different types of thermometers, the meaning of heat, how to calculate the involve heat flow, how heat is transferred by conduction, convection and radiation processes. How to relate the temperature, pressure and volume of ideal and real gas. How the interaction between gas molecules determine the properties of the gas, liquid and solid substance. How to calculate the work done by different thermodynamic systems. How to analyze adiabatic thermodynamic processes in gas phase. Differences between reversible and irreversible processes. Efficiency of the heat engine. Relation between heat engines and heat pumps (refrigerator). How the second law of thermodynamics sets limits on the efficiency of the engine and refrigerators. What entropy mean, and how to calculate entropy in thermodynamic processes. Statistical view on entropy. Probability and entropy.

Classes:

Identification of the various thermodynamic processes; algorithms to solve the problem of heat flow; work in thermodynamic processes; calculation of an efficiency of heat engines and heat pumps; estimation of heat, work and internal energy changes of thermodynamic systems; thermodynamic flows

Presentation and discussion of completed projects

Basic bibliography:

1. Stanisławski B., Termodynamika, PWN, Warszawa 1982.
2. Buchowski H., Elementy termodynamiki statystycznej, WNT, Warszawa 1998.

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Lectures	15
2. Classes	15
3. consultations with tutor	10
4. individual preparation to the classes	7
5. individual work before test	15
6. individual preparation to the lectures	7
7. individual work before exam	10

Student's workload

Source of workload	hours	ECTS
Total workload	79	3
Contact hours	40	2
Practical activities	15	1