COURSE DESCRIPTION CARD - SYLLABUS

Course name
Kinetics of liquids and gases [N1Trans1>KCiG]

Course

Field of study
Transport

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
18

Laboratory classes
0

Other (e.g. online)
0

Tutorials
9

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: The student knows the basics of physics and chemistry as well as the basics of thermodynamics and fluid mechanics Skills: Student use of terminology terms in the field of mechanics, thermodynamics, physics and chemistry. Correct description of the observed phenomena, analysis of the obtained results and drawing conclusions. Social competences. Work in an interdisciplinary team. Ability to lead a team and expand team knowledge.

Course objective

Getting to know the basic relationships showing the physical and chemical properties of gases.

Course-related learning outcomes

Knowledge:
The student has extended and in-depth knowledge of physics useful for formulating and solving selected technical tasks, in particular for correct modeling of real problems

Skills:
The student is able to properly plan and conduct perform experiments, including measurements and

computer simulations, interpret the obtained results, and correctly draw conclusions
The student is able to design elements of means of transport using data on environmental protection

Social competences:
The student is aware of the importance of knowledge in solving engineering problems, knows examples and understands the causes of malfunctioning transport systems that have led to serious financial and social losses or to serious loss of health and even life

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The knowledge acquired during the lecture is verified on the basis of a written exam in the form of a test.
The skills acquired during the exercises are verified on the basis of a final test in the form of a written test.

Programme content

Characteristics of the gas and liquid state. Thermodynamic properties: ideal, semi-perfect and real gas equations of state, compressibility factor. Viscosity of gases and liquids, depending on pressure and temperature. Influence of gases and liquids on pipeline materials. Influence of aggressive ingredients, anti-corrosion and anti-erosion protection. Combustion. Phase equilibria in multicomponent systems. Osmotic phenomena in two-component systems. Osmosis, dialysis. Donnan"s membrane equilibria. Diffusion. Kinetics and mechanism of phase changes.

Course topics

Lecture
1. Classification of inorganic compounds.
2. Characteristics of organic compounds.
3. Type of chemical bonds.
4. Basic kinetic laws.
5. Physicochemical properties of liquids and solutions.
6. Characteristics of the liquid state.
7. Phase equilibria in multicomponent systems.
8. Equilibria in aqueous electrolyte solutions. The ionic product of water.
9. Characteristics of the gaseous state.
10. Combustion and fuels.
11. Environmental aspects of combustion processes.
12. Diagnostics of physicochemical processes.

Exercises
1 Stoichiometric calculations.
2. Ways of expressing concentrations of solutions. The rule of mixing.
3. basic kinetic laws.
4. Phase equilibria in multicomponent systems.
5. Equilibria in aqueous electrolyte solutions. Concept of ph of solutions.
6. Gas laws.

Teaching methods

Information and problematic lecture with a multimedia presentation. Exercises - solving problems.

Bibliography

Basic
1. J. Szargut: Termodynamika techniczna, PWN 1991
2. J. Molenda: Gaz ziemny, PWN 1999
3. H. Buchowski, W. Ufnalski „ Fizykochemia gazów i cieczy”, Wydawnictwa Naukowo -Techniczne, Warszawa 2012

Additional
1. K. Pigoń, Z. Ruziewicz: Chemia fizyczna, PWN 2012

Breakdown of average student's workload

	Hours	ECTS
Total workload	70	3,00
Classes requiring direct contact with the teacher	27	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	43	2,00