COURSE DESCRIPTION CARD - SYLLABUS

Course name
Chemistry [S1Energ2>Chem]

Course

Field of study
Power Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of chemistry and mathematics (core curriculum for secondary schools, basic level). Ability to solve elementary problems in chemistry based on your knowledge (eg: preparation of solutions at given concentrations, handling of weights, application of a known mathematical apparatus and chemistry problems for physicochemical calculations), ability to obtain information from indicated sources. Understanding the need for further education; readiness to cooperate within the team.

Course objective

1. Passing knowledge of chemistry to students, to the extent specified by the curriculum relevant to the field of study. 2. Developing students' ability to solve simple problems and perform simple experiments and analysis of results based on the acquired knowledge. 3. Shaping teamwork skills in students

Course-related learning outcomes

Knowledge:
1.The student can formulate and explain basic chemical laws in the area covered by the curriculum relevant to the field of study.
2. Student can determine the basic limitations and scope of applicability of laws of chemistry and

electrochemistry and give examples of their application to the description of phenomena in the surrounding world

Skills:
1. The student can perform standard measurements of basic physicochemical quantities, estimate the time needed for their implementation and follow the schedule.
2. The student cano make a qualitative and quantitative analysis of the results of simple chemical experiments.
3. The student can formulate conclusions based on the obtained results of calculations and measurements made.
4. The student can use the understanding from the indicated sources of knowledge (list of basic literature) and gain knowledge from other sources.

Social competences:
1. The student can cooperate within the team, fulfill the responsibilities entrusted within the division of work in a team.
2. The student can actively engage in solving set tasks, set priorities for the implementation of a specific task .

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: on the basis of passing the laboratory exercises.
Laboratory exercises: final assessment based on points obtained for: response, planning and conducting subsequent experiments and preparation of the report. Passing exercises from: 52% of points.

Programme content

The course covers a wide range of chemical and technological topics, such as the thermodynamics of chemical reactions, the characteristics of fossil and synthetic fuels, as well as the properties of colloids, emulsions, and detergents. Participants will also learn about the kinetics of chemical reactions, the principles of catalyst operation, the mechanisms of explosive reactions, metal corrosion processes, and water treatment methods, including softening and water parameter control.

Course topics

Lecture:
1. Energy (thermodynamics) of chemical reaction. Fuel. Synthetic fuels. Coal, oil, natural gas.
2. Colloids. Emulsions. Cleaning agents. Smoke, fog. Foam. Production, destruction.
3. Kinetics of chemical reaction. Rate of chemical reaction, rate constant. Complex Reactions: competitive, consecutive.
4. Explosive reactions. Explosive combustion.
5.Catalysts. Homo- and heterogeneous catalysis. Catalyst supports (powder and monolithic). Exhaust gas purification.
6. Corrosion of metals. Stainless steels. Passivition, immunity and corrosion zones.
7. Water, treatment. pH. Hardness, softening. Ion exchangers. Basic parameters.
Laboratory:
PHASE EQUILIBRIUM: Gibbs phase rule. Phase diagrams: liquid - solid for the two component systems. Two and multi component systems. Thermal analysis. Cooling curves.
ELECTROCHEMISTRY: Chemical and electrochemical corrosion (examples). Protecting from Corrosion. Chemical and electrochemical depositions of metal coating. Electrolysis, electrolysis laws.Types of half-cells. Methods of EMF (electromotive force) determination. Standard potential. Types of the galvanic cells. Primary and Secondary cells.
WATER PHYSICS AND CHEMISTRY: Water hardness and its types. Removing water hardness - distillation,
thermal method, chemical methods,ion-exchange method, water demineralization. Water treatment for refrigeration and boiler purposes.
ACID-PRINCIPLE REACTIONS: Acids, bases, salts - structure, types, preparation, properties. Electrolytic dissociation of acids, bases and salts, constant and degree of dissociation. Ionic product of water. pH and pOH. Methods for measuring pH. Acid-base indicators. Acid-base titration (acid-base), PK (end

point) titration. Buffer.
CHEMICAL KINETICS: Rate of chemical reaction, rate constant. Order of the Chemical Reaction. 1st, 2nd and 3rd order reactions. First and second-order rate equations.Half-life. Temperature dependence of the rate constant. Activation Energy.
CHEMICAL EQULIBRIUM:Thermal dependency of chemical equilibrium. Heat reaction and temperature dependence. Solubility equilibrium. Conductometry. Conductivity measurements of the electrolytes. Measurement cell construction.

Teaching methods

Lecture: multimedia presentation
Laboratory exercises: performing a given experiment as part of a laboratory exercise and preparation of the report.

Bibliography

Basic:
1. L. Jones, P. Atkins, Chemia ogólna, PWN, W-wa 2006
2. Z. Sarbak, Kataliza w ochronie środowiska, UAM, Poznań 2004
3. A. Lewandowski, St. Magas, Wiadomości do ćwiczeń laboratoryjnych z chemii fizycznej, WPP, Poznań 1994 (skrypt nr 1765).
4. Instrukcje do ćwiczeń laboratoryjnych z chemii.

Additional:
1. P. Atkins, Podstawy Chemii Fizycznej, PWN, Warszawa 1999
2. A.G. Whittaker, A.R. Mount, M.R. Heal, Krótkie wykłady. Chemia fizyczna, PWN, W-wa 2007

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00