COURSE DESCRIPTION CARD - SYLLABUS

Course name
Chemistry [S1IBiJ1>CHE]

Course

Field of study
Safety and Quality 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
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr hab. inż. Joanna Zembrzuska
joanna.zembrzuska@put.poznan.pl

Lecturers

dr hab. inż. Joanna Zembrzuska
joanna.zembrzuska@put.poznan.pl

dr hab. inż. Magdalena Frańska
magdalena.franska@put.poznan.pl

dr inż. Włodzimierz Zembrzuski
wlodzimierz.zembrzuski@put.poznan.pl

Prerequisites

1. Student has knowledge of chemistry acquired in high school, necessary to formulate and solve simple tasks in the field of chemistry 2. The student knows how to analyze the phenomena occurring around him. The student is able to assess situations in which it is located 3. The student is aware of the limitations of their own knowledge and understands the need for further education

Course objective

Systematize and broaden the knowledge of chemistry, acquiring the ability to identify, anticipate and reduce potential or existing hazards arising from the use of chemicals

Course-related learning outcomes

Knowledge:

1. Describes basic concepts and reactions in inorganic chemistry, including acid-base reactions, redox reactions, mechanisms of electrochemical corrosion of metals, and methods of corrosion protection, complex compounds, precipitation processes, and reactions characteristic of inorganic cations and anions [K1_W01].
2. Recognizes and classifies chemical hazards, including those arising from exposure to chemical substances, using information contained in Safety Data Sheets for Hazardous Substances and understands the significance of hazard statements H and safety statements P [K1_W01].
3. Explains procedures for dealing with chemical hazards, including during spills, dispersion of substances, ingestion or inhalation poisoning, and chemical burns [K1_W01].

Skills:
1. Performs pH measurements and analyzes reactions in the acid-base system, using knowledge about the reaction of aqueous salt solutions to interpret experimental results [K1_U04].
2. Demonstrates the ability to conduct complexation reactions and oxidation-reduction reactions, using acquired knowledge to analyze and synthesize information about the characteristic properties of cations and anions [K1_U01].
3. Applies precipitation techniques for substance separation and skillfully operates automatic pipettes, demonstrating the ability to plan, organize, and manage individual and team work in a chemical laboratory [K1_U11].
4. Designs and performs qualitative analysis of cations and anions, using appropriate methods and techniques to solve engineering tasks in the field of chemistry, maintaining high standards of quality and safety [K1_U07].

Social competences:
1. Demonstrates awareness of responsibility for safe handling of chemical substances, understanding the impact of engineering actions on the environment and the need to minimize chemical hazards [K1_K03].
2. Develops readiness for teamwork, adhering to the principles of cooperation and taking responsibility for jointly performed tasks in a chemical laboratory, reflecting an awareness of the significance of team and individual work in achieving scientific and engineering goals [K1_K07].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures end with a written exam checking the level of understanding of acquired knowledge and the ability to draw conclusions.
Laboratories: Each experiment is preceded by verbal or written verification of the acquisition of the theoretical foundations necessary for understanding a given instrumental method.
In the case of online classes - Laboratories: the assessment will be exercise reports and tests from individual departments, the assessment of the lectures will consist of the grades obtained from partial tests, tasks and the final test

Programme content

Lectures: During the series of lectures, the basics of inorganic chemistry will be presented, including acid-base reaction, redox reactions, electrochemical corrosion of metals and methods of protection against it, complex compounds, sedimentation, characteristic reactions of inorganic cations and anions The risk related to exposure to chemical substances (elements of toxicology) will also be discussed - identification and classification of hazards, familiarization with the construction and information contained in the Material Safety Data Sheets (in particular H-phrases and P-phrases),
Laboratories: The cycle of practical classes consists of eleven laboratory exercises covering the basic issues presented during lectures:
1. pH scale
2. Reaction in the acid-base system
3. pH of aqueous solution
4. The properties of the coordination compounds I
5. The properties of the coordination compounds II
6. Oxidation and reduction reactions I
7. Oxidation and reduction reactions II
8. The separation of substances by precipitation

9. Deterining the accuracy and precision of automatic pipette measurement
10. Qualitative analysis of cations
11.Qualitative analysis of anions
In the case of online classes, the above-mentioned exercises will be discussed in detail by the teacher with the use of film materials

Course topics

none

Teaching methods

Lecture: multimedia presentation and discussion of examples
Laboratory course: performing experiments using instrumental techniques - practical classes

Bibliography

Basic:
1. Bielański A., Podstawy chemii nieorganicznej, Wyd. Naukowe PWN, Warszawa, 2008, Tom 1 i 2.
2. Jones L..,Atkins P.W., Chemia ogólna. Cząsteczki, materia, reakcje, Wyd. Naukowe PWN, Warszawa, 2009.
3. Minczewski J., Marczenko Z., Chemia analityczna, Wyd. Naukowe PWN, Warszawa, 2007, Tom 1 i 2.
4. MCMurry J., Chemia organiczna, Wyd. Naukowe PWN, Warszawa, 2009, Tom 1-5.

Additional:
1. A. Ciszewski, M. Baraniak, Aktywność chemiczna i elektrochemiczna pierwiastków w środowisku wody, Wydawnictwo PP, Poznań 2006
2. F.A. Cotton, G. Wilkinson, C. Murillo, M. Bochmann, Chemia nieorganiczna. Podstawy, PWN, Warszawa 1995
3. G. Charlot, Analiza nieorganiczna jakościowa, PWN, Warszawa 1976
4. M.J. Sienko, R.A. Plane, Chemia. Podstawy i zastosowania, WNT, Warszawa 2002
5. G.W. van Loon, S. J. Duffy, Chemia środowiska, PWN, Warszawa 2008
6.Kowal R., Bezpieczeństwo i higiena pracy przy stosowaniu substancji i preparatów chemicznych, Ośrodek Szkolenia PIP, Wrocław ,2006.
7 Wasilewski M., Dawydow W., Bezpieczeństwo w pracowni chemicznej, Wyd. Naukowo-Techniczne, Warszawa,2008.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	48	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	52	2,00