COURSE DESCRIPTION CARD - SYLLABUS

Course name

General and Inorganic Chemistry

Course

Field of study

Chemical Technology

Year/Semester

I/2

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

0

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr eng. Andrzej Szymański

e-mail: Andrzej.Szymanski@put.poznan.pl

Faculty of Chemical Technology

street: Berdychowo 4, 60-965 Poznan

phone: (61) 665 2806

Responsible for the course/lecturer:

Prerequisites

Knowledge:

Student: has knowledge resulting from passing the general and inorganic chemistry in the first semester, and in particular:

W1) Has extensive knowledge on the structure of matter; identifies the constituents of matter and characterizes the interactions between them; knows the structure of atoms and their origin; defines and explains the laws governing the interactions of the constituents of matter at the intra nuclear and atomic level

W2) Indicates the properties of elements resulting from the electronic configuration of their atoms and position in the periodic table, and in particular knows and explains the relationship between the electronic configuration of atoms and the reactivity of elements

W3) Explains the strong relationship between laboratory and technical applications of the elements and their physicochemical properties, based on their location in the periodic table of elements

Skills:

Student: has the skills resulting from passing the general and inorganic chemistry course in the first semester, and in particular:

U1) Uses the periodic table of elements and knows how to use it as a basic source of information on the physicochemical properties of elements and their compounds

U2) Writes and correctly balances chemical reactions between inorganic reagents (also involving simple organic compounds); predicts the direction of chemical reactions of any type (including oxidation and reduction reactions)

U3) Correctly calculates the energetic effect of the chemical reaction, based on the functions of state of substrates and reaction products

Social competences:

Student: has social competences resulting from passing the general and inorganic chemistry course in the first semester, in particular:

K1) Is aware of the continuous, rapid increase of knowledge in the field of inorganic chemistry, and on this background - the level of his knowledge in this field, which causes him to be determined and active attitude in further study and acquisition of new knowledge on his own initiative

K2) Is aware that knowledge in the field of inorganic chemistry is widely used in industry and economy; understands therefore and counts with the necessity of practical use of the acquired knowledge and skills in the future; is aware of the responsibility involved with these facts

Course objective

Extending knowledge in the field of general and inorganic chemistry with knowledge about geochemistry (especially rare elements), as well as the properties, applications and methods of obtaining rare elements by processing their mineral resources obtained from the Earth's crust

Course-related learning outcomes

Knowledge

1. Indicates the properties of rare elements resulting from the electronic configuration of their atoms

and their position in the periodic table, and in particular knows and explains the dependence between the electronic configuration of the atoms of these elements and their reactivity and physicochemical and technical properties (K_W03)

2. Lists and characterizes rare elements from the point of view of their industrial applications and production technologies (K_W09)

3. Lists and describes methods of obtaining rare elements from the lithosphere and understands the economic determinants of these processes (K_W15, K_W16)

Skills

1. Has well-established skills in the field of using the periodic table of elements and notation of the electronic configuration of chemical elements (K_U01

2. Able to choose an inorganic component of technical material based on its planned use (K_U22)

3. Can propose a method for obtaining a chemical element not widely disseminated in nature from his raw materials based on the analysis of chemistry and thermodynamics of the process (K_U03, K_U23)

Social competences

1. Is aware of the continuous, rapid increase of knowledge in the field of inorganic chemistry, and on this background - the level of his knowledge in this field, which causes him to be determined and active in further self-education and assimilation of the new knowledge from own initiative (K_K01)

2. Is aware that knowledge in the field of inorganic chemistry is widely used in industry and economy; understands in this connection and counts with the necessity of practical use of acquired knowledge and skills in the future; is aware of the responsibility related to this (K_K02, K_K06)

3. He is aware that the implementation of the technological process of acquiring the chemical elements with the low prevalence in nature requires an in-depth analysis of his environmental determinants (K_K02, K_K04)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

At the end of the lecture cycle, a final passing test is carried out, consisting of 4-8 open-ended problem questions of varying degrees of difficulty (differently scored) - passing threshold: 50% of the total number of points. Based on the number of points obtained, the final grade for the lecture is issued, according to the grading scale in force at Poznan University of Technology

Programme content

1. Introduction to geology of chemical elements: geochemical classification, isomorphic affinity and dispersion of elements; general systematics and characteristics of useful mineral deposits; minerals and ores; economic evaluation of mineral deposits; technological classifications of rare elements

2. Basics of mechanical enrichment of ores and minerals; overview of the most important methods of mechanical enrichment

3. Basics of chemical enrichment of ores and minerals: flotation - flotation factors and their applica-tion; flotation regulators; foaming agents in the flotation process; ion and foam flotation and new flotation methods; enrichment and production of metals by amalgamation; amalgamation hydrome-tallurgy; high temperature amalgamation metallurgy

4. The use of chlorine in the processing of ores of rare metals: chlorinating agents and their use; mechanism of chlorination reaction with the use of metal chlorides; chlorination of compounds with the metal present in several oxidation states; production of chlorides of rare metals

5. Separation of rare metals from solution: basics of the extractive equilibria; review of the most technologically important extraction systems; extraction in hydrometallurgy; adsorption processes; cementation; hydrometallurgical processing of ores and concentrates; separation of metals from solution by reduction with hydrogen

6. Production of selected rare elements - the chemistry and technological bases of the used pro-cesses: copper, cadmium, mercury, titanium, vanadium, molybdenum, tungsten, cobalt, nickel, lithium, beryllium, gallium, boron, germanium; technology of production of precious metals

Teaching methods

The lecture is conducted with the use of multimedia presentations with relevant examples; as a supplement, additional examples are presented on the board with appropriate explanations

Bibliography

Basic

1. M. Saternus, A. Fornalczyk, J. Dankmeyer-Łączny, Chemia ogólna dla metalurgów, Wydawnictwo Politechniki Śląskiej, Gliwice 2011

2. A. Bielański, Chemia nieorganiczna, PWN, Warszawa 2010

3. B. Jeżowska-Trzebiatowska, S. Kopacz, T. Mikulski, Pierwiastki rzadkie. Część 1, Występowanie i technologia, PWN, Warszawa-Wrocław 1976

4. J. Drzymała, Podstawy Mineralurgii, Oficyna Wydawnicza Politechniki Wrocławskiej 2001

5. S. Siekierski, Chemia pierwiastków, SNS, Warszawa 1998

Additional

1. W. Trzebiatowski, Chemia nieorganiczna, PWN, Warszawa 1988

2. J. Szymanowski, Ekstrakcja miedzi hydroksyoksymami, PWN, Warszawa-Poznań 1990

3. W. Charewicz, Pierwiastki ziem rzadkich. Surowce, technologie, zastosowanie, WNT, W-wa 1990

4. F. Łętowski, Podstawy Hydrometalurgii, WNT, Warszawa 1975

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	25	1,0
Student's own work (current literature studies, preparation for the final test) [1]	25	1,0

[1] delete or add other activities as appropriate