COURSE DESCRIPTION CARD - SYLLABUS

Course name
Management of raw and waste materials of inorganic industry [N2TCh2-TCO>GSiOPN]

Course

Field of study
Chemical Technology

Year/Semester
2/3

Area of study (specialization)
General Chemical Technology

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

Structured and systematic knowledge in the field of general and inorganic chemistry, organic chemistry and chemical technology, and apparatus of the chemical industry (the curriculum of the full-time first cycle studies). Ability to solve elementary engineering problems based on knowledge. Ability to obtain information from the indicated sources in Polish and a foreign language. Understanding the need for further education, understanding the need to expand their competences, readiness to cooperate within a team.

Course objective

Acquiring basic knowledge in the field of waste substances managment raising from the processes of inorganic chemical technology. Understanding the basic industrial processes and operations related to inorganic technology and energy acquisition. Ability to select raw materials and chemical intermediates. Indication of the possibility of using post-production wastes in inorganic technology processes. Learning methods of reducing the harmful impact of technological processes and methods of energy acquisition on the environment. Acquisition of basic information related to waste management. Proposal of using environmentally friendly technologies.

Course-related learning outcomes

Knowledge:
K_W2 - has expanded and in-depth knowledge in chemistry and other related areas of science, allowing to formulate and solve complex tasks related to chemical technology
K_W3 - has knowledge of complex chemical processes, including the appropriate selection of materials, raw materials, methods, techniques, apparatus and equipment for carrying out chemical processes and characterizing the products obtained
K_W6 - has expanded knowledge of the latest chemical and material technologies, including advanced materials and nanomaterials technologies, knows current trends in the development of chemical industrial processes
K_W7 - knows modern methods of testing the structure and properties of materials, necessary to characterize raw materials and products of the chemical and related industries
K_W11 - has a well-established and expanded knowledge of the selected specialty
K_W13 - has extended knowledge of advanced devices and apparatus used in chemical technology
K_W14 - has knowledge of selected issues of modern chemical knowledge and aspects of copyright and industrial property

Skills:
K_U1 - has the ability to obtain and critically evaluate information from literature, databases and other sources, and formulate opinions and reports on this basis
K_U2 - has the ability to work in a team and lead a team
K_U5 - can independently determine the directions of further education and implement self-education
K_U11 - is able to properly verify the concepts of engineering solutions in relation to the state of knowledge in technology and chemical engineering
K_U12 - has the ability to adapt knowledge of chemistry and related fields to solve problems in the field of chemical technology and planning new industrial processes
K_U15 - can critically analyze industrial chemical processes and introduce modifications and improvements in this area, using the acquired knowledge, including knowledge about the latest achievements of science and technology
K_U16 - has the ability to assess the technological suitability of raw materials and the selection of the technological process in relation to the quality requirements of the product
K_U23 - has the ability to use the knowledge acquired under the specialty in professional activity

Social competences:
K_K1 - is aware of the need for lifelong learning and professional development
K_K2 - is aware of the limitations of science and technology related to chemical technology, including environmental protection
K_K4 - observes all rules of teamwork; is aware of the responsibility for joint ventures and achievements in professional work
K_K6 - can think and act in a creative and entrepreneurial way

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Stationary form - the knowledge acquired during the lecture is verified in the form of a written pass (test) at the last class. The pass consists of 10-20 opened and closed test questions (single or multiple choice).
Online form - the knowledge acquired during the lecture is verified in the form of a written exam at the last class via the eKursy platform. The exam includes 10-20 opened and closed test questions (single or multiple choice), to which students answer using the test module on the eKursy platform. Grade criteria: 3 - 50.1%-60.0%; 3.5 - 60.1%-70%; 4 - 70.1%-80.0%; 4.5 - 80.1%-90%; 5 - from 90.1%.

Programme content

1. Characteristics of inorganic and organic pollutant streams within inorganic technology and methods of their elimination
2. Characteristics and methods of waste management generated during the acquisition of energy from fossil fuels (fly ash, saline mine water)
3. Management of waste phosphogypsum
4. Waste management of fluorine compounds
5. Reduction of CO2 emissions from energy processes

6. Inorganic pigments technology with particular emphasis on titanium white production

Teaching methods

Lecture - multimedia presentation, materials in the form of pdf files on the eKursy platform

Bibliography

Basic:
1. K. Schmidt-Szałowski, J. Sentek, J. Raabe, E. Bobryk, Podstawy technologii chemicznej. Procesy w przemyśle nieorganicznym, Oficyna Wydawnicza Politechniki Warszawskiej Warszawa 2004
2. Jess Andreas, Chemical Technology: An Integral Textbook, Wiley 2013, ISBN13 (EAN): 9783527304462,
ISBN10: 3527304460.
3. Moulijn Jacob A., Chemical Process Technology, Wiley-Blackwell 2013, ISBN13 (EAN): 9781444320251,
ISBN10: 1444320254.

Additional:
1. C.H. Bartholomew and R.J. Farrauto, Fundamentals of industrial catalytic processes, Wiley, Hoboken, New Jersey 2006.
2. M.B. Hocking, Handbook of chemical technology and pollution control, Elsevier, Amsterdam 2016.
3. G. Ertl, H. Knözinger, F. Schüth, J. Weitkamp, Handbook of heterogeneous catalysis, WILEY-VCH Weinheim 2008.
4. F. A. Henglein, Chemical Technology, Elsevier, 2013, ISBN 1483160254, 9781483160252.
5. J. Szarawara, J. Piotrowski, Podstawy teoretyczne technologii chemicznej, WNT Warszawa 2010
6. S. Bretsznajder, W. Kawecki, J. Leyko, R. Marcinkowski: Podstawy ogólne technologii chemicznej, WNT, Warszawa 1973.
7. J. Kępiński: Technologia chemiczna nieorganiczna, PWN, Warszawa 1975.
8. H. Konieczny: Podstawy technologii chemicznej, PWN, Warszawa 1975.

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	10	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	15	0,50