COURSE DESCRIPTION CARD - SYLLABUS

Course name
Neutralization and Recovery of Inorganic and Power Industry

Course

Field of study
Environmental Protection Technologies
Year/Semester
I/1
Area of study (specialization)
Ecotechnology
Profile of study
general academic
Level of study
Second-cycle studies
Course offered in
polish
Form of study
full-time
Requirements
compulsory

Number of hours

Lecture
30
Laboratory classes
45
Other (e.g. online)
0
Tutorials
0
Projects/seminars
15

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
D. Sc. Filip Ciesielczyk

e-mail: Filip.Ciesielczyk@put.poznan.pl

telephone 61 665-36-26

Faculty of Chemical Technology

Instituite of Chemical Technology and Engineering

Berdychowo 4, PL-60965 Poznan

Responsible for the course/lecturer:
D. Sc. Katarzyna Siwińska-Ciesielczyk

e-mail: Katarzyna.Siwinska-Ciesielczyk@put.poznan.pl

telephone 61 665-36-26

Faculty of Chemical Technology

Instituite of Chemical Technology and Engineering

Berdychowo 4, PL-60965 Poznan

Prerequisites

Student has knowledge of inorganic chemical technology and apparatus of chemical industry (core curriculum of III year of the studies). Student can obtain information from literature, databases and other sources, can interpret the obtained information to draw conclusions and formulate opinions in the area of inorganic chemical technology. Student is able to apply that knowledge in practice, both during the implementation work and the further education. Student is able to interact and work in a group.

Student is able to properly identify the priorities used to perform a specific task. Student understands the need for further education.

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_W01 - Has in-depth knowledge of chemistry, inorganic chemical technology and waste management.

K_W03 - Has theoretically founded detailed knowledge covering selected issues of environmental protection

K_W07 - Knows the basic rules of how to conduct in neutralizing the impact of harmful substances on the natural environment

K_W08 - Knows the basic principles of conducting the neutralization and recovery of industrial waste

K_W11 - Has knowledge necessary to understand the problem of environmental hazards and ways to increase safety

K_W14 - Has knowledge necessary to understand social, economic and legal consequences resulting from negligence in environmental protection

K_W17 - Has solid knowledge of environmentally friendly modern industrial technologies (green chemistry, zero-emission technologies)

Skills

K_U03 - Has the ability to selectively adapt knowledge of inorganic chemical technology and related fields to planning and implementing research tasks in the field of environmental protection technology

K_U04 - Is able to plan, prepare and present a presentation on the implementation of a research tasks and conduct a substantive discussion on this topic

K_U09 - Can indicate the ways of utilization of various industrial wastes

K_U12 - Has the skills to indicate the directions of conducting the neutralization and utilization of atypical industrial waste

K_U15 - Understands the need for continuous training (post-graduate studies, courses, training) - raising personal professional competences

K_U16 - Can work independently and in a team

K_U17 - Can think creatively

Social competences

K_K01 - Is able to skillfully use professional literature, integrate obtained information by interpreting and critically assessing them, and formulate competent opinions and reports on this basis

K_K02 - Is able to critically evaluate and verify the results of experimental research

K_K03 - Is able to analyze and critically evaluate new areas in environmental protection technologies, assess their innovation and technical feasibility

K_K06 - Understands the need to popularize knowledge in the field of environmental protection

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - exam, criterion: 3 - 50.1%-70.0%; 4 - 70.1%-90.0% and 5 from 90.1%

Laboratory and projects - reports from laboratory exercises, colloquium, oral/written answer, presentation of theoretical and experimental material, solving scientific problems, assessment of student's activity in lectures, laboratory and project classes, evaluation of practical classes, evaluation of teamwork; criterion: 3 - basic theoretical and practical knowledge, preparation skills concerning reports from laboratories and projects, basic participation in theoretical and practical classes without additional involvement; 4 - practical preparation supported by theoretical knowledge, the ability to formulate the right conclusions from the data obtained during the laboratory and the projects, active participation in classes supported by the desire to acquire additional practical and theoretical knowledge; 5 - complete preparation for classes, the ability to draw conclusions at an advanced level, and also posed defense, preparation of project assumptions at a high substantive level and their presentation, precise execution of entrusted tasks, independent search additional theoretical knowledge, coordination of work in a research team, an ambitious approach to the subject matter.

Programme content

1. Characteristics of inorganic and organic pollutant streams within inorganic technology

2. Overview of methods for purifying waste aqueous solutions

3. Characteristics and methods of waste management generated during the acquisition of energy from fossil fuels (fly ash, saline mine water)

4. The phosphorus compounds industry and harmful waste - waste phosphogypsum management

6. Waste management of fluorine compounds

7. Aluminum metallurgy

8. Soda technology and post-production waste

9. Methods of reregulation / utilization of waste solutions of sulfuric acid

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

Teaching methods

Lecture - multimedia presentation

Laboratory - teaching materials for the laboratory in pdf files, practical exercises

Project - multimedia presentations, illustrated with examples on a board, group work, discussion of scientific problems.

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 2012, 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 2005.

4. G. Ertl, H. Knözinger, F. Schüth, J. Weitkamp, Handbook of heterogeneous catalysis, WILEY-VCH Weinheim 2008.

5. S. Bretsznajder, W. Kawecki, J. Leyko, R. Marcinkowski: Podstawy ogólne technologii chemicznej, WNT, Warszawa 1973.

6. B.I. Stiepanow [tł. z jęz. ros.: Wojciech Czajkowski et al.]: Podstawy chemii i technologii barwników organicznych, WNT, Warszawa 1980.

7. J. Kępiński: Technologia chemiczna nieorganiczna, PWN, Warszawa 1975.

8. H. Konieczny: Podstawy technologii chemicznej, PWN, Warszawa 1975.

9. J. Szarawara, J. Piotrowski, Podstawy teoretyczne technologii chemicznej, WNT Warszawa 2010

10. Laboratory materials

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	5,0
Classes requiring direct contact with the teacher	100	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	50	2,0

[1] delete or add other activities as appropriate