COURSE DESCRIPTION CARD - SYLLABUS

Course name
Inorganic technology [S1IChiP1>TN]

Course

Field of study
Chemical and Process Engineering

Year/Semester
3/5

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
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

dr hab. inż. Filip Ciesielczyk prof. PP
filip.ciesielczyk@put.poznan.pl

dr hab. inż. Agnieszka Kołodziejczak-Radzimska
agnieszka.kolodziejczak-radzimska@put.poznan.pl

Lecturers

Prerequisites

Student has knowledge of general and inorganic chemistry, physical chemistry and apparatus of chemical industry, knows the basic methods, techniques and tools used in chemical analysis (core curriculum of I and II 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 general and inorganic chemistry. 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 inorganic chemical technology. Understanding the basic industrial processes and operations related to inorganic technology. Ability to select raw materials and chemical intermediates. Understanding the methods of obtaining inorganic products and their identification. Indication of the possibility of using products manufactured in inorganic technology processes. Proper waste handling. Proposal of using environmentally friendly technologies.

Course-related learning outcomes

Knowledge:
k_w03 - has structured, theoretically founded general knowledge in the field of inorganic, organic, physical and analytical chemistry enabling understanding, description and study of chemical phenomena and processes related to inorganic chemical technology
k_w04 - has general knowledge in the field of inorganic chemical technology as a related field of study to chemical and process engineering.
k_w05 - has basic knowledge related to the selection of materials used in the construction of chemical apparatus and installations
k_w09 - has knowledge of raw materials, products and processes used in the chemical industry and directions of development of the chemical industry in the country and in the world
k_w10 - knows the basics of kinetics, thermodynamics and catalysis of chemical processes
k_w13 - has structured, general and detailed knowledge of inorganic chemical technology and the apparatus of the chemical industry
k_w14 - has a basic knowledge of the life cycle of products, equipment and installations in the chemical industry

Skills:
k_u01 - is able to obtain information from literature, databases and other sources related to inorganic chemical technology, also in a foreign language, integrate them, interpret and draw conclusions and form opinions
k_u03 - can prepare in polish and in a foreign language a well documented study in the field of inorganic chemical technology in polish and in a foreign language
k_u05 - has the ability to self-study
k_u14 - can use the principles of saving raw materials and energy, and through the modernization of equipment and processes obtains favorable economic indicators and reduction of environmental burden
k_u22 - can work in a team, plan and organize team work

Social competences:
k_k01 - understands the need for further training and raising their professional and personal competences
k_k02 - is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the environment and the associated responsibility for decisions made
k_k04 - is aware of the responsibility for own work and readiness to submit to work in a team and to bear responsibility for jointly performed tasks

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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 exam after the completed cycle of lectures. The exam consists of 5-10 open questions. Online form - the knowledge acquired during the lecture is verified in the form of a written exam after the completed cycle of lectures via the eKursy platform. The exam includes 5 open questions that students answer in the "live view" mode with the webcam turned on via eMeeting or Zoom platform, and 10-20 closed test questions (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%.
Laboratory: Stationary form - oral answer or written test (3-5 questions) from the material contained in the exercises and the given theoretical issues; presence and realization of all laboratory exercises provided in the study program; grade from reports prepared after each exercise. A final grade will be given based on the average grades of the oral/written answers and reports for each exercise, divided by the number of exercises performed. Online form - oral answer and/or written test (10-20 closed, multiple choice test questions) from the material contained in the exercises, tutorial videos and the theoretical issues provided, conducted in the "live view" mode with the webcam turned on via eMeeting or Zoom platform during a direct conversation with the teacher and/or using the test module on the eKursy platform; online presence and completion of all laboratory exercises provided in the study program; grade from the reports prepared after each exercise and sent via the eKursy platform or by e-mail using the university"s e-mail system. A final grade will be given based on the average grade of the

oral/written answers and reports for each exercise, divided by the number of exercises performed.
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. Chemical concept of method and technological principles with particular reference to inorganic processes.
2. Mineral and fuel resources.
3. Wet and dry methods of enrichment of minerals.
4. Coal processing core processes: combustion, gasification and degasification of coal, desulfurization of coal.
5. Production of synthesis gas.
6. Heterogenous catalysis.
7. Technology of sulfur compounds (sulfur combustion, oxidation of SO2-SO3, absorption of SO3, sulfuric acid).
8. Technology of nitrogen compounds (ammonia synthesis, combustion of ammonia, absorption of nitrogen oxides, synthesis of urea, nitrogen fertilizers, nitric acid).
9. Production of soda.
10. Industry of phosphorus and phosphate fertilizers.

Teaching methods

Lecture - multimedia presentation, materials in the form of pdf files on the eKursy platform
Laboratory - teaching materials for the laboratory in pdf files, practical exercises, tutorial videos 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. J.A. Moulijn, M. Makkee, A. van Diepen: Chemical Process Technology, Wiley-Blackwell, Chichester 2013.
3. J. Szarawara, J. Piotrowski, Podstawy teoretyczne technologii chemicznej, WNT Warszawa 2010.
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.
3. G. Ertl, H. Knözinger, F. Schüth, J. Weitkamp, Handbook of heterogeneous catalysis, WILEY-VCH Weinheim 2008.
4. S. Bretsznajder, W. Kawecki, J. Leyko, R. Marcinkowski: Podstawy ogólne technologii chemicznej, WNT, Warszawa 1973.
5. M. Taniewski: Technologia chemiczna - surowce, Wydawnictwo Politechniki Śląskiej, Gliwice 1997.
6. H. Konieczny: Podstawy technologii chemicznej, PWN, Warszawa 1975.
7. J. Kępiński: Technologia chemiczna nieorganiczna, PWN, Warszawa 1975.
8. Laboraotry materials

Breakdown of average student's workload

	Hours	ECTS
Total workload	135	5,00
Classes requiring direct contact with the teacher	85	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00