COURSE DESCRIPTION CARD - SYLLABUS

Course name

Inorganic Chemical Technology

Course

Field of study

Chemical Technology

Year/Semester

III/5

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

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

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Faculty of Chemical Technology

Instituite of Chemical Technology and Engineering

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Responsible for the course/lecturer:

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Faculty of Chemical Technology

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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 the necessary knowledge of chemistry to enable understanding of chemical phenomena and processes

K_W07 - knows the rules of environmental protection related to inorganic chemical technology and waste management

K_W08 - has a systematically, theoretically founded general knowledge in the field of general and inorganic chemistry

K_W09 - has the necessary knowledge about both natural and synthetic raw materials, products and processes used in inorganic chemical technology, as well as about the directions of development of the chemical industry in the country and in the world

K_W10 - knows the basics of thermodynamics, kinetics, surface phenomena and catalysis of chemical processes

K_W13 - has 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 - can obtain the necessary information from literature, databases and other sources related to chemical sciences, correctly interprets them, draws conclusions, formulates and justifies opinions

K_U02 - can work both individually and as a team in a professional and other environment

K_U04 - can prepare and present in Polish an oral presentation on chemical technology

K_U05 - has the ability to self-study

K_U16 - based on general knowledge, explains the basic phenomena associated with significant processes in inorganic chemical technology

K_U18 - distinguishes between types of chemical reactions and has the ability to select them for chemical processes

K_U22 - knows the physical and chemical properties of chemical compounds and materials

K_U25 - assesses the risks associated with the use of chemical products and processes

Social competences

K_K01 - understands the need for further training and raising their professional, personal and social competences

K_K02 - is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including their impact on the environment and the associated responsibility for decisions made

K_K03 - is able to cooperate and work in a group, inspire and integrate engineering environments

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 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 or oral exam after the completed cycle of lectures via the eKursy platform. The written 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. Oral exam includes 5 open questions that each student answer in the "live view" mode with the webcam turned on via eMeeting or Zoom platform during a direct conversation with the teacher. 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 (experimental/practical part) and written test (10-20 closed, single choice test 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, single 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. Assessment 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

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

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. Laboratory materials

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	75	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