POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Selected fields of technology [N2TCh2-TCO>WDT]

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
20

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

1. A student has basic theoretical systematic knowledge of general and inorganic chemistry, organic and chemical technology, including the key issues of natural and synthetic raw materials, products and processes used in the organic and inorganic chemical technology. 2. A student has the ability to assess the technological suitability of raw material sources and the selection of the technological process in relation to the product quality requirements. He can obtain information from the literature, databases, and other sources in English and to interpret the data obtained, draw conclusions and formulate and justify opinions. 3. A student understands the need for further education and improvement of his professional and personal competences, knows how to interact and work in a group, can think and act in a creative and entrepreneurial way.

Course objective

Extending of knowledge of inorganic and organic chemical technology enabling students to link flows in selected technological processes with the fundamental physico-chemical properties of raw materials, intermediate and end products. Deepening of the students knowledge in the field of the technological process conducting, calculation of the efficiency and selectivity, analytical testing, and the use of by-products and waste.

Course-related learning outcomes

Knowledge:
1. A student has broad and deep knowledge of inorganic and organic technology and related fields of science, allowing him to formulate and solve complex tasks associated with chemical technology. [K_W01, K_W02, K_W11]
2. A student has knowledge of complex chemical processes involving selection of appropriate materials, raw materials, methods, techniques, apparatus and equipment for chemical processes and the characterization of the resulting products. [K_W03, K_W11]
3. A student has extended knowledge about the newest chemical technologies and problems of environmental protection resulting from chemical processes, he/she knows contemporary trends of development of industrial chemical processes. [K_W06, K_W08, K_W11]

Skills:
1. A student has the ability to obtain and critically evaluate information from literature, databases and other sources and to formulate on the basis of opinions and reports. [K_U01]
2. A student has the ability to team work and team leadership. [K_U02]
3. A student is able to design and conduct chemical reactions in the laboratory under various conditions and proper use of the results of that research to scale-up. [K_U09]
4. A student is able to plan reasonable use of natural resources for chemical industry taking into account rules of environmental protection and sustainable development. [K_U13]
5. A student is able to critically analyze industrial chemical processes and modify or improve them applying the aquired knowledge, particularly the state-of-the-art. [K_U15]

Social competences:
1. A student is aware of the need for lifelong learning and professional development. [K_K01]
2. A student is aware of the limitations of science and technology related to chemical technology, including environmental protection. [K_K02]
3. A student understands the need to provide the public with information on the current state and directions of development of chemical technology, on the principles of use and handling of chemical products, about the risks of obtaining raw materials, chemical production and distribution. [K_K07]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture - Stationary form - the knowledge acquired during the lecture is verified in the form of a written exam after the completed cycle of lectures. 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 3-5 open questions that students answer in the "live view" mode with the webcam turned on via the eMeeting or Zoom platforms, or 10-30 open and closed test questions (single and 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%.
2. 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 (10-30 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 email 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

The lecture covers the issues of obtaining, properties and use of the most common semi-finished and organic products, implemented on an industrial scale, taking into account current raw materials for the organic industry. It enables students to learn in detail the selected petrochemical processes and industrial organic synthesis processes, to analyze the course of individual stages of the technological process. The thematic scope of one part of the lectures includes the following issues:
• Crude oil and its characteristics, crude oil processing - tube and tower distillation.
• Thermal processes in crude oil processing - types of processes.
• Catalytic cracking, hydrocracking, catalytic reforming.
• Modern processes of chemical coal processing, e.g. coal gasification, gasification agents, methanation, modern methods of coal gasification.
• Obtaining liquid fuels or olefins from raw materials other than crude oil (Fischer-Tropsch synteza , MTG (Mobil) process).
• Methanol - production and application.
• Biorefineries and platform chemicals.
In the contrast, the thematic scope of lectures related to the processes carried out in the field of inorganic technology includes:
• The phosphorus compounds industry and harmful waste - waste phosphogypsum management
• Waste management of fluorine compounds
• Aluminum metallurgy
• Soda technology and post-production waste
When discussing technology, an analysis of market demand, the use of by-products and waste products with elements of economic aspects is also carried out.
As the laboratory classes, exercises are carried out in two thematic groups. The subject of the 1st group of exercises is related to the organic chemistry processes: obtaining gasoline from methanol - MTG process and analysis of products of this process, hydrogenation of aromatic compounds, catalytic cracking of aromatic compounds. The second group of exercises is related to inorganic technology processes concerns: processing waste phosphogypsum into ammonium sulfate (liquid conversion), regeneration of sulfuric acid from dilute sulfate solutions, adsorption of organic dyes on inorganic oxide material and neutralization of fluorosilicic acid and fluorosilicates. Performing exercises should deepen students' knowledge of how to conduct the technological process, calculate efficiency and selectivity, analytical control and the use of by-products and waste.

Teaching methods

Lecture, discussion, practical exercises (laboratories)

Bibliography

Basic:
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e-zasoby Biblioteki PP, baza ebooków Knovel:
1. D.Y. Murzin, Chemical Reaction Technology, De Gruyter, 2015.
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Additional:
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2. L. Sobczyk, A. Kisza, Chemia fizyczna dla przyrodników, PWN, Warszawa 1975.
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10. J. Szarawara, J. Piotrowski, Podstawy teoretyczne technologii chemicznej, WNT Warszawa 2010
11. Laboratory materials

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	54	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	71	3,00