



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Extraction methods

Course

Field of study

Chemical and process engineering

Area of study (specialization)

Chemical engineering

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

Dr hab. Inż. Mariusz B. Bogacki

Responsible for the course/lecturer:

dr inż. Ireneusz Miesiąc

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Wydział Technologii Chemicznej

60-965 Poznań

Ul. Berdychowo 4 , pok. 124A

Prerequisites

The student starting this course should have basic knowledge of separation processes, with particular emphasis on multi-stage processes. He should also have basic knowledge of inorganic and organic chemistry. He should also have the ability to obtain information from the indicated sources and be ready to cooperate as part of the team.

Course objective

Provide students with knowledge focused on extraction processes regarding the separation of both organic and inorganic chemical compounds. Developing students' skills in solving problems that arise



while analyzing issues related to metal recycling and the recovery of various types of raw materials from waste water streams.

Course-related learning outcomes

Knowledge

1. K_W03 has an extended and deepened knowledge of chemistry and other related areas of science, allowing for the formulation and solving of complex tasks related to chemical engineering.
2. K_W04 has knowledge of complex chemical processes, including the appropriate selection of materials, raw materials, apparatus and devices for the implementation of chemical processes and the characterization of the obtained products.
3. K_W9 has knowledge of environmental protection problems related to the implementation of industrial chemical processes.

Skills

1. K_U01 has the ability to obtain and critically evaluate information from literature, databases and other sources and to formulate opinions and reports on this basis.
2. K_U02 has the ability to work in a team and to lead a team.
3. K_U012 is able to properly use natural resources in industry, guided by the principles of environmental protection and sustainable development.

Social competences

1. K_K02 is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions.
2. K_K01 understands the need for lifelong learning; is able to inspire and organize the learning process of other people; is aware of the importance and non-technical aspects and effects of engineering activities, including its impact on the environment, and the related responsibility for decisions made.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired in the course of the lecture is verified on the exam at the 15th lecture. The exam consists of 15-20 test questions (closed and open), with different scores. Passing threshold: 51% of points. Final issues on the basis of which the questions are developed will be given to students during the lecture.

The skills acquired during the laboratory classes are verified on an ongoing basis during the classes.

Programme content

1. General characteristics of extraction processes.
2. Leaching processes.



3. Processes of dissolving metals.
4. Extractive equilibrium.
5. Used extractants. Division and application.
6. Copper hydrometallurgy.
7. Hydrometallurgy of nickel and cobalt.
8. Special processes: gold hydrometallurgy, ocean concretions.
9. Isolation of organic compounds.
10. Membrane processes.

Teaching methods

1. Lecture: multimedia presentation.
2. Laboratory exercises: multimedia presentation and carrying out the tasks given by the teacher - practical exercises.

Bibliography

Basic

1. Mariusz Bogacki, Procesy ekstrakcyjne w hydrometalurgii, Wydawnictwo Politechniki Poznańskiej, 2012.
2. Szymanowski J., Ekstrakcja miedzi hydroksoksymami, Warszawa - Poznań, PWN, 1990.

Additional

1. Mariusz Bogacki, Procesy ekstrakcyjne w hydrometalurgii, Wydawnictwo Politechniki Poznańskiej, 2012.
2. Szymanowski J., Ekstrakcja miedzi hydroksoksymami, Warszawa - Poznań, PWN, 1990.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	60	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	30	1,0

¹ delete or add other activities as appropriate