# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Natural and secondary raw materials in organic technology

## Course

Field of study
Circular System Technologies
Area of study (specialization)

Level of study
First-cycle studies
Form of study
full-time

Year/Semester
3/6
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

## Number of hours

Lecture
30
Laboratory classes
30
Other (e.g. online)

Tutorials
0
Projects/seminars
0

## Number of credit points

5

## Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

## Prerequisites

Basic knowledge of general, organic and inorganic chemistry as well as physical chemistry and apparatus of the chemical industry (program basis of the 1st and 2nd year of full-time studies of 1st degree). The ability to solve elementary problems in general and organic chemistry on the basis of knowledge, the ability to obtain information from indicated sources in Polish and foreign languages. Understanding of the need for further education and the necessity to broaden one's competences, readiness to start cooperation within the team.

## Course objective

The subject allows to get to know the raw material base for the organic industry, i.e. natural - reproducible and fossil raw materials, as well as directions and methods of their processing. The technical importance of many renewable raw materials, as well as hard coal, oil and natural gas, is recognized. The properties and obtaining of the so called synthetic raw materials, i.e. chemicals produced on a large scale for multidirectional processing, are also known. It also indicates the possibilities the use of products manufactured in organic technology processes, as well as the proper handling of secondary raw materials.

## Course-related learning outcomes

### Knowledge

1. Student has knowledge of raw materials, products and processes used in closed-loop technologies [K_W10].

2. Student has knowledge of technologies based on renewable materials (so-called green materials) [K_W15].

3. Student has basic knowledge of industrial waste neutralisation and recovery processes [K_W07]

4. Student has basic knowledge of the life cycle of products, equipment and installations used in closed-loop technologies [K_W12].

### Skills

1. Student is able to obtain information from literature, databases and other sources related to closed-circuit technologies, also in a foreign language, integrate them, interpret and draw conclusions and formulate opinions [K_U01].

2. Student plans, selects scientific equipment and apparatus, conducts research and analyses the results and formulates conclusions on this basis [K_U03].

3 Student is able to plan and organize individual and team work [K_U08].

### Social competences

1. Student behaves professionally in all situations, takes responsibility for decisions made in connection with professional duties, acts in accordance with moral principles and professional ethics [K_K01].

2. Student supports the idea of harmonious, global civilization and economic development, promoting the principles of closed-loop economy, sustainable development and rational management of environmental resources on a local and global scale [K_K09].

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written pass; assessment criteria: 3 - 50.1-70.0%; 4 - 70.1-90.0%; 5 - from 90.1%

Laboratory - reports from laboratory exercises, oral/written response, evaluation of student activity during laboratory classes, evaluation of teamwork, evaluation criterion: 3 - basic theoretical and practical preparation, the ability to prepare reports from conducted laboratory exercises, basic participation in practical classes without additional involvement; 4 - practical preparation supported by theoretical knowledge, the ability to formulate appropriate conclusions from data obtained during the laboratory, active participation in classes supported by the desire to obtain additional practical and theoretical knowledge; 5 - complete preparation for teaching classes, the ability to formulate conclusions at an advanced level, precise performance of assigned tasks, independent search for additional theoretical knowledge, coordinating work in a research team, ambitious approach to the subject.

## Programme content

1. Raw material base for organic industry - renewable and fossil raw materials, directions and methods of processing these raw materials, rational management of environmental resources.

2. Methods of enrichment, purification and refining of raw materials. The range of use of raw materials, including plant and animal ones. Renewable raw materials in organic synthesis (fat, carbohydrate, natural rubber).

3. Receiving and processing of the most important organic compounds (e.g. synthesis gas, alkenes, aromatic hydrocarbons, etc.), high volume organic industry products.

4. Basic technologies of processing of chemical raw materials into finished products and semi-finished products for further synthesis. Application products: surfactants, dyes, selected low-tonnage organic products.

5. Biomass as a chemical raw material.

6. Examples of utilization of selected secondary raw materials of organic chemical industry.

7. Raw material perspectives of the modern organic chemical industry. Information on development trends in organic chemical technology.

## Teaching methods

Lecture - multimedia presentation.

Laboratory - educational materials for the laboratory in the form of pdf files, practical exercises.

## Bibliography

Basic

1. E. Kociołek-Balawejder (red.): Technologia chemiczna organiczna: wybrane zagadnienia, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, 2013.

2. B. Burczyk: Biomasa. Surowiec do syntez chemicznych i produkcji paliw, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2011.

3. M. Taniewski: Technologia chemiczna - surowce, Wydawnictwo Politechniki Śląskiej, Gliwice 1997.

4. K. Materna: Trends in technology of oxygen containing hydrocarbons: aldehydes, ketones, ethers; rozdział w książce: Chemical Technologies and Processes, Edited by: K. Staszak, K. Wieszczycka, B. Tylkowski, De Gruyter, 2020. DOI: https://doi.org/10.1515/9783110656367

5. J.A. Moulijn, M. Makkee, A. van Diepen: Chemical Process Technology, Wiley-Blackwell, Chichester 2013.

6. M. Stasiewicz (red.): Technologia chemiczna organiczna: ćwiczenia laboratoryjne, Wydawnictwo Politechniki Poznańskiej, Poznań 2013.

Additional

1. R. Zieliński: Surfaktanty: budowa, właściwości, zastosowania, Wydawnictwo Uniwersytetu Ekonomicznego, Poznań 2017.

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

3. M. Taniewski: Przemysłowa synteza organiczna. Kierunki rozwoju, Wydawnictwo Politechniki Śląskiej, Gliwice 1991.

4. B. Burczyk: Zielona chemia: zarys, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2014.

5. E. Milchert: Technologie produkcji chloropochodnych organicznych: utylizacja odpadów, Politechnika Szczecińska, Wydaw. Uczelniane PS, Szczecin 1997.

6. Laboratory materials (exercise reports).

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 125 | 5,0 |
| Classes requiring direct contact with the teacher | 65 | 2,5 |
| Student's own work (literature studies, preparation for laboratory classes, preparation for exam) [1] | 60 | 2,5 |

[1] delete or add other activities as appropriate