COURSE DESCRIPTION CARD - SYLLABUS

Course name
Green Chemistry

Course

Field of study
Environmental Protection Technologies

Year/Semester
II/3

Area of study (specialization)
Ecotechnology

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	0	
Tutorials	Projects/seminars	
15	0	

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Faculty of Chemical Technology
Institute of Chemical Technology and Engineering
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Responsible for the course/lecturer:

Prerequisites

Student has a structured, theoretically based knowledge covering key issues in the field of environmental technology.

Student is able to obtain information from literature, databases and other sources, also in English. The student is able to interpret information obtained, draw conclusions and formulate and justify opinions.

Student is able to cooperate and work in a group.

Student is able to adequately determine the priorities for a given task.

Course objective

Obtaining knowledge about the principles and assumptions of green chemistry aimed at sustainable development, i.e. manufacturing of a safe chemical product using modern, economical methods, while protecting the natural environment.

Course-related learning outcomes

Knowledge

1. Student has the knowledge necessary to understand the issues of environmental risk and ways to improve safety. [K_W11]

2. Student has the knowledge necessary to understand the social, economic and legal consequences of negligence in environmental protection. [K_W14]

3. Student has a well-established knowledge of environmentally friendly modern industrial technologies (green chemistry). [K_W17]

Skills

1. Student has easy verbal communication with specialists in green chemistry. [K_U01]

2. Student can plan, prepare and demonstrate a presentation on the implementation of the research task and conduct a substantive discussion on the subject. [K_U04]

3. Student can work individually and in a team. [K_U16]

Social competences

1. Student is able to make skilful use of technical literature, integrate information obtained by interpreting and critically appraising it and, on that basis, formulate competent opinions and reports. [K_K01]

2. Student is able to analyse and critically assess new areas in environmental technologies, assess their innovation and technical feasibility. [K_K03]

3. Student is aware of personal responsibility for teamwork. [K_K04]

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%

Tutorials: current control during classes, evaluation of prepared multimedia presentations and participation in discussions during classes;
assessment criteria: 3 - basic theoretical preparation and moderate participation in the discussion;
4 - preparation for the classes supported by theoretical knowledge, ability to formulate conclusions and active participation in the discussion during the classes; 5 - very good preparation for the classes, ability to formulate own opinions and conclusions during the discussion, independent search for additional theoretical knowledge concerning discussed issues.

Programme content

1. The essence of green chemistry and sustainable development. Objectives and principles of green chemistry.

2. Unconventional methods of conducting chemical reactions (electrochemical, photochemical, sonochemical, microwave radiation, without solvents).

3. Alternative reaction media - green solvents (water, supercritical fluids - water and carbon dioxide, ionic fluids, fluorine fluids).

4. Renewable raw materials in organic synthesis (fat, carbohydrate, natural rubber).

5. Green chemistry in polymer materials.

6. Green chemistry in agriculture (alternative plant protection products and fertilisers).

7. Patents in green chemistry.

8. Examples of applications of green chemistry principles in industry (Presidental Green Chemistry Challange Awards).

9. Green engineering (definition, Anastasius and Zimmerman principles, Sandestin principles).

10. Quantitative measures of sustainable chemistry.

11. Prospects for the development of green chemistry and its future tasks.

Teaching methods

Lecture - multimedia presentation.

Tutorials - discussion of selected issues using multimedia presentations.

Bibliography

Basic

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

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

3. Török B., Dransfield T.: Green chemistry: an inclusive approach, Elsevier, Amsterdam 2018.

4. Kolb V.M.: Green organic chemistry and its interdisciplinary applications, CRC Pres Taylor & Francis Group, Boca Raton 2016.

5. Matlack A.S.: Introduction to green chemistry, New York; Basel; Marcel Dekker, 2001.

6. Nelson W.M., Green solvents for chemistry: perspectives and practice, Oxford University Press, Oxford 2003.

Additional

1. Imae T.: Nanolayer research: methodology and technology for green chemistry, Elsevier, Amsterdam 2017.

2. Afonso C.A. M., Crespo J. G.: Green separation processes: fundamentals and applications, Wiley-VCH, Weinheim 2005.

3. Khalaf M.N.: Green polymers and environmental pollution control, Apple Academic Press Inc., Oakville, Waretown 2016.

4. Wasserscheid P., Welton T.: Ionic liquids in synthesis, Wiley-VCH, Weinheim 2003.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	60	2,4
Student's own work (literature studies, preparation for tutorials, preparation for written pass) [1]	40	1,6

[1] delete or add other activities as appropriate