



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Anaerobic digestion and biorefineries

Course

Field of study

Circular system technologies

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

4/7

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

Accoc. Prof. Piotr Oleśkowicz-Popiel

Responsible for the course/lecturer:

Prerequisites

Basic knowledge on chemistry, biotechnology and engineering.

Course objective

Course includes a review of technologies for biofuels and biochemicals production from biomass, wastewater and waste. Biorefinery concepts integrating variety of processes will be presented and discussed.



Course-related learning outcomes

Knowledge

K_W07 (has basic knowledge of neutralization processes and recovery of industrial and municipal waste),

K_W10 (has knowledge of raw materials, products and processes used in closed-loop technologies),

K_W11 (has knowledge of techniques and methods of identification and characterization of main products and by-products in closed-loop technologies),

K_W13 (has the knowledge to describe basic development trends related to closed-loop technologies),

K_W15 (has knowledge in the field of technologies based on renewable materials (so-called green materials),

Skills

K_U01 (can retrieve information from literature and databases and other sources related to closed-loop technologies, also in a foreign language, integrate and interpret it and draw conclusions and formulate opinions),

K_U04 (has the ability to self-study, is able to ethically use source information in Polish and in a foreign language, is able to read with comprehension, carries out analyses, syntheses, summaries, critical assessments and draws correct conclusions),

K_U05 (correctly uses in discussions and adequately uses nomenclature and terminology in the field of closed-loop economy, chemistry, technologies and chemical engineering, environmental protection and related disciplines, also in a foreign language),

K_U07 (knows how to participate in debates by presenting and assessing views on closed-loop technologies),

Social competences

K_K05 (objectively assesses the level of his own knowledge and skills, understands the importance of improving both professional and personal competences in line with changing social conditions and progress in science),

K_K06 (thinks and acts in an entrepreneurial manner),

K_K08 (participates in discussions and knows how to conduct discussions, is open to various opinions and is ready to assertively express feelings and criticisms),

K_K09 (supports the idea of a harmonious, global civilization and economic development, promoting the principles of a closed-loop economy, sustainable development and rational management of natural resources locally and globally),

K_K10 (is aware of the negative impact of human activity on the state of the environment and actively prevents its degradation),



K_K11 (understands the need to communicate to society – also through mass media - complete information about benefits and challenges related to implementation of closed-loop economy concept)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Participants' knowledge will be continuously verified during lectures based on activity in discussions and reading scientific papers. In addition, learning outcome will be verified by oral examination. In case of on-line lectures, student will be obliged to prepare a short presentation on the topic indicated by a lecturer.

Programme content

Key information on biorefinery technologies: types and methods for substrate collection for biorefineries, fermentation processes including anaerobic digestion, thermal processes, methods for process integration, methods for process evaluation.

Teaching methods

Interactive lecture including group discussions, conversations on the newest or most interesting/breakthrough scientific papers, conversations on new implemented biorefinery technologies.

Bibliography

Basic

Kamm B., Gruber P.R., Kamm M.: Biorefineries - Industrial Processes and Products: Status Quo and Future Directions. 2010, ISBN: 978-3-527-32953-3.

Additional

1. Cherubini F.: The biorefinery concept: Using biomass instead of oil for producing energy and chemicals. Energy Conversion and Management 51 (2010) 1412–1421.
2. Kleerebezem R., Joose B., Rozendal R., van Loosdrecht MCM.: Anaerobic digestion without biogas? Rev Environ Sci Biotechnol 2015, DOI 10.1007/s11157-015-9374-6.

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	16	0,5
Student's own work (literature studies, preparation for tests/exam) ¹	9	0,5

¹ delete or add other activities as appropriate