COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biogas plants and biorefineries [S1TOZ1>BiB]

Course

Field of study
Circular System Technologies

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

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:

Learning outcomes presented above are verified as follows:
Participants" knowledge will be continously verified during lectures based on activity in discussions and reading scietific papers. In addition, learning outcome will be verified by oral examination. In case of on-line lectures, student will be onbliged to prepare a short presentation on the topic indicated by a lecturer.

Programme content

Biorefinery technologies. Types and methods for substrate collection for biorefineries. Methods for assessing the efficiency of biorefinery processes.

Course topics

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	1,00
Classes requiring direct contact with the teacher	16	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	9	0,50