GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biowaste Management, PG_00069685		
Field of study	Recycling and Energy Recovery		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Filip Gamoń	
	Teachers	dr inż. Filip Gamoń	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	20.0	0.0	10.0	10.0	0.0	40

E-learning hours included: 0.0

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=2287

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	40	5.0	30.0	75

Subject objectives

The aim of the course is to familiarize students with the various types of biowaste and their energy potential. Participants will learn about both the possibilities and the methods of managing this type of waste, as well as the ways of recovering valuable substances and raw materials from it. During the course, students will gain not only theoretical knowledge but also practical skills related to modern solutions in biowaste management. Particular emphasis will be placed on the ability to design and evaluate installations operating within the bioeconomy. This will enable participants to better understand technological processes and their significance for sustainable development and the circular economy.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K03] is committed to independent lifelong learning and independently follows the development of science and technology, especially in the area of recycling raw materials and energy.	The student engages in independent lifelong learning, is able to independently follow the development of science and technology – particularly in the field of raw material and energy recovery – and applies the acquired knowledge to expand their competencies and improve professional practice.	[SK3] Assessment of ability to organize work [SK2] Assessment of progress of work [SK1] Assessment of group work skills
[K6_U03] designs processes, technologies and systems related to the recovery of raw materials and energy, using appropriate concepts, standards and design methods.	The student is able to design processes, technologies, and systems related to the recovery of raw materials and energy, applying appropriate theoretical concepts, applicable standards, and design methods, while taking into account the principles of sustainable development and the circular economy.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
[K6_W05] analyzes practical issues in the field of recovery of raw materials and energy, using knowledge and understanding of: materials, devices and tools, processes and technologies.	The student analyzes practical issues related to the recovery of raw materials and energy, using acquired knowledge and understanding of materials, equipment and tools, as well as the processes and technologies applied in this field.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>Course content – lecture

The course program includes the presentation and detailed characterization of various types of biowaste, along with a discussion of technologies for their management. Particular emphasis will be placed on the analysis and description of methane fermentation and hydrogen fermentation processes, highlighting their energy potential and significance in the bioeconomy. An integral part of the course will also involve preparing a conceptual design of a biowaste management facility, enabling students to apply the acquired knowledge in practice and to further develop their design and analytical skills.

Course content – laboratory

The laboratory program includes familiarizing students with practical methods for assessing the efficiency of biogas plant operation.

Course content – project

The students task will be to prepare a conceptual design of a biogas plant based on basic data concerning the substrate used.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>The student has basic knowledge and understands key concepts in the field of bioeconomy, including the significance of biowaste in the circular economy. The student is able to identify the main categories of biowaste and characterize their potential for use in technological processes.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Test</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Project</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>• Jędrczak, Andrzej. Biological Waste Processing. PWN Scientific Publishers, 2007.
• Akhter Attari, Ali. Biogas Production from Anaerobic Digestion of Food Waste. LAP Lambert Academic Publishing, 2020.
• Wu, Guangxue. Anaerobic Digestion: Fundamentals, Modelling, and Applications. Springer International Publishing AG, 2024.
• Articles available in open-access databases.</td></tr>
<tr><td>Supplementary literature</td><td>lecture materials</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>• Explain the mechanism of methane fermentation, describing the individual stages of the process (hydrolysis, acidogenesis, acetogenesis, methanogenesis) and the role of microorganisms.
• Discuss the influence of environmental parameters (pH, temperature, retention time) on the course of methane fermentation.
• Based on the given data, calculate the theoretical amount of biogas that can be obtained from 1 kg of dry matter of biowaste.
• Compare the energy value of biowaste of plant and animal origin and assess their suitability in bioeconomy processes.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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