GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00072905		
Field of study	Recycling and Energy Recovery		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	4	Language of instruction	Polish
Semester of study	7	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Environmental Engineering Technology -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Aneta Łuczkiewicz	
	Teachers	prof. dr hab. inż. Aneta Łuczkiewicz Rafał Węglarek	

Lesson types

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

E-learning hours included: 0.0

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=9259

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	0.0	0.0	40

Subject objectives

Deepening knowledge of biological and biochemical processes involved in waste bioconversion, as well as the factors influencing their efficiency and stability.

Developing the ability to assess the bioconversion potential of waste and to select appropriate technologies for energy recovery, nutrient recovery, and other resource reclamation.

Enhancing skills in preparing material and energy balances and evaluating the net energy efficiency of the solutions under analysis.

Introducing methods for assessing the environmental impacts of waste bioconversion and resource recovery, including life-cycle perspectives and ESG reporting together with carbon footprint determination.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] solves engineering issues and problems in the area of raw materials and energy recovery through the use of appropriate analytical, numerical and experimental tools and methods.	The student solves engineering problems in the area of resource and energy recovery by applying appropriate and relevant analytical tools and method	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K6_W02] analyzes engineering and technological issues and problems in the area of raw materials and energy recovery using appropriate and appropriate analytical, numerical and experimental tools and methods	The student analyses engineering and technological issues in the area of resource and energy recovery, using modern analytical tools and methods.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K6_W06] integrates and extracts data from multiple sources to analyze complex engineering and technology problems.	The student integrates and acquires data from multiple sources in order to analyse complex engineering and technological problems.	[SW2] Assessment of knowledge contained in presentation
[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 follows developments in science and technology in the area of resource and energy recovery.	[SK2] Assessment of progress of work

Subject contents	Course content – lecture **Characteristics of waste and assessment of their bioconversion potential** **Microbiological and biochemical foundations of bioconversion processes** **Anaerobic digestion and co-digestion of waste** **Composting and other aerobic waste-treatment processes** **Alternative bioconversion pathways and production of bioproducts** **Pretreatment of substrates and integration of bioconversion processes** **Material and energy balances and net energy efficiency** **Resource recovery, product quality, and possibilities for their use** **Environmental impact assessment from a life-cycle and ESSG raports perspective** **Legal and economic frameworks and comparative evaluation of solutions** Course content – project **Selection of the waste stream and definition of the analysis objective, functional unit, and system boundaries** **Identification and characterization of the environmental problem, its causes, and consequences** **Analysis of legal frameworks and strategic documents at international, EU, national, and local levels** **Critical review of scientific literature and available data, including identification of knowledge gaps** **Synthesis and presentation of analysis results, along with a comparative assessment of possible solutions in the context of the circular economy model** **Assessment of societal perception of the problem and acceptance of proposed solutions** **Analysis of the environmental and economic benefits resulting from the proposed solutions** **Assessment of greenhouse gas emissions in waste-processing systems**
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
project	60.0%	20.0%
test	60.0%	60.0%
workshop	60.0%	20.0%

Recommended reading	Basic literature	**D**irective 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. OJ L 312, 22.11.2008, pp. 3–30, as amended. Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast). OJ L 328, 21.12.2018, pp. 82–209, as amended. Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003. OJ L 170, 25.06.2019, pp. 1–114, as amended.
	Supplementary literature	-
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Practical activites within the subject	Not applicable	

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