GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Biomass as a source of renewable energy, PG_00070772		
Field of study	Chemical Technology		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	e-learning
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Energy Conversion and Storage -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Katarzyna Januszewicz	
	Teachers	dr hab. inż. Katarzyna Januszewicz	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

E-learning hours included: 15.0

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=4615

Moodle ID: 4615 BIOMASA JAKO ŹRÓDŁO ENERGII ODNAWIALNEJ
https://enauczanie.pg.edu.pl/2025/course/view.php?id=4615

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	15	2.0	8.0	25

Subject objectives

The aim of the class is to supplement knowledge about biomass as a renewable energy source and to become familiar with processing technologies and modern directions of development.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W04] recognises scientific, technological, organisational and economic opportunities and constraints in technology and related fields	The student has the knowledge necessary to identify the advantages and limitations of individual technological solutions and understands the relationships between biomass properties and the selection of appropriate pre-treatment stages and equipment.	[SW1] Assessment of factual knowledge
[K7_W01] defines the phenomena, processes and laws of nature used to produce consumer goods and provide services	The student knows and is able to describe biomass processing processes, including thermal conversion. They classify and describe installations and technological processes that utilize biomass. They are able to characterize biomass.	[SW2] Assessment of knowledge contained in presentation
[K7_W05] recognises the key developments in research, apparatus and technology in technology and related fields	The student has knowledge of the latest development directions in technologies utilizing biomass and is able to describe technological solutions. They are familiar with the construction of pyrolysis reactors, gasifiers, combustion chambers, and fermentation chambers. In addition, the student can describe systems for hydrogen production from biomass.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – lecture
1.
Characteristics of biomass, including waste biomass.

2. Biomass potential.
3. Classification of biomass.
4. Moisture content of biomass. Discussion of the drying process, which is the most costly and energy-intensive stage.
5. Main directions of biomass processing: fermentation (biogas), combustion, pyrolysis, and gasification.
6. Overview of boilers and technologies used for combustion, pyrolysis, and gasification processes.
7. Hydrogen production from biomass. Reforming processes.
8. Production of biochar from biomass.
9. Biodiesel vs. bioethanol.
10. Comparison of waste biomass processing technologies.
11. Use of biomass in distributed energy sources.
12. Use of biomass in heating systems and industrial energy production. Biomass combustion plants.
13. Problems and challenges related to biomass properties: overview of equipment used for biomass size reduction and drying.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></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>60.0%</td><td>100.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Lewandowski W.M., Ryms M., Biopaliwa Proekologiczne odnawialne źródła energii, WNT, 2013
2. Werle S.Termiczne przetwarzanie biomasy odpadowej jako element gospodarki obiegu zamkniętego., Monografia, Politechnika Śląska
3. Podkówka W., Biogaz rolniczy, Powszechne Wydawnictwo Rolnicze i Leśne, 2013</td></tr>
<tr><td>Supplementary literature</td><td>1. Hakeem K.R., Jawaid M., Rashid U., Biomass & Bioenergy, Springer, 2014
2. Hardyman R., Biomass Energy, Cheriton Children's Books, 2022
3. Dahiya A., Bioenergy: Biomass to Biofuels and Waste to Energy, Academic Press, 2014</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>• Compare the processes of pyrolysis, gasification, and combustion.
• Discuss the process of biomass drying and the equipment used for it.
• Properties of biomass.
• Advantages and limitations of biomass utilization.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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