GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	BIOMASS AS A SOURCE OF RENEWABLE ENERGY, PG_00064335		
Field of study	Chemical Technology		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Optional subject group Specialty subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Energy Conversion and Storage -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Katarzyna Januszewicz	
	Teachers	dr hab. inż. Katarzyna Januszewicz	

Lesson types and methods of instruction

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: 0.0

eNauczanie source addresses:

Moodle ID: 43729 BIOMASA JAKO ŹRÓDŁO ENERGII ODNAWIALNEJ_2025 (PG_00064335)
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43729

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 classes is to supplement knowledge about renewable energy sources, specifically biomass, as well as to learn about processing technologies and modern development trends

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 is able to indicate the advantages and disadvantages of particular technological solutions. Based on the properties (characteristics) of biomass, they can assess the necessity of selecting preliminary stages and choose appropriate equipment	[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 is able to indicate the latest directions in the development of biomass utilization technologies and describe technological solutions. They know the design of pyrolytic reactors, gasifiers, combustion chambers, and fermentation chambers. They are able to describe a system for hydrogen production from biomass	[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 is able to describe biomass processing processes, including thermal processing. They classify and describe installations and technological processes that use biomass. They are able to characterize biomass	[SW1] Assessment of factual knowledge

Subject contents	1. **Characteristics of biomass, including waste biomass** 2. **Biomass potential** 3. **Classification of biomass** 4. **Moisture content of biomass. Discussion of the drying process as the most costly and energy-intensive stage** 5. **Main directions of biomass processing: fermentation (biogas), combustion, pyrolysis, gasification** 6. **Discussion of boilers and technologies for conducting combustion, pyrolysis, and gasification processes** 7. **Hydrogen production from biomass. Reforming** 8. **Biochar production 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 district heating and industrial energy. Biomass incineration plants** **Problems and challenges related to biomass properties: overview of biomass shredding and drying equipment. Biomass pelletizing**
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test	60.0%	100.0%

Recommended reading

Basic literature	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
Supplementary literature	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
eResources addresses	

Example issues/ example questions/ tasks being completed	1. **Compare the processes of pyrolysis, gasification, and combustion** 2. **Describe the transesterification process and its applications in industry** 3. **List the advantages and disadvantages of methane fermentation**
Work placement	Not applicable

Document generated electronically. Does not require a seal or signature.