Nazwa w jęz. angielskim: Sustainable energy and materials recovery from biomass and waste
Nazwa w języku polskim: Zrównoważony odzysk energii i materiałów z biomasy i odpadów

Dane dotyczące zajęć:
Information on course:

Jednostka oferująca:
Course offered by: *Faculty of Energy and Environmental Engineering // dr hab. inż. Izabella Maj, prof. PŚ*

Język wykładowy:

Language:

english

Strona WWW:
Course homepage:

Skrócony opis:

Short description:

This course introduces students to the fundamental principles and practical applications of biomass and waste conversion technologies within sustainable energy systems and the circular economy framework. The course focuses on thermochemical processes such as pyrolysis, gasification, and combustion, which enable the recovery of energy and valuable materials from biomass and waste streams.
Students will gain an understanding of the role of biomass and waste as alternative energy resources and their importance in reducing dependence on fossil fuels. The course also addresses the environmental aspects of conversion processes and the opportunities for recovering valuable elements such as phosphorous from process by-products.
The course combines knowledge from energy systems, environmental engineering, and materials science, providing students with an overview of modern technologies used in biomass and waste-to-energy systems and resource recovery. Case studies and examples of industrial applications will be presented to illustrate real-world implementation and technological challenges.

Opis:

Description:

Lecture

1. Properties and classification of biomass and waste as energy resources
2. Fundamentals of thermochemical conversion processes: combustion, gasification, pyrolysis, hydrothermal carbonization
3. Energy recovery from biomass and waste in sustainable energy systems
4. Environmental aspects and efficiency of thermal conversion technologies
5. Recovery and utilization of valuable elements from process residues
6. The role of biomass and waste conversion in the circular economy
7. Overview of European policies and strategies related to waste management and sustainable energy

Lecture:

- **full-time studies: 30 h**

Number of ECTS credits: 2

Literatura:

Bibliography:

1. Moshood Akanni Alao, Olawale Mohammed Popoola, Temitope Raphael Ayodele: Waste-to-energy nexus: An overview of technologies and implementation for sustainable development, Cleaner Energy Systems, Volume 3, 2022, https://doi.org/10.1016/j.cles.2022.100034.
2. Stanislav V. Vassilev, David Baxter, Lars K. Andersen, Christina G. Vassileva, An overview of the

composition and application of biomass ash. Part 1. Phase–mineral and chemical composition and classification, Fuel, Volume 105, 2013, https://doi.org/10.1016/j.fuel.2012.09.041.
3. Stanislav V. Vassilev, David Baxter, Lars K. Andersen, Christina G. Vassileva: An overview of the composition and application of biomass ash.: Part 2. Potential utilisation, technological and ecological advantages and challenges, Fuel, Volume 105, 2013, Pages 19-39, https://doi.org/10.1016/j.fuel.2012.10.001.
4. Papers in the following journals: Waste Management, Biomass Conversion and Biorefinery, Biomass and Bioenergy, Energies, Materials, Fuel, Renewable & Sustainable Energy Reviews, Journal of Cleaner Production

Efekty uczenia się:

Learning outcomes:

Knowledge: knows and understands the basic problems of modern civilization in relation to the achievements of science and technology - K1A_W5
Skills: is able to independently plan and implement his own lifelong learning - K1A_U8
Social competence: is ready to critically evaluate the knowledge he possesses and the content he receives, to recognize the importance of knowledge in solving cognitive and practical problems, and to consult experts in case of difficulties in solving the problem independently - K1A_K2.

Metody i kryteria oceniania:

Assessment methods and assessment criteria:

Lecture
Passing the course method:
- remote

in the form of:
- on-line presentation covering the assigned topic (literature review/case study analysis)
- presence in classes and engagement in discussion

Criteria for passing the course with percentage share
Presentation - 50%
Presence in classes and engagement in discussion - 50%

Dodatkowe informacje
Element of course groups in various terms:

Opis zajęć Course group description	
zajęcia z bazy UBZO studia stacjonarne stopień studiów – dowolny kierunek studiów – dowolny, semestr dowolny elective courses full-time studies degree - any field of study - any semester - any	2026/2027
cykl	