GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Renewable and waste energy sources, PG_00059953						
Field of study	Environmental Engineering						
Date of commencement of studies	February 2026		Academic year of realisation of subject	2026/2027			
Education level	second-cycle studies		Subject group	Obligatory subject group 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	2		ECTS credits	2.0			
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 hab. inż. Sylwia Fudala-Książek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
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	30		5.0	20.0	55	
Subject objectives	The aim of the course is to acquire knowledge and skills in the types of renewable energy sources and technologies using renewable energy in practice.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] can obtain information from literature, databases and other sources; can integrate the obtained information, interpret and critically evaluate them, draw conclusions, and formulate and comprehesively justify the opinions	Students will be able to acquire, analyse and make appropriate use of information from Polish and foreign literature in the field of unconventional energy sources.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
K7_U04	Students will be able to prepare and deliver a presentation and lead a discussion on the presentation given, on the subject of renewable energy sources, including waste sources.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
K7_W04	The student is able to present solutions to complex engineering tasks in the field of design, modelling, optimisation, control of processes, objects and systems in environmental engineering, in the field of practical solutions using renewable energy sources.	[SW2] Assessment of knowledge contained in presentation
K7_U12	The student analyses and evaluates technical solutions using renewable sources in terms of their economic viability and functionality.	[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
[K7_W11] has knowledge to analyze, evaluate and optimize processes, objects and systems of environmental engineering and knows the principles of rational energy management and resources	The student is able to analyse, evaluate and optimise processes in terms of energy efficiency in environmental engineering on the basis of the acquired knowledge and is familiar with the principles of rational energy and resource management.	[SW2] Assessment of knowledge contained in presentation

Subject contents

Course content – lecture

1.Conventional and non-conventional energy sources division and types2.Solar energy: types of solar collectors, construction and principle of operation of flat plate collectors, construction and principle of operation of vacuum collectors, selection of collectors.2 Heat pumps: Schematics and principle of operation, definition of COP, SOP, division and types of lower heat sources, examples of heat pump applications;3 Geothermal waters: ways of using geothermal sources, geothermal water resources, geothermal heat plant solutions monovalent and bivalent systems.4 Biomass: energy potential of biomass, methods of energy use of biomass, examples of pellet and straw combustion plant solutions. Methane fermentation systems (biogas plants and biorefineries).5 Wind energy and its utilisation: energy potential of wind, types of wind turbines, Basic information on wind power plants.6. photovoltaic cells: construction and principle of operation, examples of application

Prerequisites and co-requisites

Knowledge of selected topics in physics, chemistry and biology. Basic principles and laws of engineering thermodynamics, heat transfer and fluid mechanics. fluid mechanics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture	60.0%	40.0%
Classroom exercises	60.0%	60.0%

Recommended reading	Basic literature	1. Tytko Ryszard, Odnawialne źródła energii, Wydawnictwo OWG, Warszawa 2009 2. Lewandowski Witold M., Proekologiczne odnawialne źródła energii, Wydawnictwa NaukowoTechniczne Warszawa 2007 3. Foit Henryk, Zastosowanie odnawialnych źródeł ciepła w ogrzewnictwie i wentylacji, Wydawnictwo Politechniki Śląskiej Gliwice 2010 4. Rubik Marian, Pompy ciepła w systemach geotermii niskotemperaturowej, MULTICO Oficyna Wydawnicza Warszawa 2015 5. Ewa Klugmann-Radziemska, Lewandowski Witold M., 2023. Proekologiczne odnawialne źródła energii Kompendium, Wydawnictwo Naukowe PWN 6. Wytyczne PORT PC. Wytyczne projektowania, wykonania i odbioru instalacji z pompami ciepła
	Supplementary literature	1. Kusto Zdzisław, Współpraca pomp ciepła ze źródłem konwencjonalnym. Algorytmy obliczania bilansu energetycznego i efektywności ekonomicznej, Wydawnictwo Gdańskiej Wyższej Szkoły Administracji, Gdańsk 2009 2. Wiśniewski Grzegorz , Kolektory słoneczne. Poradnik wykorzystania energii słonecznej, Wydawnictwo: centralny Ośrodek Informacji Budownictwa, Warszawa 1992 3. Klugmann-Radziemska Ewa, Odnawialne źródła energii. Przykłady obliczeniowe, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2009
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. List the types of renewable sources.2. What energy-reducing technologies do we use in municipal wastewater treatment plants.	
Practical activites within the subject	Not applicable	

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