GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Alternative Energy Sources, PG_00064339		
Field of study	Chemical Technology		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
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	2	ECTS credits	3.0
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	prof. dr hab. Ewa Klugmann-Radziemska	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

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	45	5.0	25.0	75

Subject objectives

The purpose of the course is to familiarize students with the devices and installations for the generation of energy from alternative sources. During the lectures, students will be introduced to the theory of energy generation equipment and the basics of plant design, and the selection of appropriate equipment for needs and conditions. Alternatives to fossil fuels in the form of alternative fuels as well as renewable energy sources will be presented. The key topic of storing the energy produced will also be addressed.

As part of the laboratory, students will independently design one of the selected systems: photovoltaic, collector or heat pump, based on their measurements under laboratory conditions. A component of the class will be to carry out measurements and work with the laboratory equiment in small groups, design, make calculations under supervision, as well as work with standards and catalogs as data sources for calculations.

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	recognizes technological limitations and identifies organizational opportunities in energy generation and storage technologies.	[SW1] Assessment of factual knowledge
[K7_U07] takes into account ethical issues and regulations in research planning and product and process design	is able to take into account legal regulations when designing energy generation and storage facilities.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K7_K01] critically evaluates the content of cognitive and practical problems	is able to critically evaluate the content of the subject on cognitive and practical problems.	[SK5] Assessment of ability to solve problems that arise in practice

<table>
<tr><td>Subject contents</td><td>Course content – lecture

- Power systems: centralized and decentralized;
- construction of power grids and transmission lines;
- sustainable energy management;
- construction of photovoltaic systems, and methods of selecting system components;
- working with PV-GIS software;
- The key role of the inverter in a PV installation and its characteristics;
- calculation of peak heat and hot water demand;
- the main components of a collector system and the selection of the type of collector for geographic conditions and demand;
- Heat pump and appropriate selection of system components, including heat exchangers and compressors;
- selection of heat storage, domestic hot water tanks and electricity storage.

Course content – laboratory

- students will divide into small subgroups and each subgroup will be assigned an installation (collector, photovoltaic or heat pump)
- the group's task will be to perform experiments and design, including calculations and equipment selection of the assigned installation.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Course credit:
PHYSICAL AND CHEMICAL METHODS OF ENERGY GENERATION</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>Written test</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Laboratory project</td><td>60.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1.Lewandowski W.M. Proekologiczne źródła energii odnawialnej. Wwa WNT 2001
2. Boyle G. Renewable Energy. 2nd ed. New York Oxford University Press Inc. 2004
3. Szymański B. Instalacje fotowoltaiczne: teoria i praktyka od pomysłu d realizacji. Kraków GlobEnergia 2021
4. E.Klugmann-Radziemska. Odnawialne Źródła Energii Przykłady obliczeniowe. Wyd. P.G. Gdańsk 2009
5. Strzyżewski A. Pompy ciepła : zasady działania i wybór rozwiązań. W-wa WWiP 2017</td></tr>
<tr><td>Supplementary literature</td><td>1. E.Klugmann-Radziemska E.Klugmann, Systemy słonecznego ogrzewania i zasilania elektrycznego budynków Wydawnictwo Ekonomia i Środowisko, 2002
2. E.Klugmann, E.Klugmann-Radziemska, Ogniwa i moduły fotowoltaiczne oraz inne niekonwencjonalne źródła energii Wydawnictwo Ekonomia i Środowisko, 2005</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>State the differences between centralized and decentralized systems.
List the components of a photovoltaic installation.
Select an inverter based on the installation data.
Give the formula for the demand for domestic hot water.
List the components of a collector system.
Select a compressor based on the parameters of a heat pump.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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