



## Subject card

Subject name and code	Renewable energy sources, PG_00060853						
Field of study	Chemical Technology						
Date of commencement of studies	October 2023		Academic year of realisation of subject			2024/2025	
Education level	first-cycle studies		Subject group			Obligatory subject group in the field of study 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	2		Language of instruction			Polish	
Semester of study	3		ECTS credits			2.0	
Learning profile	general academic profile		Assessment form			assessment	
Conducting unit	Department of Energy Conversion and Storage -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Ewa Klugmann-Radziemska				
	Teachers		dr inż. Anna Dettlaff				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	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		2.0		18.0	50
Subject objectives	Presentation of knowledge in the field of natural resources management and their use as renewable energy sources. Analysis of the possibilities of using solar, biomass, water, wind and nuclear energy to produce electricity and heat. Gaining knowledge on the measurement of basic physical parameters related to obtaining energy from renewable sources.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W03] has knowledge of environmental protection in chemical technology, the classification of technological processes in terms of their environmental impact and how to eliminate the environmental impact of technological installations		the student has knowledge about environmental protection in chemical technology			[SW1] Assessment of factual knowledge	
	[K6_K02] understands the non-technical aspects and implications of the activities of a chemical engineer, including the impact on the environment, is aware of professional behaviour, observance of professional ethics and respect for diversity of views and cultures		the student understands non-technical aspects and effects of the activities of a chemical engineer, including the impact on the environment			[SK2] Assessment of progress of work	
	[K6_W12] knows the chemical nomenclature in Polish and specialized terms related to chemical technology		the student knows the chemical nomenclature in Polish and specialist terms related to chemical technology			[SW1] Assessment of factual knowledge	

Subject contents	<div>1. Introduction to renewable energy sources, including current EU regulations on renewable energy sources.</div> <div>2. Consequences of using conventional energy sources: acid rain, smog (temperature inversion phenomenon; London-type smog, Los Angeles-type smog, Polish-type smog; global warming (greenhouse effect phenomenon; fast and slow carbon cycle, carbon thermostat; mechanisms and feedbacks controlling climate change; climate models)</div> <div>3. Discussion of the potential of renewable energy in Poland, including the availability and use of various renewable energy sources: geographical conditions: explanation of what geographical factors influence the choice and location of renewable energy installations in Poland and worldwide. examples of towns and regions with high potential for various renewable energy sources.</div> <div>4. Use of solar energy (low- and high-temperature solar energy systems; active and passive systems; solar collectors; photovoltaic cells; solar farms; helioelectric power plants; solutions used in passive construction).</div> <div>5. Technologies for the production and use of hydrogen. Hydrogen economy. Use of biomass, biofuels, biogas.</div> <div>6. Biogas plants powered by waste biomass.</div> <div>7. Integrated methods of using available renewable energy sources.</div> <div>8. Installation and device diagrams: presentation of various diagrams and structures of installations based on renewable energy sources, together with a discussion of the devices used, their functions and role in the process of obtaining energy.</div> <div>9. Energy storage methods: discussion of technologies related to energy storage (batteries, capacitors, fuel cells, etc.)</div>								
Prerequisites and co-requisites	NA								
Assessment methods and criteria	<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></table>	Subject passing criteria	Passing threshold	Percentage of the final grade	test	60.0%	100.0%		
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Recommended reading	Basic literature	<div>Energetyka i ochrona środowiska. Generowanie i magazynowanie energii. Odpady energetyczne. Analiza cyklu życia, Wydawnictwo Naukowe PWN, 2023</div> <div>G. Jastrzębska, Energia ze źródeł odnawialnych i jej wykorzystanie, WKŁ 2021</div> <div>W. M. Lewandowski, E. Klugmann-Radziemska; Proekologiczne odnawialne źródła energii. Kompendium, Wydawnictwo Naukowe PWN, 2017</div>							
	Supplementary literature	<div>Krawiec F., Odnawialne źródła energii w świetle globalnego kryzysu energetycznego, Wydawnictwo Difin, ISBN: 978-83-7641-241-2, Warszawa 2010</div> <div>S. Radkowski, A. Piętak, S.W. Kruczyński, K.W. Szewczyk, M. Struś, Wieloaspektowa analiza stosowania paliw alternatywnych w Polsce ze szczególnym uwzględnieniem biopaliw, Politechnika Warszawska, 2006</div>							
	eResources addresses	Adresy na platformie eNauczanie:							
Example issues/ example questions/ tasks being completed	<div>What is a carbon thermostat?</div> <div>What principles are used in passive construction?</div> <div>What determines the choice of a wind energy storage?</div> <div>What is the role of a solar panel?</div> <div>Application of a selected renewable energy source in municipal economy.</div> <div>Describe the factors stimulating and limiting biogas production</div>								
Work placement	Not applicable								

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