



Subject card

Subject name and code	Alternative energy sources, PG_00038547						
Field of study	Chemical Technology						
Date of commencement of studies	February 2022	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group			Optional 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			exam		
Conducting unit	Department of Energy Conversion and Storage -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Anna Dettlaff				
	Teachers		dr inż. Anna Dettlaff				
Lesson type and method 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						
	Alternatywne źródła energii 2022/23 - Moodle ID: 26343 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26343						
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		10.0		35.0	75
Subject objectives	Introducing students to the renewable energy sources.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_W07	the student has knowledge of biotechnological processes such as biogas production			[SW1] Assessment of factual knowledge		
	K7_K03	understands the non-technical aspects of the operation of a chemical engineer master's degree, including the impact on the environment, is aware of the responsibility for the decisions made			[SK5] Assessment of ability to solve problems that arise in practice		
	K7_K01	student can critically evaluate the received content and use the acquired view to solve cognitive and practical problems			[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	Resources and characteristics of renewable energy sources; hydropower (energy of water flow, energy of water level differences, energy of waves, energy of tides, energy of currents); solar energy (low-temperature and high-temperature solar energy systems, active and passive systems, decentralized systems, centralized systems, solar collectors, photovoltaic cells); wind energy (lifting force, wind farm capacity, onshore and offshore wind farms); geothermal energy (geothermal energy resources, heat pumps); solid, liquid and gaseous biofuels (energy wood, straw, biodiesel, bioethanol, biomethanol, biohydrogen, biogas, wood gas); energy storage (technologies of mechanical, electrochemical, electric, chemical and thermal energy storage, hydrogen energy, galvanic cells, fuel cells, electrochemical capacitors); conventional energy sources (hard coal, lignite, crude oil, natural gas); nuclear energy (principle of operation, construction of the core of a nuclear power plant, types of nuclear reactors, nuclear energy in Poland); environmental contamination						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		Test	60.0%
Recommended reading	Basic literature	1. Bogdanienko J.: Odnawialne Źródła Energii. Biblioteka Problemów, t. 290. Warszawa, PWN 1989. Brinkworth B.J.: Energia Słoneczna w Służbie Człowieka. Biblioteka Problemów, t. 254. Warszawa, PWN 1979. 2. Cieśliński J., Mikielwicz J.: Niekonwencjonalne źródła energii. Gdańsk, Wydawnictwo Politechniki Gdańskiej 1996. 3. Mikielwicz J., Cieśliński J.T.: Niekonwencjonalne urządzenia i systemy konwersji energii. Seria Maszyny Przepływowe, t. 24. Wrocław, Ossolineum 1999. 4. Lewandowski W.M., Klugmann-Radziemska E., Proekologiczne odnawialne źródła energii - kompendium, PWN Warszawa 2017. 5. Klugmann E., Klugmann-Radziemska E.: Alternatywne źródła energii. Energetyka fotowoltaiczna. Białystok, Wydawnictwo Ekonomia i Środowisko 1999. 6. Klugmann-Radziemska E., Klugmann E.: Systemy słonecznego ogrzewania i zasilania elektrycznego budynków. Wyd. Ekonomia i Środowisko, Białystok 2002. 7. Planning and Installing Solar Thermal Systems, a guide for installers, architects and engineers, The German Solar Energy Society (DGS LV Berlin BRB), Ecofys 2005	
	Supplementary literature	No recommendations	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>What are the differences between a solar collector and a photovoltaic cell?</p> <p>Describe how the heat pump works. How does a nuclear power plant work?</p>		
Work placement	Not applicable		