



## Subject card

Subject name and code	Natural energy resources, PG_00055885						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2023/2024		
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			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Bartosz Dawidowicz				
	Teachers		dr inż. Bartosz Dawidowicz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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	8.0		37.0		75
Subject objectives	Presentation of the modern achievements and tendencies in the area of renewable energy resources utilization. Classification of renewable energy resources. Possibilities of renewable energy resources utilization in Polish conditions. Discussion of theoretical backgrounds of selected technologies.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W06] knows classic and developmental energy technologies, rules for the selection and operation of heat and energy devices and installations, basic principles of energy systems operation, basic issues regarding the reliability of energy devices and diagnostics, environmental effects of energy technologies used, methods of using renewable energy sources	The student's knowledge includes knowledge of classical and renewable energy sources. He knows the physical laws of these processes. They presented the construction and operation of energy conversion devices. Has knowledge of the effects of both classic and renewable energy sources on the natural environment. He knows what are the limitations of the use of renewable energy sources and their profitability.			[SW1] Assessment of factual knowledge		
	[K6_U02] is able to apply the learned mathematical methods to the analysis and design of elements, systems and energy systems	The student performs calculations, correctly interprets the obtained results and performs a project using engineering tools.			[SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_W10] knows the basic installations in the field of renewable energy sources and their impact on the environment	The student has theoretical knowledge of energy installations as well as the construction and operation of renewable energy sources. Is aware of the impact of the above-mentioned installation on the environment.			[SW1] Assessment of factual knowledge		

Subject contents	Energy resources. Ocean and sea resources. Tidal energy. Wave energy. Osmotic energy. Ocean thermal energy conversion. Wind energy. Betz criterion. Aerogenerators. Hydro-power. Water turbines. Hydropower stations - types and characteristics. Geothermal energy. Dry rock and aquifer resources. Geothermal power stations and heat-generating plants. Solar energy. Solar collectors. Solar ponds. Solar "power tower". Solar "thermal tower". Photovoltaics. Exercises - estimation of the power of tidal-, wave- and osmotic power plant as well as OTEC cycle, - wind power, rotor diameter of aerogenerator, - calculation of the power of hydropower plant, - efficiency of geothermal power plant, - surface area and efficiency of solar collector Laboratory 1. Characteristics of solar collector 2. Characteristics of photovoltaic panel 3. Characteristics of micro-wind generator		
Prerequisites and co-requisites	Thermodynamics, fluid mechanics, heat transfer		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture - test	56.0%	65.0%
	Laboratory - report, test	56.0%	35.0%
Recommended reading	Basic literature	1. Mikielwicz J., Cieśliński J.T.: Niekonwencjonalne urządzenia i systemy konwersji energii. Maszyny Przepływowe pod red. E.S. Burki. Tom 24. IMP PAN, Ossolineum Wrocław 1999. 2. Cieśliński J.T.: Niekonwencjonalne urządzenia i układy energetyczne. Przykłady obliczeń. Wyd. PG 1997. 3. Lewandowski W.M.: Proekologiczne źródła energii odnawialnej. WNT W-wa, 2001. 4. Twidell J.W., A.D Weir: Renewable energy sources. London: Chapman and Hall 1990	
	Supplementary literature	Journal: Czysta Energia	
	eResources addresses	Adresy na platformie eNauczenie: Naturalne zasoby energetyczne - Moodle ID: 34217 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=34217">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=34217</a>	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Physical properties of renewable sources</li> <li>2. OTEC system</li> <li>3. Classification of hydro power plants and their advantages</li> <li>4. Types of geothermal sources and scheme of the binary power plant</li> <li>5. Features of wind/electricity generating systems</li> <li>6. Solar constant</li> </ol>		
Work placement	Not applicable		