



## Subject card

Subject name and code	Problems of renewable energy sources, PG_00050170						
Field of study	Mechanical Engineering, Mechanical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject				2022/2023	
Education level	first-cycle studies	Subject group				Optional subject group Subject group related to scientific research in the field of study	
Mode of study	Part-time studies	Mode of delivery				at the university	
Year of study	3	Language of instruction				Polish	
Semester of study	5	ECTS credits				4.0	
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						
	Teachers						
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		62.0	100
Subject objectives	Presentation of the basic problems of energy and fuels. Presentation of achievements and trends in the field of renewable energy sources, their classification, as well as an indication of the possibility of using renewable energy sources, with particular emphasis on Polish conditions. The theoretical basis of the operation of energy conversion devices and examples of technical solutions are given. Presentation of the limitations and problems of using renewable energy sources.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W09] possesses basic knowledge within the range of thermodynamics and fluid mechanics, construction and operation of heat generating devices, process equipment, including renewable energy sources, cooling and air conditioning		Student knows the basics of physical phenomena used in energy conversion devices. It independently performs mechanical and thermal-flow calculations.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects	
	[K6_U07] is able to design a typical construction of a mechanical device, component or a testing station using appropriate methods and tools, adhering to the set usage criteria		The student has the ability to use tools supporting engineering design (CAD). Is able to independently carry out a project and make correct calculations and interpret them.			[SU1] Assessment of task fulfilment	

Subject contents	<p>Lecture</p> <p>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.</p> <p>Laboratory</p> <p>1. Investigation of a wind turbine.2. Testing of photovoltaic cells - determination of the current-voltage characteristics and efficiency of the module.3. Testing of photovoltaic cells - determination of the load characteristics.4. Examination of a flat plate solar collector.5. Heat pump efficiency test.6. Calculation of the heat pump's heat source.7. Water turbines.8. Hydroelectric power plants - types, operation, hydro-energetic devices.</p>											
Prerequisites and co-requisites	Physics, thermodynamics, fluid mechanics, heat transfer, basics of electrical engineering.											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 736 794 763">Subject passing criteria</th> <th data-bbox="799 736 1137 763">Passing threshold</th> <th data-bbox="1142 736 1481 763">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 770 794 797">Test</td> <td data-bbox="799 770 1137 797">56.0%</td> <td data-bbox="1142 770 1481 797">50.0%</td> </tr> <tr> <td data-bbox="456 804 794 831">Lab</td> <td data-bbox="799 804 1137 831">56.0%</td> <td data-bbox="1142 804 1481 831">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Test	56.0%	50.0%	Lab	56.0%	50.0%
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Lab	56.0%	50.0%										
Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>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</p> <p>Journal Czysta Energia</p>										
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											