

## GDAŃSK UNIVERSITY OF TECHNOLOGY

## 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	y and Industrial	rial Apparatus -> Faculty of Mechanical			Engineering and Ship Technology			
Name and surname	Subject supervisor								
of lecturer (lecturers)	Teachers								
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	t	Seminar	SUM	
	Number of study hours	15.0	0.0	15.0	0.0		0.0	30	
	E-learning hours inclu	uded: 0.0						-	
Learning activity and number of study hours	Learning activity	Participation ir classes includ plan	n didactic led in study	actic Participation in study 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	Lecture						
	Energy resources. Ocean and see 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.						
	Laboratory 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-energet devices.						
Prerequisites and co-requisites	Physics, thermodynamics, fluid mechanics, heat transfer, basics of electrical engineering.						
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade				
and criteria	Test	56.0%	50.0%				
	Lab	56.0%	50.0%				
Recommended reading	Basic literature       1. Mikielewicz 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 eNauczanie:					
Example issues/ example questions/ tasks being completed	1. Physical properties of renewable sources						
	2. OTEC system						
	3. Classification of hydro power plants and their advantages						
	4. Types of geothermal sources and scheme of the binary power plant						
	5. Features of wind/electricity generating systems						
	5. Features of wind/electricity genera	ating systems					
	<ol> <li>Features of wind/electricity genera</li> <li>Solar constant</li> </ol>	ating systems					