



Subject card

Subject name and code	Renewable energy sources, PG_00037308						
Field of study	Technical Physics						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2027/2028	
Education level	first-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	2	Language of instruction				Polish	
Semester of study	4	ECTS credits				1.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Division of Molecular Photophysics -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Grygiel					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15	2.0		8.0	25	
Subject objectives	Understanding the operation principles and use of basic renewable energy sources.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W02] possesses structured knowledge of the fundamentals of physics, including mechanics, thermodynamics, electricity and magnetism, optics, atomic and molecular physics, solid-state physics, and nuclear and particle physics.	Has structured knowledge of the fundamentals of physics (including mechanics, thermodynamics, electricity and magnetism, optics, atomic and molecular physics, solid state physics, nuclear physics and elementary particle physics) to the extent necessary for learning and understanding. the principles of operation and use of basic renewable energy sources.			[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K6_U08] communicates effectively using specialist terminology in physics and related disciplines, enabling the preparation of reports, publications or presentations, as well as participation in discussion and expression of opinions.	Is able to produce a written report on the operation and use of renewable energy sources, in Polish or English, using specialist terminology. Is able to present the results of the work in the form of an oral presentation and take part in the discussion that follows, expressing his/her own opinions.			[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task		
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> Fuel cells: principle of operation, types of fuel cells, fuel cell systems, including cogeneration systems. Solar energy. The usage of solar energy for electricity generation (photovoltaic cells, solar thermal power stations). The usage of solar energy for heat generation (solar collectors, water and air heating systems). Energy of wind. Conversion of wind energy in a wind turbine. Wind power plant, wind farms. Geothermal energy. Methods of obtaining geothermal energy and its use. Heat pumps. Biomass and biogas. Use of biomass for heat production. Energy of water. Conversion of energy in a hydroelectric turbine. Types of hydroelectric power plants. 						
Prerequisites and co-requisites	Knowledge of a basic course in physics and electrochemistry.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		Preparation and oral completion of a written essay on a selected topic.	50.0%
Recommended reading	Basic literature	1. E. Boeker, R. van Grondelle, Environmental Physics, second edition, John Wiley & Sons, 1997 2. J. Larminie, A. Dicks, Fuel Cell Systems Explained, John Wiley & Sons, 2003	
	Supplementary literature	1. S.A. Kalogirou, Solar Energy Engineering Processes and Systems, Elsevier Inc., 2014	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Calculation of the Gibbs free energy of the fuel cell reaction. 2. The Butler-Volmer equation. 3. AFC type fuel cell. 4. DMFC type fuel cell. 5. PAFC type fuel cell. 6. MCFC type fuel cell. 7. SOFC type fuel cell. 8. Fuel cell power generation systems. 9. Solar radiation and its concentration. 10. The maximum power point of a photovoltaic cell and its tracking. 11. Tracking systems for photovoltaic installations. 12. Types of photovoltaic systems. 13. Parameters of flat plate solar collectors and their determination. 14. Determination of the optimum tilt angle of a solar collector. 15. Principle of operation, properties, construction and operational problems of vacuum tube collectors. 16. Wave energy. 17. Wave power plants. 18. Tidal energy. 19. Tidal power plants. 20. Biomass energy conversion. 21. Biomass power plants. 22. Geothermal energy. 23. Geothermal power plants. <p>It is possible to prepare a presentation on a topic of your choice, after consulting with the course instructor.</p>		
Practical activities within the subject	Not applicable		

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