GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Renewable energy seminar I, PG_00037311		
Field of study	Technical Physics		
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	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Grygiel	
	Teachers	dr inż. Piotr Grygiel	

Lesson types and methods of instruction							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	0.0	15.0	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

Consolidation of knowledge concerning the physical basics and specificity of operation of systems employing sources of the renewable energy.

Improving the skills of preparing and presenting lectures on a given topic.of renewable energy

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U01	Is able to independently obtain the source information on a selected topic of the lecture.	[SU1] Assessment of task fulfilment
K6_U08	Has the ability to prepare oral presentations on a selected topic of the lecture.	[SU1] Assessment of task fulfilment
K6_K05	Can communicate a selected issue in a communicative way and assess the lectures of other people.	[SK4] Assessment of communication skills, including language correctness
K6_U07	He can present the basic facts of physics related to renewable energy in a popular way.	[SU1] Assessment of task fulfilment

Subject contents	The lecture topics: 1. Calculation of the Gibbs free energy of the cell reaction. 2. Fuel cell efficiency and the Carnot cycle. 3. The Butler-Volmer equation. 4. The DMFC fuel cell. 5. Electrode mechanisms of fuel cells. 6. The maximum operation of a system. 7. Types and basics of fuel processing for fuel cells. 8. Steam reforming of fuel for fuel cells (short description, reactions). 9. Electrolysis of water and biological methods of hydrogen production. 10. Storing hydrogen in pure form. 11. Chemical methods of hydrogen storage. 12. Measurements of wind speed and the principle of operation of instruments used for them. 13. Characteristics of the atmospheric boundary layer. 14. Operation of an aviation profile. Force generated by airflow - a theme for two. 15. Air flow around the aviation profile - description and characteristics - a theme for two. 16. The power of the wind. 17. The Betz's law (derivation). 18. Dynamics of a wind turbine rotor. 19. The energy of water. Energy conversion in a water turbine. 20. Solar radiation and its concentration. 21. Parameters of flat plate solar collectors and their determination. 22. The principle of operation, properties, design and operational problems of vacuum collectors. 23. Selection of the optimal inclination angle of the solar collector. 24. The principle of operation of a photovoltaic cell (a classic p-n junction). Cell characteristics. 25. PV cell maximum power point and tracking. 26. Biomass as an energy source.
Prerequisites and co-requisites	Knowledge of mechanics, electricity and magnetism, quantum physics, thermodynamics and the functioning of semiconductor devices, within the scope of the basic academic course.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Assessment of the oral presentation: the content and the manner of its presentation.	50.0%	100.0%

Recommended reading	Basic literature	1. J. Larminie, A. Dicks: ,,Fuel Cell Systems Explained Wiley & Sons, 2003. 2. Kordesch, G. Simader ,,Fuel Cells and Their Applications VCH, 1996. 3. J .F. Manwell; J. G. McGowan; A. L. Rogers Wind Energy Explained - Theory, Design and Application, Wiley & Sons, 2003. 4. A. Szlek, M. Wróbel, "Renewable Energy Sources: Engineering, Technology, Innovation", Springer Nature Switzerland AG, 2020
	Supplementary literature	B. Sorensen, "Renewable Energy, Physics, Engineering, Environmental Impacts, Economics and Planning", Academic Press, 2010.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	See list of topics.	
Work placement	Not applicable	