



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	<p>The lecture topics:</p> <ol style="list-style-type: none"> 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	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Subject passing criteria</th> <th style="width: 30%;">Passing threshold</th> <th style="width: 30%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Assessment of the oral presentation: the content and the manner of its presentation.</td> <td>50.0%</td> <td>100.0%</td> </tr> </tbody> </table>			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%
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Assessment of the oral presentation: the content and the manner of its presentation.	50.0%	100.0%							
Recommended reading	Basic literature	<ol style="list-style-type: none"> 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								