GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Energy conversion laboratory II, PG_00037310		
Field of study	Technical Physics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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 Classes are conducted in Polish, but in the case of foreign students, they are conducted in English.
Semester of study	5	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	0.0	0.0	15.0	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

1. Application of knowledge in the field of thermodynamics, quantum physics, gas physics, heat transfer and electrical circuit theory to conduct experiments illustrating the functioning of certain renewable energy systems.
2. Ability to plan and perform measurements of physical quantities.
3. Ability to compile and present research results in writing.
4. Ability to critically evaluate research results.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] plans and conduct experiments, critically analyzes their results, draw conclusions and forms opinions, has laboratory work experience	Using their experience in laboratory work, they plan and conduct experiments in the field of research into the functioning of certain renewable energy systems and the physical principles underlying their operation, critically analyse the results, and correctly formulate conclusions based on these results.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K6_W08] has knowledge of planning and conducting physical experiments, and critical analysis of its results	Has knowledge of planning and conducting experiments in the field of researching the functioning of certain renewable energy systems and the physical principles behind their operation, including critical analysis of the results.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents

Course content – laboratory
Set of experiments: 1. Investigation of a solar battery. 2. Investigation of the emission capacity of bodies with different surfaces as a function of temperature. 3. Investigation of a semiconductor thermogenerator. 4. Investigation of thermoelectric phenomena in metals. 5. Investigation of a solar collector. 6. Comparative studies of absorbers of solar collectors. 7. Heat pump test. 8. Investigation of the solar collector - heat pump assembly. 9. Investigation of fuel cell systems with proton membranes (2 experiments). 10. Examination of the Stirling engine. 11. Investigation of ideal gas transformations. 12. Investigation of a heat pump with Peltier elements. 13. Determination of the value of the thermal insulation coefficient of various materials.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">1. Knowledge of thermodynamics, quantum physics, gas physics, heat transport and electric circuit theory.
2. Advanced knowledge of methods of analysis of experimental data and calculus of uncertainties.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Acceptance of reports from each exercise according to the schedule</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Passing the theoretical admission to each exercise according to the schedule</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. P. Grygiel and H. Sodolski, Energy Conversion Laboratory, manuscript script, Gdańsk University of Technology, 2006.
2. D. Halliday, R. Resnick, J. Walker, " Fundamentals of Physics", Extended, 10th Edition, Wiley, 2013.
3. J. Larminie i A.Dicks ,,Fuel cell systems explained"", John Wiley & Sons Ltd., Chichester, 2003.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. R. Eisberg, R. Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, John Wiley & Sons Inc, 1985.

2. A. Szlek, M. Wróbel, "Renewable Energy Sources: Engineering, Technology, Innovation", Springer Nature Switzerland AG, 2020</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Describe the operation of a solar cell with a p-n junction and provide the necessary formulas.

2. Derive the formula describing the law of black body radiation and explain its significance in the context of the experiment.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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