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 2026	Academic year of realisation of subject	2028/2029
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	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] is able, individually or in a team, to plan and conduct experiments in physics and related fields, including applied computer science or energy engineering, and to analyse and interpret results and formulate conclusions.	Is able to plan and carry out, either independently or as part of a group, experiments investigating the functioning of certain renewable energy systems and the physical principles underlying their operation; critically analyses and correctly interprets the results, and draw appropriate conclusions from them.	[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_W04] has advanced knowledge of the principles of experimental design, experimental methods, measurement techniques and scientific equipment used in physics and related sciences, including their life cycle.	Has advanced knowledge of the planning and conduct of experiments, as well as of experimental methods and measurement techniques relating to research into the operation of certain renewable energy systems and the physical principles underlying their functioning. Has advanced knowledge of the operation and life cycle of the equipment used in research.	[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 prepare a written report on the research carried out, in Polish or English, using specialist terminology from the fields of physics and related sciences. Is able to participate actively in discussions of research findings, formulating his/her own opinions.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

<table>
<tr><td>Subject contents</td><td>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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>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>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Passing the theoretical admission to each exercise according to the schedule</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Acceptance of reports from each exercise according to the schedule</td><td>100.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>P. Grygiel and H. Sodolski, Laboratory of Energy Conversion. A guide for laboratory experiments

1. D. Halliday, R. Resnick, J. Walker, " Fundamentals of Physics", Extended, 10th Edition, Wiley, 2013.

2. J. Larminie i A.Dicks ,,Fuel cell systems explained"", John Wiley & Sons Ltd., Chichester, 2003.</td></tr>
<tr><td>Supplementary literature</td><td>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></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>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>Not applicable</td></tr>
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