GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Energy conversion laboratory I, PG_00064047		
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
Semester of study	5	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Physics of Electronic Phenomena -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Daniel Pelczarski	
	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. Utilisation of the knowledge of thermodynamics, quantum physics, physics of gases, heat transport as well as theory of electric circuits.

2. Ability to plan and perform the measurements of physical quantities.

3. Ability to eleborate and present in a written form the results of measurements.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W08] has knowledge of planning and conducting physical experiments, and critical analysis of its results	Has knowledge of planning and conducting physical experiments in the field of renewable energy sources, as well as of critically analysing their results.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U04] plans and conduct experiments, critically analyzes their results, draw conclusions and forms opinions, has laboratory work experience	Is able to plan and carry out experiments related to the study of various energy conversion systems, critically analyse the results, draw conclusions, and formulate informed opinions. Has experience in laboratory work.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W07] has knowledge of the construction and operation of physical instruments, measurement and research equipment	Has basic knowledge of the design and operation of physical instruments, measurement equipment, and research apparatus used in the investigation of various energy conversion systems.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – laboratory
The set of experiments: 1. Investigation of a battery of solar cells. 2. Investigation of emissivity of various surfaces as a function of temperature. 3. Investigation of semiconductor thermogenerator. 4. Investigation of thermoelectric phenomena in metals. 5. Investigation of a solar collector. 6. Comparative investigations of absorbers of solar collectors . 7. Investigation of a heat pump. 8. Investigation of a solar collector - heat pump system. 9. Investigation of proton membrane fuel cell systems (2 experiments). 10. Investigation of Stirling engine. 11.Investigation of cycles of an ideal gas. 12.Investigation of a heat pump with Peltier elements. 13. Determination of thermal insulation coefficient of different materials.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>1. Advanced knowledge of thermodynamics, quantum physics, physics of gases, heat transport, theory of electric circuits. 2. Advanced knowledge of methods for experimental data and error analysis.</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>Acceptance of reports on each experiment according to schedule</td><td>100.0%</td><td>50.0%</td></tr>
<tr><td>Credit for the theory of each experiment</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. P.Grygiel i H. Sodolski ,,Laboratorium konwersji energii"", skrypt na prawach rękopisu, Politechnika Gdańska, 2006.</td></tr>
<tr><td>Supplementary literature</td><td>1. J.I. Pankove ,,Zjawiska optyczne w półprzewodnikach"", Wydawnictwa Naukowo - Techniczne, Warszawa, 1974. 2. E. Boeker i R. van Grondelle ,,Fizyka rodowiska"", Wydawnictwo Naukowe PWN, Warszawa, 2002. 3. J. Godlewski, Generacja i detekcja promieniowania optycznego, Wydawnictwo Naukowe PWN, Warszawa, 1997. 4. R. Eisberg i R. Resnick,, Fizyka kwantowa"", Państwowe Wydawnictwo Naukowe, Warszawa, 1983. 5. S. Szczeniowski ,,Fizyka do wiadczalna czę ć III"", Państwowe Wydawnictwo Naukowe, Warszawa, 1955. 6. W.M. Lewandowski ,,Proekologiczne ródła energii odnawialnej"", Wydawnictwa Naukowo - Techniczne, Warszawa, 2002. 7. H.Kaiser ,,Wykorzystanie energii słonecznej"", Wydawnictwa AGH, Kraków, 1995. 8. J. Larminie i A.Dicks ,,Fuel cell systems explained"", John Wiley & Sons Ltd., Chichester, 2003.</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. Investigation of a battery of solar cells. 2. Investigation of emissivity of various surfaces as a function of temperature. 3. Investigation of semiconductor thermogenerator. 4. Investigation of thermoelectric phenomena in metals. 5. Investigation of a solar collector. 6. Comparative investigations of absorbers of solar collectors . 7. Investigation of a heat pump. 8. Investigation of a solar collector - heat pump system. 9. Investigation of proton membrane fuel cell systems (2 experiments). 10. Investigation of Stirling engine. 11.Investigation of cycles of an ideal gas. 12.Investigation of a heat pump with Peltier elements. 13. Determination of thermal insulation coefficient of different materials.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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