GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Photovoltaic cells, PG_00037316		
Field of study	Technical Physics		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
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	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Physics of Organic and Perovskite Photovoltaic Structures -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Damian Głowienka	
	Teachers	dr inż. Damian Głowienka	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

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	30	2.0	18.0	50

Subject objectives

The aim of the course is to familiarize students with the physical basics of the functioning of semiconductor photovoltaic cells.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U02	The student is able to determine the theoretical limits of energy conversion efficiency for different photovoltaic cells and at different spectra of illuminating radiation.	[SU2] Assessment of ability to analyse information
K6_W02	The student knows the physical basics of the operation of a photovoltaic cell.	[SW1] Assessment of factual knowledge
K6_W07	The student is able to experimentally determine the basic parameters of a photovoltaic cell.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

1.Introduction to semiconductor physics and solar cells

2. Solar cell efficiency
3. Characterisation of solar cells
4. Modeling of electrical and optical phenomena
5. Influence of transport and recombination mechanisms on operation of solar cell
6. Dye-sensitized solar cell
7. Organic solar cells
8. Perovskite solar cells
9. Tandem solar cells

Prerequisites and co-requisites

Basics of modern physics

<table>
<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>kolokwia</td><td>50.0%</td><td>70.0%</td></tr>
<tr><td>reports</td><td>50.0%</td><td>30.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Peter Würfel, Physics of Solar Cells, Wiley-VCH, Weinheim 2005.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">P Würfel, U Würfel, Physics of solar cells - John Wiley & Sons 2016.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:
Ogniwa fotowoltaiczne 2025 - Moodle ID: 45511
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=45511</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Define AM0, AM1, AM1.5.

Determine the power conversion limit of solar cells from the Shockley-Queisser model</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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