



## Subject card

Subject name and code	Photovoltaic cells, PG_00037316						
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	6	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Fizyki Organicznych i Perowskitowych Struktur Fotowoltaicznych -> Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Damian Głowienka					
	Teachers	dr inż. Piotr Grygiel 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 10. Photovoltaic modules						
Prerequisites and co-requisites	Basics of modern physics						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	kolokwia	50.0%	70.0%
	reports	50.0%	30.0%
Recommended reading	Basic literature	Peter Würfel, Physics of Solar Cells, Wiley-VCH, Weinheim 2005.	
	Supplementary literature	P Würfel, U Würfel, Physics of solar cells - John Wiley & Sons 2016.	
	eResources addresses	Adresy na platformie eNauczenie: Ogniwa fotowoltaiczne 2022/2023 sem. 2 - Moodle ID: 30556 <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30556">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=30556</a>	
Example issues/ example questions/ tasks being completed	Define AM0, AM1, AM1.5.  Determine the power conversion limit of solar cells from the Shockley-Queisser model		
Work placement	Not applicable		