



Subject card

Subject name and code	Technology of Photovoltaic Cells and Thermophotovoltaics, PG_00067894						
Field of study	Technical Physics						
Date of commencement of studies	February 2027	Academic year of realisation of subject			2027/2028		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Damian Głowienka				
	Teachers		dr inż. Damian Głowienka				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	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		4.0		16.0	50
Subject objectives	To acquaint students with the technology of solar cells and thermophotovoltaics						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> 1. Processes involved in energy conversion. 2. Fundamentals of photovoltaic and thermophotovoltaic cell operation. 3. Basic parameters characterizing a solar cell. 4. Methods for characterizing photovoltaic cells. 5. ShockleyQueisser (S-Q) limit. 6. Fundamental parameters limiting the efficiency of photovoltaic and thermophotovoltaic cells. 7. Structure and technology of single-junction solar cells. 8. Photovoltaic modules. 						
	<p>Course content – seminar</p> <ol style="list-style-type: none"> 1. Silicon solar cell a step in the manufacturing process 2. CIGS why isnt there mass production? 3. Organic solar cells one large-scale manufacturing technique 4. Organic solar cells have they already been completely replaced by perovskite materials? 5. Perovskite solar cells what has made them so popular? 6. Perovskite solar cells what technological stage are we at? 7. Organic vs. perovskite solar cells what are the differences in stability testing? 8. How does the manufacturing technology of silicon and perovskite solar modules differ? 9. Tandem cells what is the technological limit on the number of junctions? 10. Encapsulation methods which approach is most effective for flexible cells? 						
Prerequisites and co-requisites	A basic understanding of semiconductor physics and solar-cell operation is required.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	oral presentation	100.0%	40.0%
	Passing the exam	50.0%	60.0%
Recommended reading	Basic literature	<p>[1] W. Shockley, H. Queisser, Detailed balance limit of efficiency of p-n junction solar cells, Journal of Applied Physics 32 (2) (1961) 510-518.</p> <p>[2] P. Würfel, Physics of Solar Cells From Principles to New Concepts, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim 2005.</p> <p>[3] A. Luque, S. Hegedus, Handbook of Photovoltaic Science and Engineering, John Wiley & Sons Ltd, England 2003.</p> <p>[4] Thomas Bauer Thermophotovoltaics. Basic Principles and Critical Aspects of System Design</p> <p>[5] Donald Chubb Fundamentals of Thermophotovoltaic Energy Conversion</p>	
	Supplementary literature	M. Waclawek, T. Rodziewicz, "Ogniwa słoneczne" WNT Warszawa 2011	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>1. Describe the models of free charge-carrier recombination in solar cells.</p> <p>2. How does an organic solar cell differ from a perovskite solar cell? Explain based on the operating mechanisms of these two types of cells.</p> <p>3. Describe the difference between a solar cell, a module, and a solar panel.</p> <p>4. Name and describe the basic elements of a thermophotovoltaic cell?</p>		
Practical activities within the subject	Not applicable		

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