



## Subject card

Subject name and code	Optical Spectroscopy in Photovoltaics, PG_00069098						
Field of study	Technical Physics						
Date of commencement of studies	February 2027	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group			Specialty 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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			1.0		
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 hab. inż. Jędrzej Szmytkowski					
	Teachers	dr hab. inż. Jędrzej Szmytkowski					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	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	1.0		9.0		25
Subject objectives	Demonstration of spectroscopy methods used to study phenomena occurred in photovoltaic cells						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W03] demonstrates awareness of current development trends and recent advances in physics-based technologies.	Student knows how to use optical spectroscopy in photovoltaics			[SW1] Assessment of factual knowledge		
	[K7_K01] demonstrates readiness for continuous professional development, including updating and critically evaluating knowledge in physics and related fields, and recognising its importance in solving practical and theoretical problems.	The knowledge is useful for further learning of methods of optical spectroscopy in photovoltaics			[SK5] Assessment of ability to solve problems that arise in practice		
Subject contents	Course content – lecture Course content lecture Theoretical introduction to molecular spectroscopy (rotational, vibrational and electronic levels, the Raman effect, Franck-Condon rule, Jabłoński diagram, fluorescence and phosphorescence, quenching of excited states). Theoretical introduction to solid state spectroscopy (band structure, trap states, recombination, luminescence centres, kinetics of luminescence, photoconduction, quantum dots). Types of photovoltaic cells and phenomena occurred in them. Steady state absorption and emission. Spectral lines. Sources of lights, filters, detectors. Lasers. Nonlinear optics and its application to laser spectroscopy. Time-resolved absorption and emission. Examples of experimental results recorded for different photovoltaic structures. Other methods of optical spectroscopy.						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Written test	50.0%			100.0%		
Recommended reading	Basic literature	1. Z. Kęcki Podstawy spektroskopii molekularnej 2. J. Sadlej Spektroskopia molekularna 3. M. Drozdowski (red.) Spektroskopia ciała stałego 4. H. Abramczyk Wstęp do spektroskopii laserowej 5. W. Demtröder Spektroskopia laserowa					

	Supplementary literature	All textbooks in laser spectroscopy
	eResources addresses	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Jabłoński diagram</li> <li>2. Photoconductivity</li> <li>3. Absorption and emission spectra</li> <li>4. Methods of laser spectroscopy</li> </ol>	
Practical activities within the subject	Not applicable	

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