GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Optical Spectroscopy in Photovoltaics, PG_00039462		
Field of study	Technical Physics		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2024/2025
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		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jędrzej Szmytkowski	
	Teachers	dr hab. inż. Jędrzej Szmytkowski	

Lesson types and methods of instruction

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	2.0	8.0	25

Subject objectives

Demonstration of spectroscopy methods used to study phenomena occured in photovoltaic cells

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] has knowledge of current development paths and discoveries in the scope of physics and related fields of science and technology	Student knows how to use optical spectroscopy in photovoltaics	[SW1] Assessment of factual knowledge
[K7_K01] knows limitations of own knowledge, understands the need to learn and improve professional and personal competencies	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

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 occured in them. Steady state absorption and emission. Sprectral 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	Adresy na platformie eNauczanie: Spektroskopia optyczna w fotowoltaice - 2024/2025 - Moodle ID: 44918 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44918
Example issues/ example questions/ tasks being completed	1. Jabłoński diagram 2. Photoconductivity 3. Absorption and emission spectra 4. Methods of laser spectroscopy	
Work placement	Not applicable	

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