GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00065846		
Field of study	Materials Engineering		
Date of commencement of studies	October 2025	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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Nanomaterials Physics -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marcin Łapiński	
	Teachers	dr hab. inż. Marcin Łapiński	

Lesson types

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

The aim of the course is to familiarize students with the materials used in modern photovoltaic cells, the manufacturing methods of cell components, and the techniques for their analysis. Students will independently produce cell components and examine their properties.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U06] Can evaluate usefulness and feasibility of using new achievements (techniques and technologies) within the scope of materials science.	The student is able to plan and conduct an experiment, produce a functional component, and design and perform its analysis.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K7_W06] Knows the theoretical basics the functioning of scientific equipment in the fields of science and scientific disciplines relevant to materials engineering.	The student knows and can operate basic equipment used for the deposition of thin films for PV cells. They are able to plan and conduct an experiment.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

Course content – laboratory
The laboratory classes cover two topics. The first involves the fabrication of a transparent electrode used in PV cells and comparing the properties of the produced layer with commercially available materials.

The second topic focuses on the independent fabrication of a semiconductor junction, which forms the main part of a photovoltaic cell, and measuring the properties of the obtained structure.

Students will present the results of their work in a short written report.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Basic knowledge of the structure and operation of semiconductor junctions and photovoltaic cells.</td></tr>
<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>raport</td><td>51.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Optical processes in semiconductors / Jacques I. Pankove

Thin Films / edited by Alicia Esther Ares.

Solar Energy / edited by Radu D. Rugescu.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Sol-gel processing and applications / edited by Yosry A. Attia.

Handbook of physical vapor deposition (PVD) processing / Donald M. Mattox.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Development of ITO deposition technology using magnetron sputtering.

Fabrication of CuO and ZnO layers using the sol-gel method.</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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