GDAŃSK UNIVERSITY OF TECHNOLOGY

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<br>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<br>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<br>[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

<table>
<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>kolokwia</td><td>50.0%</td><td>70.0%</td></tr>
<tr><td>reports</td><td>50.0%</td><td>30.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Peter Würfel, Physics of Solar Cells, Wiley-VCH, Weinheim 2005.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">P Würfel, U Würfel, Physics of solar cells - John Wiley & Sons 2016.</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:<br>Ogniwa fotowoltaiczne 2022/2023 sem. 2 - Moodle ID: 30556<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30556</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Define AM0, AM1, AM1.5.<br><br>Determine the power conversion limit of solar cells from the Shockley-Queisser model</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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