GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Light and matter, PG_00069257 | | |
| Field of study | Chemistry | | |
| Date of commencement of studies | February 2025 | Academic year of realisation of subject | 2025/2026 |
| 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 | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Department of Inorganic Chemistry -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Agnieszka Pladzyk | |
| | Teachers | | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 0.0 | 20.0 | 0.0 | 10.0 | 45 |

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 | 45 | 5.0 | 25.0 | 75 |

**Subject objectives**

The subject is designed to provide knowledge of photochemistry and the interaction of electromagnetic radiation with matter, with particular emphasis on practical applications in modern chemistry, nanotechnology, biology, medicine and environmental protection. Students will learn the fundamental mechanisms of photochemical reactions and key applications of photochemistry in various fields of science and industry.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_K02] is able to cooperate and work in a group, taking on different roles | The student is able, in collaboration with other team members, to plan, conduct and document a simple laboratory experiment. | [SK3] Assessment of ability to organize work<br>[SK2] Assessment of progress of work |
| [K7_U02] prepares detailed documentation of the results of independently conducted experiments and analyzes the obtained results, uses professional vocabulary with understanding and prepares and communicates information | The student is able to present in the report a critical analysis of the results of the experiment and formulate correct conclusions based on it. | [SU4] Assessment of ability to use methods and tools<br>[SU2] Assessment of ability to analyse information<br>[SU1] Assessment of task fulfilment |
| [K7_U82] is able to proficiently obtain and process information related to field of study and academic environment in foreign language at B2+ level of the Common European Framework of Reference for Languages (CEFR) | The student is able to search, analyze and use English-language sources of information to complete the tasks in the seminar | [SU1] Assessment of task fulfilment<br>[SU2] Assessment of ability to analyse information |
| [K7_W04] indicates methods for the synthesis of chemical compounds with defined properties | The student explains photochemical phenomena, indicating the underlying chemical reactions and their mechanisms. | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation |

<table>
<tr><td>Subject contents</td><td>Lecture:<br>1) Introduction to photochemistry - concepts and laws of photochemistry.<br>2) Interactions of light with matter.<br>3) Photochemistry in organic synthesis.<br>4) Application of photochemistry in biology and medicine<br>5) Photochemistry in environmental protection<br>6) Photosensitive materials<br>7) Modern research techniques in photochemistry<br>Laboratory<br>Laboratory exercises will be carried out in groups of 3-4 people<br>1. photodegradation of dyes - influence of reaction conditions<br>2. photocatalysis in oxidation reactions using TiO2 and ZnO<br>3.Synthesis of photoluminescent ZnO nanoparticles<br>4.Synthesis of a non-toxic fluorescent compound and study of fluorescence under varying pH conditions<br>5.Isolation of natural plant dyes and study of their photochemical properties.<br>Seminar:<br>In the seminar, students will work in small teams (2-3 persons). Each team will choose one topic, prepare a professional scientific presentation, and then present it to the other participants. After the presentation, the team will moderate a discussion on the presented topic, encouraging the exchange of ideas and critical analysis of the issue. This format of the class will allow participants not only to deepen their expertise, but also to develop key competencies: teamwork, public speaking skills and critical thinking based on argumentation supported by scientific literature.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic knowledge of inorganic, physical and organic chemistry</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>sprawozdania z wszystkich zajęć laboratoryjnych</td><td>60.0%</td><td>35.0%</td></tr>
<tr><td>prezentacja</td><td>60.0%</td><td>35.0%</td></tr>
<tr><td>sprawdziany na wykładzie</td><td>60.0%</td><td>30.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>• Turro N.J., Ramamurthy V., Scaiano J.C. Principles of Molecular Photochemistry<br>• Klán P., Wirz J. Photochemistry of Organic Compounds<br>• Artykuły naukowe z czasopism (m.in. Journal of Photochemistry and Photobiology, ACS Photonics)<br>• S. Paszyc Podstawy fotochemii</td></tr>
<tr><td>Supplementary literature</td><td>Paul Suppan Chemia i światło" PWN</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Mechanism of light absorption by an organic molecule, considering electron transitions and types of excited states.<br>2. Mechanism of photodegradation of organic pollutants (e.g. phenol) in the presence of light and photocatalyst<br>3. Difference between fluorescence and phosphorescence at the level of quantum mechanism.<br>4. The principle of photocatalyst (e.g., TiO) in oxidation reactions.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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