GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | , PG_00069413 | | |
| Field of study | Nanotechnology | | |
| Date of commencement of studies | October 2022 | Academic year of realisation of subject | 2025/2026 |
| 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 | 4 | Language of instruction | Polish |
| Semester of study | 7 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Division of Ceramics -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Aleksandra Mielewczyk-Gryń | |
| | Teachers | dr hab. inż. Aleksandra Mielewczyk-Gryń | |

**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

eNauczanie source addresses:

Moodle ID: 973 Metody badawcze nanotechnologii w innych dziedzinach nauki i techniki
https://enauczanie.pg.edu.pl/2025/course/view.php?id=973

**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 | 34.0 | 50 |

**Subject objectives**

The aim of the course is to present students with research methods of nanotechnology that are applied in other scientific fields, such as biology, medicine, chemistry, physics, archaeology, and historical sciences. Students will acquire knowledge about tools and techniques used for analysis and imaging at the nanoscale, their application possibilities, and their limitations.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| K6_W06 | has knowledge of the properties of nanomaterials and how these properties can be related to other fields of knowledge | [SW1] Assessment of factual knowledge |
| K6_U06 | knows the limitations and challenges related to transferring nanotechnology methods to other disciplines | [SU3] Assessment of ability to use knowledge gained from the subject<br>[SU5] Assessment of ability to present the results of task |
| K6_W07 | knows the basic research techniques used in nanotechnology (e.g., atomic force microscopy, electron microscopy, spectroscopic methods) | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |

**Subject contents**

The research methods include calorimetric techniques, such as scanning calorimetry and Calvet-type calorimetry, as well as microscopic methods and advanced chemical composition analysis techniques based on microscopic imaging. Resonance methods, including NMR and ESR, are also employed, along with spectroscopic techniques utilizing electron emission, such as XPS, AES, and UPS. Important methods also include ion scattering techniques, infrared and Raman spectroscopy, optical property measurements, and low-temperature measurement techniques. Additionally, electrochemical methods for studying electrical properties, such as voltammetry and impedance spectroscopy, as well as diffraction techniques, including neutron diffraction, are used.

**Prerequisites and co-requisites**

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Test</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>Essay</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="2">Recommended reading</td><td>Basic literature</td><td>Experimental Methods in the Physical Sciences</td></tr>
<tr><td>Supplementary literature</td><td>scientific papers eg:<br><br>J Biomol Tech. 2010 Dec; 21(4): 167193.<br><br>Hyperfine Interactions 154: 159176, 2004<br><br>Proc Natl Acad Sci U S A. 2013 Apr 23; 110(17): 66516656</td></tr>
<tr><td></td><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">- Proteins denaturation analysis.<br><br>- Microscopy in archeology.<br><br>- photoelectric effect and it's applications</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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