GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | , PG_00052094 | | |
| Field of study | Nanotechnologie w materiałach konstrukcyjnych | | |
| Date of commencement of studies | October 2023 | 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 | 3 | Language of instruction | Polish |
| Semester of study | 5 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Division of Nanomaterials Physics -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Wojciech Sadowski | |
| | Teachers | prof. dr hab. inż. Wojciech Sadowski<br>dr inż. Marek Chmielewski<br>dr hab. inż. Marcin Łapiński | |

**Lesson types**

| 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

eNauczanie source addresses:

Moodle ID: 2109 Nanotechnologie w materiałach konstrukcyjnych 2025
https://enauczanie.pg.edu.pl/2025/course/view.php?id=2109

**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 | 5.0 | 40.0 | 75 |

**Subject objectives**

The aim of the course is to show the influence of nanostructures on the properties of macroscopic materials, creating construction materials with new functional properties, increased strength, energy-saving and environmentally friendly.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| K6_U04 | Student is able to plan and conduct experiments, critically analyze their results, draw conclusions and formulate opinions. He has experience in laboratory work in the field of material testing. | [SU2] Ocena umiejętności analizy informacji |
| K6_U02 | Student is able to analyze and solve simple scientific, technical and construction problems based on his knowledge of nanotechnology. | [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu<br>[SU2] Ocena umiejętności analizy informacji |
| K6_W06 | The student has basic knowledge of materials science and nanomaterials (structure of crystalline and amorphous bodies, crystal bonds, structural defects and their impact on material properties, lattice vibrations and thermal properties of materials, electronic structure, selected transport phenomena). | [SW1] Ocena wiedzy faktograficznej |

<table>
<tr><td>Subject contents</td><td>Lecture:<br><br>Properties of nanomaterials. Nanostructures in macroscopic materials Self-organization in the system nano-sized.<br><br>Nanofibers. Nanoporous materials. Nanocomposite materials<br><br>Modification of the surface structure.<br><br>Structural and functional nanostructures - examples.<br><br>Laboratory:<br><br>1. Microscopic analysis (SEM, confocal microscopy) of multiphase composite material.<br><br>2. Non-destructive flaw detection of nanoferrocomposite material.<br><br>3. Research on multiphase materials using thermal analysis.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Introduction to nanotechnology.</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>Completion of the lecture content</td><td>50.0%</td><td>70.0%</td></tr>
<tr><td>Passing laboratory work</td><td>100.0%</td><td>30.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>Nanomaterials and Their Applications. Editors Zishan Husain Khan. Springer, 2018<br><br>Springer Handbook of Nanotechnology. Editors Bharat Bhushan. Springer, 2017</td></tr>
<tr><td>Supplementary literature</td><td>Nanomaterials and Their Applications. Editors Zishan Husain Khan. Springer, 2018<br><br>Springer Handbook of Nanotechnology. Editors Bharat Bhushan. Springer, 2017</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Thermal properties of nanomaterials and structures.<br><br>Optical properties of nanomaterials and structures.<br><br>Strength properties of nanomaterials and structures.<br><br>Properties of nanocomposite materials.<br><br>Methods of designing material properties taking into account nanotechnology and artificial intelligence.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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