GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Nanotechnology in chemistry and medicine, PG_00049385 | | |
| Field of study | Biomedical Engineering, Biomedical Engineering, Biomedical Engineering | | |
| Date of commencement of studies | October 2024 | Academic year of realisation of subject | 2027/2028 |
| 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 | Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Kamila Sadowska | |
| | Teachers | | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 30.0 | 0.0 | 0.0 | 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 introduce basic concepts related to nanotechnology. Methods of nanostructures manufacturing, methods of their properties examination and examples of usage in the biomedical sciences will be discussed.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K6_U07] can apply methods of process and function support, specific to the field of study | Student gives examples of the use of nanostructures in medicine, chemistry and technology. The methods of obtaining nano-scale systems are known. | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| [K6_U52] can determine properties of materials and biomaterials used in biomedical engineering | Student explains how the properties of materials change with decreasing sizes, down to the nano scale. Provides examples of (bio)nanomaterials. Lists the features of (bio)nanomaterials. | [SU3] Assessment of ability to use knowledge gained from the subject |
| [K6_W53] Knows and understands, to an advanced extent, selected aspects of materials science and biomaterials constituting general knowledge related to the field of study | Student knows and understands the influence of nanomaterials on the human body and the environment. | [SW1] Assessment of factual knowledge |

**Subject contents**

Lecture: Molecules and bonds. Types of bonds and the material properties. Chemical bonds and interactions in nanotechnology (covalent, ionic, metallic, coordinative, hydrogen bridge bonds, van der Waals, dipol-dipol, hydrophobic interactions). Bottom-up and top-down methods. Precursors, building blocks, assembly of building blocks, reaction equilibrium. Nanoparticle size control. Zero-dimensional nanostructures: metallic, semiconducting, ceramic, polymer and carbon nanoparticles. One-dimensional nanostructures: nanorods, nanotubes, nanowires. Two-dimensional nanostructures: monolayers and thin films of metals, ceramics, polymers, carbon and organic compounds. Langmuir-Blodgett technique. Surface modification. Lipofilic and lipofobic materials. Doping of nanostructures. Composite materials, hybrid materials (metal-organic etc.). Examination methods of chemical properties. Examples of nanostructures implementation in chemistry and medicine.

**Prerequisites and co-requisites**

Student uses basic chemical terms. Student defines basic terms concernig structure of matter. Student lists types of chemical compounds, organic and inorganic.

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Written exam | 50.0% | 100.0% |

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| Recommended reading | Basic literature | 1. Guazhong Cao. NANOSTRUCTURES& NANOMATERIALS. Synthesis, Properties, and Applications. Imperial College Press, 2004. 2. M. Kohler, W. Fritzsche. Nanotechnology. Wiley-Vch, 2003 3. C.C. Koch. NANOSTRUCTURED MATERIALS. Processing, Properties and Potential Applications. Noyes Publications, 2002.<br><br>2. K. Żelechowska. Nanotechnologia w chemii i medycynie. Wydawnictwo PG, Gdańsk 2015 |
| | Supplementary literature | 1. R. W. Keldall i inni. Nanotechnologie. PWN, 2008. 2. H. Dodziuk. Wstęp do chemii supramolekularnej. Wydawnictwo Uniwersytetu Warszawskiego, 2008. |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | | |
| Work placement | Not applicable | |

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