GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | , PG_00066150 | | |
| Field of study | Nanotechnology | | |
| 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 | 6 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr inż. Mateusz Cieślik | |
| | Teachers | dr inż. Mateusz Cieślik | |

**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

**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 | 3.0 | 42.0 | 75 |

**Subject objectives**

The subject "Introduction to additive technologies" aims to familiarize students with the basics and techniques of reverse engineering, as well as the process of designing and manufacturing objects using various 3D printing methods and other additive technologies. The classes are practical - students take part in creating composites enriched with various nanomaterials and then analyze their functional properties.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| K6_K05 | The student is able to plan and implement tasks related to the use of selected additive technologies, based on basic knowledge in this field. He can also prepare a factual report summarizing the activities performed. | [SK2] Assessment of progress of work<br>[SK1] Assessment of group work skills<br>[SK3] Assessment of ability to organize work |
| K6_U06 | The student has basic knowledge of the structure, production processes and characteristics of nanomaterials, especially those used in additive technologies. Understands the principles of conducting selected material tests, is able to analyze the results and create technical documentation. | [SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU4] Assessment of ability to use methods and tools |
| K6_W06 | The student is able to analyze the relationships between the structure of materials (crystalline and amorphous) and their mechanical, thermal and electrical properties. Understands the impact of structural defects on the performance parameters of materials and is able to interpret the phenomena of transport and network vibrations in the context of the practical application of engineering materials. | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation |

<table>
<tr><td>Subject contents</td><td>Course content – lecture<br>The course begins with an introduction to the basics of additive technologies, their history and classification. Subsequent lectures discuss in detail individual techniques, such as FDM, SLA, SLS, as well as spray and hybrid technologies, along with their principles of operation, materials and practical applications. There is a strong focus on design for 3D printing, topological optimization and CAD tools, as well as materials used in additive processes - from polymers and metals to functional and intelligent materials. Students learn quality control methods, certification standards, and challenges related to accuracy and repeatability of processes. An important element of the course are industrial applications (aviation, medicine, automotive) and innovations such as bioprinting, 4D printing or integration with Industry 4.0. Lectures also discuss issues of ecology and sustainable development, including recycling and waste minimization. The whole thing ends with a summary, a question session and an exam or project presentation.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>3D prototyping skills in any CAD program.</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>Lecture</td><td>50.0%</td><td>60.0%</td></tr>
<tr><td>Laboratory</td><td>50.0%</td><td>40.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Nick Kloski, Druk 3D. Praktyczny przewodnik po sprzęcie, oprogramowaniu i usługach, Helion, 2022</td></tr>
<tr><td>Supplementary literature</td><td>Anna Kaziunas France, Świat druku 3D Przewodnik, Helion</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Describe the difference between the FDM method and the SLA method in 3D printing. What are their advantages and disadvantages? Compare both methods in the context of prototype production.<br><br>2. Explain what G-code is and how it is used in 3D printing. Describe what the basic G-code commands are and how they affect the printing process. ]<br><br>3. Discuss the different types of materials used in 3D printing. Compare thermoplastics and thermosets in terms of their applications and properties. Provide examples of products that can be printed with these materials.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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