



Subject card

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| Subject name and code | Additive manufacturing of customized structures and 3D models using nanosystems, PG_00071224 | | | | | | |
| Field of study | Nanotechnology | | | | | | |
| Date of commencement of studies | February 2027 | Academic year of realisation of subject | | | 2027/2028 | | |
| Education level | second-cycle studies | Subject group | | | Specialty subject group 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 | 1 | Language of instruction | | | Polish | | |
| Semester of study | 2 | ECTS credits | | | 5.0 | | |
| 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. Marek Chmielewski | | | | | |
| | Teachers | dr inż. Marek Chmielewski | | | | | |
| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 5.0 | 0.0 | 35.0 | 20.0 | 0.0 | 60 |
| | 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 | 60 | 2.0 | 63.0 | 125 | | |
| Subject objectives | The aim of the course is the practical application of 3D prototyping systems used for practical solutions to engineering problems and issues. This process will be carried out from the initial stage of determining design needs, defining material requirements, including the process of modifying them using nanocomponents, to the issue of creating a finished design, preparing it for printing, and printing it. The possibility of working on modern FDM and SLA printing systems. | | | | | | |

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| Learning outcomes | Course outcome | Subject outcome | Method of verification |
| | [K7_U02] has advanced skills in the design of nanomaterials and in conducting laboratory work related to the fabrication and characterization of nanostructures | The student is familiar with the capabilities of laboratory equipment used to produce materials with nanostructures. They are able to effectively carry out the process of material synthesis and have the skills to verify the properties of the manufactured component. | [SU1] Assessment of task fulfilment |
| | [K7_W01] has broadened and well-structured knowledge in the field of materials science, including material fabrication or control of processes accompanying fabrication, with particular emphasis on materials and structures at the nanoscale. | The student identifies design requirements in terms of the materials necessary for its implementation. They are able to identify types of materials that meet design criteria. They are able to introduce process modifications in material manufacturing technologies to achieve the desired result in terms of material type. They are able to effectively use nanomaterials and nanostructures in the material manufacturing process. | [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge |
| | [K7_K02] is able to initiate and systematically work on long-term scientific and technical projects with clearly defined cognitive and practical objectives. Recognizes their economic aspects and their impact on the surrounding environment | The student is able to organize and plan the course of an experiment, evaluate the manner of its implementation, and understands the necessity of verification and supervision of the research task performed. The student understands the necessity of conducting long-term research and is able to estimate the economic needs of the experiment. | [SK1] Assessment of group work skills [SK2] Assessment of progress of work |
| Subject contents | <p>Course content – lecture The course aims to provide students with comprehensive knowledge of prototyping techniques based on 3D printing technologies or to refresh their knowledge in this area. The course will present software used for the rapid creation of simple and advanced 3D models. The possibilities of 3D prototyping in the laboratory designated for the course will be presented and described.</p> <p>Course content – laboratory During the laboratory, students will learn how to effectively and purposefully modify 3D printing parameters in order to achieve the desired properties of the model being created. The task of modifying print parameters will be carried out in order to achieve: airtightness, resistance to wetting, obtaining the desired wettability parameter, desired mechanical resistance parameters, including the achievement of the assumed functional effectors. The tribological effect of multi-material prints will be investigated. A process of dedicated modification of the composition of materials intended for 3D prototyping with nanomaterials will be carried out in order to control electrical, thermal, and optical properties.</p> <p>Course content – project The student will independently complete a dedicated project, from the process of creating a digital 3D model to its production using 3D printing technology, as specified by the course instructor. They will present and comment on the results of their work at the end of the course.</p> | | |
| Prerequisites and co-requisites | none | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | Test on lecture topics | 60.0% | 40.0% |
| | Assessment of the quality of the project and its presentation | 100.0% | 60.0% |
| Recommended reading | Basic literature | <p>[1] I. Gibson, D. W. Rosen, and B. Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 3rd ed. Cham: Springer, 2021.</p> <p>[5] Vigneshwaran Shanmugam, Rajkumar Velu 3D Printing of Nanocomposites 2022 Smart 3D Nanoprinting Fundamentals, Materials, and Applications.</p> | |
| | Supplementary literature | none | |
| | eResources addresses | | |
| Example issues/ example questions/ tasks being completed | <p>Use of a 3D scanner for reverse engineering, extrapolation, texture creation</p> <p>Properties of materials used in 3D printing processes</p> <p>FDM printing technique</p> | | |
| Practical activities within the subject | Not applicable | | |

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