GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00065836		
Field of study	Materials Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
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	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mateusz Cieślik	
	Teachers	dr inż. Mateusz Cieślik	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	12.0	30.0	3.0	45

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	45	5.0	50.0	100

Subject objectives

The aim of the course is to familiarize students with additive technologies, particularly 3D printing technologies, designing and manufacturing objects, and to introduce the principles of reverse engineering. The practical aspect of the course is based on applying the acquired knowledge in projects. During the completion of tasks, students will obtain prints with specific functional properties.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] Knows the theoretical basics the functioning of scientific equipment in the fields of science and scientific disciplines relevant to materials engineering.	The student is able to develop and carry out activities related to the application of selected additive technologies, using basic knowledge of these technologies. They are also able to prepare a substantive report.	[SW1] Assessment of factual knowledge
[K7_U06] Can evaluate usefulness and feasibility of using new achievements (techniques and technologies) within the scope of materials science.	The student is able to face problems both independently and as part of a team and take responsibility for their decisions and their consequences.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W03] Has extended and enhanced knowledge of mathematics, physics, chemistry and other fields, useful when formulating and solving problems within the scope of materials science.	The student has basic knowledge of the structure, production and properties of materials, especially those used in additive technologies. Knows the principles of conducting selected material tests and interpreting the results as well as creating technical documentation.	[SW1] Assessment of factual knowledge

Subject contents	Laboratory 1: Introduction to 3D Printing and Additive Technologies Introduction to the basics of additive technologies, principles of 3D printer operation, workplace safety, and preparation of 3D models. Laboratory 2: FDM Technology Designing and Printing Models Understanding the details of FDM technology, preparing models for printing, and calibrating the 3D printer. Laboratory 3: SLA Technology Printing with Photopolymer Resin Learning the principles of SLA printers, preparing models, and post-processing prints. Laboratory 4: SLS Technology Printing with Polyamide Powders Discussion of the principles of SLS technology, model preparation, and analysis of the advantages/ limitations of this method. Project: Project 1: Students' Own Project (Any Technology: FDM, SLA, SLS, 3D Scanner) Students create their own project from concept to realization, using a selected 3D printing technology or 3D scanning. The project allows for the practical application of acquired knowledge, development of creativity, and teamwork skills. Project 2: Personalized Ergonomic Handle (FDM) Designing and printing an ergonomic handle that can be customized to individual user needs. Project 3: Prototyping Electrolyzer Components Using FDM 3D Printing and Conductive Materials Objective: Development of a prototype for water electrolyzer components using 3D printing technologies (FDM and SLA), with consideration of conductive filament materials. The project aims to demonstrate the potential of 3D printing in the design and production of devices related to hydrogen technologies and to introduce students to the practical aspects of additive manufacturing. Seminar: Student presentations showcasing and discussing the progress and outcomes of their research projects.
Prerequisites and co-requisites	3D prototyping skills in any CAD program.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	50.0%	50.0%
Laboratory	50.0%	40.0%
Seminar	50.0%	10.0%

Recommended reading	
Basic literature	Nick Kloski, Druk 3D. Praktyczny przewodnik po sprzęcie, oprogramowaniu i usługach, Helion, 2022
Supplementary literature	Anna Kaziunas France, Świat druku 3D Przewodnik, Helion
eResources addresses	Adresy na platformie eNauczanie: Technologie addytywne - Moodle ID: 43535 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43535
Example issues/ example questions/ tasks being completed	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. 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. 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.
Work placement	Not applicable

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