



Subject card

Subject name and code	Additive Technologies, PG_00068091						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	October 2026	Academic year of realisation of subject				2028/2029	
Education level	first-cycle studies	Subject group				Optional 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	3	Language of instruction				Polish	
Semester of study	5	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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mateusz Cieślík					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	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		3.0		52.0	100
Subject objectives	The aim of this course is to familiarize students with the principles and methods of additive manufacturing technologies in the context of designing and manufacturing components used in medicine and biomedical engineering. Students will learn about 3D modeling processes, materials engineering, and the selection of functional and biocompatible materials. Particular emphasis is placed on practical applications, such as the production of implants, anatomical models, medical device prototypes, and the analysis of the mechanical and biological properties of materials. The course includes laboratory exercises that develop skills in planning, conducting, and evaluating additive manufacturing processes in biomedical applications.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K02] is ready to critically assess possessed knowledge and acknowledge the importance of knowledge in solving cognitive and practical problems	Students can independently analyze and evaluate the accuracy of their solutions in the design and manufacturing of medical devices. Students can verify and critically interpret the results of experiments and research on additive materials and components.	[SK2] Assessment of progress of work [SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice
	[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	The student will understand the design and manufacturing methods for medical components using additive technologies, in accordance with engineering standards and norms. The student will understand the relationship between material selection, 3D printing processes, and the functionality of manufactured objects and devices.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K6_W10] knows and understands, to an advanced extent, the parameters, functions, and methods of analysis, design, and optimization of electronic circuits and systems, the definitions of error and measurement uncertainty, measurement methods, including time, frequency, and phase measurements, the properties of converters, and methods of digital signal processing, as well as the basic processes occurring in the life cycle of technical devices, objects, and systems, and methods of supporting processes and functions, specific to the field of study	The student knows and understands the application of additive technologies in the design and manufacture of medical components, including electronic devices and sensors used in medical physics. The student understands the impact of 3D printing process parameters and material selection on the physical, electrical, and mechanical properties of manufactured components. The student understands the basic concepts related to the life cycle of technical devices and systems in medical applications, including the analysis of measurement errors and uncertainties.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
Subject contents	<p>Course content – lecture</p> <p>Topics covered:</p> <ol style="list-style-type: none"> 1. Definition of additive technologies, advantages and limitations compared to traditional manufacturing methods, 3D printing, laser processing, and milling. 2. Discussion of various 3D printing methods, technologies and materials used, advantages and limitations. 3. Possibilities of using materials science in 3D printing, composites with nanomaterials, and surface modification. 4. 3D printing in medicine. 5. Ecology and sustainability of 3D printing. 6. Preparing files for 3D printing, analyzing design performance, preparing the model, and selecting appropriate printing parameters. 7. 4D printing. 8. Quality control. 9. The economics of 3D printing. 		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory	50.0%	50.0%
	Lecture	50.0%	50.0%
Recommended reading	Basic literature	Druk 3D, Liza Wallach Kloski, Helion, 2022	
	Supplementary literature	Druk 3D: zastosowania oraz skutki społeczne i gospodarcze, Helena Dodziuk, PWN, 2019	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Describe the difference between FDM and SLA 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 the basic G-code commands and how they affect the printing process. 3. Discuss the different types of materials used in 3D printing. Compare thermoplastic and thermoset materials in terms of their applications and properties. Provide examples of products that can be printed using these materials. 4. Describe the applications of 3D printing in medicine. 		
Practical activities within the subject	Not applicable		