GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	3D printing technologies, PG_00060803						
Field of study	Chemical Technology						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2027/2028			
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	6		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Polymer Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Justyna Kucińska-Lipka				
	Teachers						
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		2.0		18.0	50
Subject objectives	The aim of this course is to develop skills in selecting appropriate 3D printing methods for specific polymer groups and to explain the relationships between process conditions and the physicochemical and mechanical properties of materials. This course provides knowledge of additive technologies used in the production of plastic products and develops competence in identifying 3D printing methods based on obtained components. The course also aims to prepare students to recognize typical flaws and defects characteristic of 3D printing of polymers and their practical analysis. This course develops teamwork skills in laboratory settings and develops awareness of the impact of engineering activities on the environment, supporting decision-making that minimizes technological and ecological impacts.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U06] Recognizes the relationships between technological issues and their impact on the environment, taking into account the principles of sustainable development, systemic and non-technical aspects, and occupational health and safety principles	Students take into account the impact of engineering activities on the environment when making technological decisions and apply the principles of sustainable development and occupational health and safety in the plastics industry.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K6_W07] Has knowledge of raw materials and technologies in the chemicaland polymer industries, also covering issues of corrosion and material protection.	The student will understand the additive technologies used in the production of plastic products. The student will be able to identify a 3D printing method based on an assessment of the finished component. The student will also be able to explain the relationship between process conditions and the physicochemical and mechanical properties of the materials used.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U07] Is able to select and justify a chemical and technological production concept, assess the quality of products and analyse and evaluate existing technical solutions.	Student can select the appropriate 3D printing method for a specific group of polymers. Student can independently identify and practically analyze typical flaws and defects characteristic of polymer 3D prints.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_K03] Understands the need for continuous learning and knows the opportunities to improve professional, personal and social competences, and is able to think and act in an entrepreneurial manner.	The student understands the need for continuous learning due to the dynamic development of the plastics industry. Students are familiar with opportunities to enhance their professional and social competencies, including developing teamwork skills.	[SK1] Assessment of group work skills [SK4] Assessment of communication skills, including language correctness

Subject contents

Course content – lecture
- History of 3D Printing
- 3D Printing Methods
- 3D Printing of Thermoplastic Materials: FDM and SLS
- 3D Printing of Photocurable Materials: SLA
- Bioprinting of Hydrogel Materials 3D
- Printing of Special Materials
- The Latest Trends in Additive Technologies 4D and 5D
- Printing Ethical Issues in the Widespread Use of 3D Printing

Course content – laboratory
- 3D Modeling
- Preparing 3D Models for Printing
- Preparing Thermoplastic Materials for 3D Printing
- Processing Properties of Thermoplastic Materials Important in 3D Printing
- 3D Printing of Thermoplastic Materials: FDM Technologies
- 3D Printing of Thermoplastic Materials: SLS Technology
- 3D Printing of Photocurable Resins: SLA/DLP Technology

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
laboratory: attendance, reports, written test	85.0%	40.0%
lecture: written test	60.0%	60.0%

Recommended reading

Basic literature	• Kloski Liza Wallach, Kloski Nick, Druk 3D. Praktyczny przewodnik po sprzęcie, oprogramowaniu i usługach, Wydawnictwo Helion, 2022 • Brian Evans, Practical 3D Printers The Science and Art of 3D Printing, Apress, 2012 • Ben Redwood, Filemon Schöffer, Brian Garret, The 3D Printing Handbook: Technologies, Design and Applications, 3D Hubs B.V., 2017
Supplementary literature	• Helena Dodziuk, Druk 3D/AM : zastosowania oraz skutki społeczne i gospodarcze, PWN, 2012 • Deepak M. Kalaskar, 3D Printing in Medicine, Woodhead Publishing, 2022
eResources addresses	

Example issues/ example questions/ tasks being completed	**Theoretical (lecture) topics:** 1. Present a brief historical overview of the development of 3D printing technology and discuss its importance for industry. 2. List and characterize the basic 3D printing methods, pointing out the differences between them. 3. Explain the operating principle of FDM technology and discuss its advantages and limitations in relation to thermoplastic materials. 4. Describe SLS technology, indicating its applications and typical materials used in this process. 5. Explain the differences between SLA photocurable printing and DLP printing. 6. Describe the basics of bioprinting using hydrogel materials and provide examples of its potential applications. 7. Present the essence and examples of 4D and 5D printing applications in the context of the latest trends in additive technologies. 8. Discuss the potential ethical issues related to the widespread use of 3D printing in everyday life and industry. **Practical (laboratory) topics:** 1. Describe step-by-step the process of preparing a 3D model for FDM printing. 2. What printing parameters (e.g., temperature, speed, layer thickness) have a key impact on the quality of a product using FDM technology? 3. Explain the differences in material preparation for printing in FDM and SLS technologies. 4. How can you recognize common defects in FDM 3D prints (e.g., underfilling, stringing, deformation) and how can you prevent them? 5. Distinguish the differences in the structure and properties of products obtained using FDM and SLS. 6. What are the safety rules when working with photocurable resins in SLA/DLP technology? 7. What is the process of curing layers in SLA technology, and how important is the exposure time? 8. Describe how to prepare and calibrate a 3D printer before starting an FDM print.
Practical activites within the subject	Not applicable

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