



Subject card

Subject name and code		3D printing technologies, PG_00060803						
Field of study		Chemical Technology						
Date of commencement of studies		October 2024	Academic year of realisation of subject			2026/2027		
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] is able to select the chemical and technological concept of the production method, is able to justify the suitability of the raw materials used, analyses and evaluates the quality of the products obtained, critically analyses the functioning of existing technical solutions and evaluates these 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 fulfillment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools			
		[K6_K03] is aware of the responsibility for his/her own work and is ready to follow the rules of teamwork and take responsibility for the tasks performed jointly	The student is aware of teamwork during laboratory tasks. The student considers the impact of engineering activities on the environment when making technological decisions.		[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice			
		[K6_W09] has knowledge of the technological and functional properties of polymers, the physical basis and processing methods of polymers and rubber	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			

Subject contents	Course content – lecture											
	<ul style="list-style-type: none"> • 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 											
Prerequisites and co-requisites	Course content – laboratory											
	<ul style="list-style-type: none"> • 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 											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th>Subject passing criteria</th> <th>Passing threshold</th> <th>Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>laboratory: attendance, reports, written test</td> <td>85.0%</td> <td>40.0%</td> </tr> <tr> <td>lecture: written test</td> <td>60.0%</td> <td>60.0%</td> </tr> </tbody> </table>			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%
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	laboratory: attendance, reports, written test	85.0%	40.0%									
lecture: written test	60.0%	60.0%										
Recommended reading	Basic literature	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<p>Theoretical (lecture) topics:</p> <ol style="list-style-type: none"> 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. <p>Practical (laboratory) topics:</p> <ol style="list-style-type: none"> 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 activities within the subject	Not applicable											

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