GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Additive Technologies - 3D Printing, PG_00064343		
Field of study	Chemical Technology		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	Optional 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	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 the course is to develop the ability to select appropriate 3D printing methods for specific polymer groups and to explain the relationships between process conditions and the physicochemical and mechanical properties of materials. The course enables students to acquire knowledge about additive technologies used for manufacturing plastic products and enhances skills in identifying 3D printing methods based on the obtained components. The goal of the program is also to prepare students to recognize typical defects and flaws characteristic of polymer 3D printing and to perform practical analysis of these issues. The course fosters teamwork skills in laboratory settings and raises awareness of the environmental impact of engineering activities, supporting decision-making to minimize technological and ecological consequences.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] selects methods of data analysis, including statistical and modelling, useful for solving scientific and technological problems	is able to list and describe the types of additive technologies for plastics, is able to identify the 3D printing method used to obtain a given plastic product, is able to identify typical flaws and defects associated with 3D printing of plastics	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_K04] is aware of his/her responsibility for making decisions, respecting and developing principles of professional ethics and taking action to uphold these principles	can collaborate and work collaboratively in laboratory settings. They are aware of the impact of engineering activities on the environment and are able to make decisions that minimize negative technological and ecological impacts.	[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice
[K7_U02] carries out experiments using properly selected techniques and apparatus, taking advantage of new developments in technology and related fields	is able to: select an appropriate 3D printing method for a specific polymer group; explain the necessity of applying specific process conditions and time in relation to the physicochemical and mechanical properties of polymers.	[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

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

Basic knowledge about plastics

Assessment methods and criteria

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

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. What are the safety rules when working with photocurable resins in SLA/DLP technology?
6. What is the process of curing layers in SLA technology, and how important is the exposure time?
7. 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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