



Subject card

Subject name and code	, PG_00072907						
Field of study	Recycling and Energy Recovery						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2026/2027		
Education level	first-cycle studies		Subject group				
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	4		Language of instruction		Polish		
Semester of study	7		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Chemistry Technology and Biotechnology of Food -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Szymon Mania				
	Teachers		dr inż. Szymon Mania				
			dr hab. inż. Robert Tylingo				
			Karol Staszczyk				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	20.0	0.0	0.0	20
	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	20		2.0		28.0	50
Subject objectives	The aim of the course is to develop practical computer-aided design skills, including 2D documentation, 3D modelling and preparation for FDM printing. Students learn to reproduce real objects from measurements, design mating parts considering tolerances, clearances and dimensional compensation, and select printing parameters. They also learn to assess the dimensional conformity of prints with CAD models and optimize designs in terms of functionality, material use, time and cost.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W02] analyzes engineering and technological issues and problems in the area of raw materials and energy recovery using appropriate and appropriate analytical, numerical and experimental tools and methods	The student analyses design and technological problems related to computer-aided design and FDM manufacturing, taking into account dimensional accuracy, tolerances, clearances and technological limitations.	[SW1] Assessment of factual knowledge
	[K6_W06] integrates and extracts data from multiple sources to analyze complex engineering and technology problems.	The student acquires and uses data from measurements of real objects, CAD models and slicing software to prepare and optimize the manufacturing process.	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
	[K6_K03] is committed to independent lifelong learning and independently follows the development of science and technology, especially in the area of recycling raw materials and energy.	The student independently develops skills in the use of CAD/ CAM tools and additive manufacturing technologies and evaluates the need to modify a design based on practical verification.	[SK2] Assessment of progress of work [SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
	[K6_U02] solves engineering issues and problems in the area of raw materials and energy recovery through the use of appropriate analytical, numerical and experimental tools and methods.	The student measures a real component, creates its CAD model, designs a mating component, selects tolerances and process parameters, prepares the model for FDM printing and evaluates the quality and dimensional conformity of the manufactured part.	[SU1] Assessment of task fulfilment [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 [SU5] Assessment of ability to present the results of task
Subject contents	Course content – laboratory 1. Introduction to computer-aided design. AutoCAD environment, units, coordinate systems, layers, and basic drawing tools. 2. Precise creation and editing of 2D geometry. Dimensioning and preparation of technical documentation. 3. 3D modelling. Creation and modification of solid models. 4. Measurement of real objects and reconstruction of their geometry in the CAD environment. 5. Design of mating components. Dimensional tolerances, assembly clearances, technological allowances, and compensation for dimensional deviations and material shrinkage. 6. Fundamentals of FDM additive manufacturing. Technological limitations and design principles for 3D-printed components. 7. Preparation of models for 3D printing using slicing software. Model orientation, layer height, walls, infill, supports, temperatures, and other process parameters. 8. Selection of materials and printing parameters considering functionality, dimensional accuracy, material consumption, manufacturing time, and cost. 9. Test printing, dimensional inspection, analysis of CAD-to-print deviations, and correction of the CAD model. 10. Independent design of a functional component based on measurements of a real object, preparation of the manufacturing process, and practical verification of fit.		
Prerequisites and co-requisites	Basic knowledge of technical drawing, geometry and computer operation. Basic ability to perform and interpret geometrical measurements.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	technical drawing	60.0%	40.0%
	Creation of the object model	60.0%	60.0%

Recommended reading	Basic literature	Basic: 1. Tickoo S., <i>AutoCAD: A Problem-Solving Approach</i>, CADCIM Technologies. 2. Gibson I., Rosen D., Stucker B., Khorasani M., <i>Additive Manufacturing Technologies</i>, Springer. 3. Dokumentacja użytkownika Autodesk AutoCAD. 4. Dokumentacja stosowanego oprogramowania typu slicer.
	Supplementary literature	• ISO 1101 – Geometrical product specifications (GPS) – Geometrical tolerancing. • ISO 2768 – General tolerances. • Technical materials from manufacturers of the filaments and printers used during the classes.
	eResources addresses	
Example issues/ example questions/ tasks being completed	Preparation of 2D technical documentation and 3D models. Modelling components based on measurements of real objects. Designing mating parts. Selection of tolerances, assembly clearances, allowances and dimensional compensation. Preparation of models for FDM printing. Selection of model orientation, layer height, walls, infill and supports. Material selection. Estimation of print mass, manufacturing time and cost. Dimensional inspection of printed components, calculation of deviations and correction of CAD models. Design of a functional component fitted to a real object.	
Practical activities within the subject	Not applicable	

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