



Subject card

Subject name and code	Engineer Graphics, PG_00058225						
Field of study	Biotechnology						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group		Obligatory subject group 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	1		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Robert Aranowski				
	Teachers		dr inż. Robert Aranowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	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		4.0		16.0	50
Subject objectives	The aim of the course is to obtain by the students knowledge on the basics of descriptive geometry and construction notation (technical drawing) as a tool in the engineer work. Students should master the selected CAD software to the level allows to draw basic engineering schemes and construction. The acquired knowledge and skills are intended to enable reading and drawing technical and technological diagrams.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W10] has knowledge in the field of bioprocess technology and engineering and knowledge in the field of engineering design of technical objects and processes including engineering graphics with the use of computer-aided design and databases		is able recreate spatial elements on a drawing plane, using orthogonal and axonometric, as well as cross-section projections. Is familiar with basic dimensioning guidelines and how to prepare technical drawings (working and assembly drawings). Is able to use computer-aided 2D and 3D design software at a basic level, allowing to prepare simple technical documentation. Student can also create simple construction diagrams with the help of such programs.		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U10] is able to use knowledge about possibilities, aims and limitations of biotechnology to develop, design and obtain products and biotechnological processes in the area of his/her specialization		can work individually and in a team, can estimate the time needed to complete a task, can develop and implement a work schedule that ensures meeting deadlines.		[SU1] Assessment of task fulfilment		

Subject contents	<p>Graphical representation of 3D object on a plane: projection on a plane, orthographic projections. Cross-sections of planes and 3D objects: solid models, cross-sections of polyhedral. Representations of revolution surfaces in orthogonal projections: projections of points lying on the surfaces of solids, cross-sections of solids of revolution with projection planes. Representation of technical object on drawing: basic concepts, principles of technical object representation, sheet formats and drawing scales, methods of graphical representation of the 3D object and dimension system. Graphical representation recording of connections: detachable connections, non-detachable connections. Assembly and manufacturing drawings. Computer added design programs, Graphic symbols used in chemistry and chemical technology.</p> <p>Using Autodesk Inventor software to prepare basic technical documentation in machine drawing: creating your own drawing templates, ISO-PL idw drawing template, part model template, assembly model template; Basics of the user interface, operations on project, GUI elements, Introduction to part design: parametric model of the structure, geometric model of the structure, parameters and decision variables, examples of parameters, 3D objects, 3D objects in 2D modelling; Concepts related to the derived model technique, typical part design process, part modelling; Editing documentation; Modifying the design from the model or drawing level; Parametric 2D modelling, sketches and sketch planes, parametric sketch planes, defining a sketch plane; Parametric 2D modelling operations; Modelling methods, standard modelling tools and techniques; Profile definition algorithm; Sharing a sketch (Share Sketch); Sharing structural elements; Extruding with a profile (Extrude); Base element; Through extrusion; Profile Rotation (Revolve); Changing the order of modelling operations; Profile dragging (Sweep); Unzipping surfaces (Loft); Ribs (Rib); Inserted elements; Holes: types and types of holes, methods of determining the position of holes; Thread and hole definition files; Hole definition algorithm: Concentric method, Linear method, From Sketch method; Editing 2D part documentation; documentation file types, creating a drawing file; document settings; drawing templates; permanent drawing elements, sheet layout editing; i-properties editing; style of objects in the drawing template file; general template settings; available template styles; default values of objects; main and dependent styles; logical and explicit styles; logical style as layer logical style as standard; layers; text style; dimension style; management of standard elements (styles). Basics of creating projections; creating a base model projection; creating basic derivative projections, sections and details. Creating a main table and a parts table.</p>		
Prerequisites and co-requisites	Knowledge of the basics of using a computer, MS Windows operating system, ability to use pointing tools (mouse, tablet).		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm tests	60.0%	50.0%
	Project	60.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. T. Dobrzański, Rysunek techniczny maszynowy, Wyd. WNT 2013, 2. W.M. Lewandowski, Maszynoznawstwo chemiczne, Gdańsk 1998, 3. M. Kochanowski, Zapis konstrukcji z geometrią wykreślną, Wyd. PG 2002, 4. K. Paprocki, Zasady zapisu konstrukcji, OWPW, Warszawa 2000, 5. A. Pikoń, AutoCAD 2023 PL, Wyd. Helion 2022, ISBN 978-83-283-9650-0. 6. A. Jaskulski, Autodesk Inventor Professional 2021 PL / 2021+ / Fusion 360. Metodyka projektowania, Wyd. Helion 2020, 978-83-283-7310-5. 	
	Supplementary literature	<ol style="list-style-type: none"> 1. Tutorials Inventor and AutoCAD programs. 2. PN-EN ISO 128-24: 2003. Rysunek techniczny. Zasady ogólne przedstawiania. Część 2 Linie na rysunkach technicznych maszynowych. 3. PN-EN ISO 3098-0: 2002. Dokumentacja techniczna wyrobu. Pismo. Część 0. Zasady ogólne. 4. PN-EN ISO 3092-2: 2002. Dokumentacja techniczna wyrobu. Pismo. Część 2. Alfabet łaciński, cyfry i znaki. 5. PN-EN ISO 5456-1: 2002. Rysunek techniczny. Metody rzutowania. Część 1. Postanowienia ogólne. 6. PN-EN ISO 5456-2: 2002. Rysunek techniczny. Metody rzutowania. Część 2. Przedstawianie prostokątne. 7. PN-EN ISO 5456-3: 2002. Rysunek techniczny. Metody rzutowania. Część 3. Przedstawianie aksonometryczne. 	
	eResources addresses	Uzupełniające Adresy na platformie eNauczanie: Grafika Inżynierska, laboratorium, Biotechnologia, 2023-24, semestr zimowy - Moodle ID: 32358 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32358	

Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Introduction to Autodesk Inventor software. Creating a new project. Principles of moving in three-dimensional space. Types of structures used in Inventor. Basic methods of creating solids in the Part module. Sketch environment for creating two-dimensional drawings. 2. Methods of creating solid elements based on a 2D drawing and tools for their modification: holes, chamfering, rounding, threads, thin-walling, rectangular and around-center duplication, mirroring. 3. Creating and editing the workspace: planes, axes and points in space. 4. The assembly environment (Assemblies), Creating fixed (Constrain) and movable (Join) relations. Duplicating solid elements. Creating parts from assemblies. 5. Creating technical documentation: sheet formats and drawing scales, methods of graphical representation of structural solids and assemblies, graphical recording of structural connections: detachable connections, non-detachable connections. Assembly and manufacturing drawings. 6. Creating views, sections, drawing details. Creating breaks and partial sections. 7. Dimensioning: Principles of dimensioning, creating linear dimensions, dimensioning diameters and radii, dimensioning angles. Creating composite tables and a basic table. 8. Preparation of 3D models and technical drawings of a selected element of the technical device/equipment using Inventor software.
Work placement	Not applicable

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