GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00059041		
Field of study	Materials Engineering, Materials Engineering, Materials Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Zakład Technologii Maszyn i Automatyzacji Produkcji -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Mariusz Deja	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	30.0	0.0	45

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	45	5.0	25.0	75

Subject objectives

Creation, modification and analysis of three-dimensional (2D or 3D) graphical representations of physical objects, especially mechanical components using the CAD software

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W05	Design of technological processes	[SW3] Assessment of knowledge contained in written work and projects
K6_U01	Simulation of the operation of the designed device	[SU1] Assessment of task fulfilment
K6_K01	Ability to use CAD software	[SK2] Assessment of progress of work
K6_U03	Analysis of the functioning of a specific device, taking into account material aspects	[SU4] Assessment of ability to use methods and tools

Subject contents	1. **Introduction to CAD Systems** • History of CAD software development. • Differences between 2D and 3D systems. • Application of CAD in various industries (mechanical engineering, architecture, electronics, etc.). • Popular CAD programs (AutoCAD, SolidWorks, CATIA, Fusion 360, Inventor). 2. **Basic CAD Tools and Functions** • Creating 2D sketches (lines, circles, rectangles, curves). • Working with dimensions and tolerances. • Layers, blocks, and drawing management. • Editing and modifying elements (snapping, transformations, copying, scaling). 3. **3D Modeling** • Introduction to solid and surface modeling. • Basic operations: extrusion, rotation, filleting, chamfering. • Creating complex models using boolean operations (union, difference, intersection). • Parametric 3D modeling. 4. **Technical Drawings from 3D Models** • Automatically generating 2D views from 3D models. • Creating cross-sections, detail views, and isometric views. • Dimensioning technical drawings. • Marking materials and fasteners on drawings. 5. **Analysis and Optimization of Designs** • Engineering simulations (structural, thermal, flow analysis). • Testing and optimizing 3D models for strength. • Stress and deformation analysis. 6. **Assemblies and Assembly Design** • Creating assemblies and mechanical designs. • Managing relationships between components. • Assembly motion simulation (kinematics). • Checking for collisions and tolerances. 7. **Technical Documentation** • Creating technical documentation in accordance with standards. • Bill of Materials (BOM). • Preparing files for manufacturing (e.g., CNC files, files for 3D printers). 8. **Advanced Modeling Techniques** • Creating complex shapes (e.g., freeform surfaces, splines). • Designing elements using symmetry and patterns. • Parametric and adaptive modeling. 9. **Collaboration in Design Teams** • Working in teams in a CAD environment (version control, collaborative editing). • Integration with other engineering tools (PLM, ERP). • Cloud-based project management. 10. **Quality Management and Project Control** • Software for managing CAD projects. • Ensuring compliance with norms and standards. • Validation and verification of the design before production. 11. **Practical Projects and Case Studies** • Solving real-world design problems. • Creating complete technical projects from concept to documentation. • Final simulations and tests for designed models. 12. **Development of New Technologies in CAD** • CAD in combination with VR and AR technologies. • Automating design through scripting and algorithms (generative design). • The impact of AI on the future of CAD.
Prerequisites and co-requisites	Engineering graphics

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project</td><td>60.0%</td><td>50.0%</td></tr>
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<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Andrzej Pikoń: AutoCAD 2023 PL. Pierwsze kroki.
2. Andrzej Jaskulski: Autodesk Inventor Professional 2024 PL / 2024+ / Fusion 360.</td></tr>
<tr><td>Supplementary literature</td><td>Software Manufacturers' Websites</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. What is parametric dimensioning in CAD, and what are its advantages in the design process?
• Explain how parametric dimensioning works and provide examples of its application in creating models.
2. Describe the differences between solid modeling and surface modeling in CAD software.
• What are the key features of both types of modeling? In which scenarios would surface modeling be preferred over solid modeling?
3. What types of relationships can be applied between components in a mechanical assembly, and how do they affect its functionality?
• List and describe several basic relationships (e.g., rotational, sliding) and their importance in assembly design.
4. List and explain the steps necessary to conduct a Finite Element Analysis (FEA) in a CAD program.
• What preparations are required before starting the simulation, and how should the results be interpreted?
5. What are the differences between an isometric view and an orthographic projection when creating technical drawings from 3D models?
• Explain when and why isometric and orthographic views are used, providing examples.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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