GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer aided manufacturing, PG_00055767
Field of study	Mechanical and Medical Engineering

Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
			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	4.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Division of Manufacturing and Production Engineering -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology

Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Dawid Zieliński
	Teachers	dr inż. Dawid Zieliński
		dr inż. Tadeusz Bocheński
		prof. dr hab. inż. Mariusz Deja

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=5231						

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	60	4.0	36.0	100

Subject objectives	Introduction to modern techniques in the field of computer-aided manufacturing, in particular CNC machine tool programming using CAD/CAM systems for machining prismatic and axially symmetrical parts, which are also used in mechanical and medical engineering.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W10] he/she has knowledge in the field of machine part manufacturing and metrology	Demonstrates knowledge and characteristics of manufacturing techniques, as well as knowledge of the selection of material types in the machining process, machining cycles depending on the required dimensional and shape accuracy and surface quality, as well as methods and tools for assessing the quality of manufactured parts.	[SW2] Assessment of knowledge contained in presentation
	[K6_U08] he/she is able to assess whether proposed methods and tools can be used in practice to solve simple engineering task related to machine design, manufacturing and utilization	Selection and characterisation of an appropriate technological process for a specific type of mechanical part. Competence in developing and evaluating the manufacturing process for a specified group of machine components using computer simulation in a CAD/CAM environment and for a specific manufacturing system, as well as CNC machine tool simulators.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

Subject contents	**Course content – lecture** Characteristics of CAx systems used in production engineering, including the medical industry. Principles of developing technology using CAD/CAM systems for selected prismatic and axially symmetrical parts. Determining the type of workpiece, semi-finished product, tools and machining fixtures. Selection and definition of machining cycles related to roughing and finishing. Analysis of selected machining strategies for specific machined surfaces and geometric and technological features. Determination of cutting parameters. Characteristics of machine tool post-processors. Generation of machining simulations with collision analysis and selected variants concerning, among others, the strategies and cutting parameters used. Characteristics of CNC programming types. Basics of CNC programming of selected machine parts in a CNC machining simulator. Modification of machining programmes. Trends in the development of computer-aided manufacturing CAD/CAM.
	Course content – laboratory Development of computer models of selected parts of prismatic and axially symmetrical machines, including technical drawings. Saving computer models in appropriate formats dedicated to CAM systems. Preparation of milling machining of selected prismatic elements using 2D and 3D models. Preparation of turning machining of selected axially symmetrical elements using 2D and 3D models. Selection and analysis of selected cycles and machining strategies, including the determination of cutting parameters. Creation of advanced machining process simulations, including the analysis of selected technological solutions. Generation and analysis of NC code for CNC machine tools.
	Course content – project Writing NC programmes for prismatic and axially symmetrical elements using a simulator for a specific CNC machine tool. Determining the shape, dimensions and type of material of the semi-finished product. Selecting a machining chuck. Determining the zero point position. Selection and characterisation of a set of cutting tools, including milling, turning and drilling tools. Writing NC code using a dedicated programming language and available machining cycles. Analysis and validation of the created NC code by simulating the machining process. Evaluation of the designed machining process.

Prerequisites and co-requisites	Basic knowledge of CAD/CAM systems and machining technology, technical drawing

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	60.0%	40.0%
	Completion of tasks during laboratory classes	60.0%	20.0%
	Activity during lectures/classes	80.0%	20.0%
	Project task	60.0%	20.0%

Recommended reading	Basic literature	1. Przybylski, W., Deja, M. (2007). Komputerowo wspomagane wytwarzanie maszyn: podstawy i zastosowanie. Wydawnictwa Naukowo-Techniczne. 2. Kochan, P. (2014). Wieloosiowe frezowanie CNC, edgecam. Wydawnictwo Helion. 3. Kochan, P. (2017). Wieloosiowe toczenie CNC, edgecam. Wydawnictwo Helion. 4. Habrat, W. (2015). Obsługa i programowanie obrabiarek CNC, podręcznik operatora. Wydawnictwo KaBe, Krosno.
	Supplementary literature	1. Chlebus, E. (2000). Techniki komputerowe CAx w inżynierii produkcji. Wydawnictwa Naukowo-Techniczne. 2. Grzesik, W. (2016). Advanced machining processes of metallic materials: theory, modelling and applications. Elsevier. 3. Kosmol, J. (2000). Automatyzacja obrabiarek i obróbki skrawaniem. WNT, Warszawa.
	eResources addresses	

Example issues/ example questions/ tasks being completed	1. Characteristics of selected CAx systems: CAD, CAM, CAP, CAPP, CAE, CAQ 2. Scope of application of CAD/CAM manufacturing support systems in mechanical and medical engineering. 3. Use and integration of CAx techniques in mechanical and medical engineering. 4. Trends in the development of CAx techniques in the field of computer-aided manufacturing 5. Integration of CAD/CAM systems with CAE systems 6. Steps to follow when developing a technology using a CAM system for milling 7. Steps to follow when developing technology using a CAM system for turning 8. Differences in the development of technology using 2D and 3D models in a CAM system 9. Methods of determining the centre of the coordinate system on the workpiece 10. Methods of determining the semi-finished product in CAM systems 11. Coordinate system axis markings for: turning and milling 12. Types of machining cycles used in CAM software 13. Types of CNC machine tool programming 14. Knowledge of basic NC codes: preparatory and machine functions 15. Determining cutting parameters 16. Types of CNC machine tool controllers 17. The principle of creating NC code using a CNC machine tool simulator 18. Basics of additive technologies 19. Types and characteristics of the main 3D printing methods 20. Characteristics of hybrid manufacturing - examples from the field of mechanical and medical engineering.
Practical activites within the subject	Not applicable

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