GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer Aided Manufacturing (CAM), PG_00055454		
Field of study	Mechatronics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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	5	ECTS credits	5.0
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	prof. dr hab. inż. Mariusz Deja	
	Teachers		

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=1859

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	5.0	60.0	125

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.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U08] is able - according to a given specification - design, calculate costs and develop a simple device, object, system or process typical for mechatronics, using appropriate methods, techniques and tools	Development of a simulation of the machining process for prismatic and axially symmetrical machine parts using CAM systems and a CNC machine tool simulator.	[SU4] Assessment of ability to use methods and tools
[K6_W08] knows and understands design and production processes of elements and simple mechatronic devices	Demonstrates skills in designing technological processes for typical prismatic and axially symmetrical machine parts, taking into account the available means of production.	[SW2] Assessment of knowledge contained in presentation
[K6_U11] is able to evaluate usefulness of methods and tools to solve simple, practical engineering task, distinctive for mechatronics and is able to choose the proper method and tools	Identification and characterization of the appropriate technological process for a specific type of machine component. Consideration of the type of material, machining cycles depending on the assumed dimensional and shape accuracy and surface quality, as well as economic aspects related to the time and cost of the manufacturing process.	[SU1] Assessment of task fulfilment
[K6_U05] is able to use properly chosen tools to compare design solutions of elements and mechatronics systems according to given application and economic criteria (e.g. power demand, speed, costs)	Development and evaluation of the manufacturing process for a specified group of machine parts using computer simulation in a CAD/ CAM environment and for a specific manufacturing system.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Course content – lecture

Characteristics of CAx systems used in production engineering. 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 postprocessors. 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 programs. Trends in the development of computer-aided manufacturing CAD/CAM. Basics of additive technologies.

Course content – laboratory

Development of computer models of selected parts of prismatic and axially symmetrical machines, including technical drawings. Saving computer models in formats suitable for CAM systems. Preparation of milling operations for 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 analysis of selected technological solutions. Generation and analysis of NC code for CNC machine tools.

Course content – project

Writing an NC program 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. Selecting and characterizing 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
Completion of tasks during laboratory exercises	60.0%	20.0%
Exam	60.0%	40.0%
Project task	60.0%	20.0%
Activity during lectures/classes	80.0%	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 3. Use and integration of CAx techniques 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 a technology using a CAM system for turning 8. Differences in the development of technologies using 2D and 3D models in a CAM system 9. Methods of determining the center 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 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.
Practical activites within the subject	Not applicable

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