



Subject card

Subject name and code	Computer Aided Manufacturing (CAM), PG_00055454						
Field of study	Mechatronics						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
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	Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Dawid Zieliński					
	Teachers	dr inż. Dawid Zieliński dr inż. Piotr Sender					
Lesson types and methods of instruction	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							
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	Learning the basic techniques of computer-aided manufacturing, especially programming CNC machines with the use of CAM software.						
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	Group design of the technological process with the use of a computer system.			[SU4] Assessment of ability to use methods and tools		
	[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	The manufacturing process selection depending on the class, type of parts, material, dimensional and shape requirements as well as time and cost of production. The student applies the practical use of CAD/ CAM systems to present the designed technology for the production of mechanical components.			[SU1] Assessment of task fulfilment		
	[K6_W08] knows and understands design and production processes of elements and simple mechatronic devices	The student can design technological processes of typical machine parts for the available means of production, including measuring devices and analysis of experimental results.			[SW2] Assessment of knowledge contained in presentation		
[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)	Analysis of the production process using computer simulation for a specific manufacturing system.			[SU3] Assessment of ability to use knowledge gained from the subject			

Subject contents	Systems for computer-aided manufacturing. Integration of CAD and CAM systems. The exchange of data between systems. Declaration of the workpiece, semi-finished product, tools and fixtures. Definition of machining cycle. Types of turning and milling machining cycles. Selection of machining strategy for specific areas treated. Declaration of cutting parameters. Treatment of free surfaces. High speed machining HSM. Databases in CAM systems. Files containing data access tools. Postprocessors machine tool. Simulation with an analysis of collision. Modification of machining programs. Trends in the development of computer aided manufacturing. Additive technologies and reverse engineering.		
Prerequisites and co-requisites	Technical drawing, basics of manufacturing techniques, Computer Aided Design CAD		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercises during laboratories	60.0%	20.0%
	Active participation in lectures	80.0%	20.0%
	Projects	60.0%	20.0%
	Exam	60.0%	40.0%
Recommended reading	Basic literature	1. Przemysław Kochan. EdgeCAM. Wieloosiowe frezowanie CNC. Wydawnictwo Helion. Gliwice 2014. 2. Grzesik W., Niesłony P., Bartoszek M.: Programowanie obrabiarek NC/CNC. WNT, Warszawa 2020, Wyd. IV. 3. Przybylski W., Deja M.: Komputerowo wspomagane wytwarzanie maszyn. Podstawy i zastosowanie. WNT, Warszawa 2007. 4. Augustyn K.: EdgeCAM. Komputerowe wspomaganie wytwarzania. Wydanie II. Helion, Gliwice 2006.	
	Supplementary literature	1. Grzesik, W. Advanced machining processes of metallic materials: theory, modelling and applications. Elsevier, 2016. 2. Kosmol J.: Automatyzacja obrabiarek i obróbki skrawaniem. WNT, Warszawa 2000. 3. Chlebus E.: Techniki komputerowe CAx w inżynierii produkcji. WNT, Warszawa 2000.	
	eResources addresses	Adresy na platformie eNauczanie: Komputerowo wspomagane wytwarzanie - Moodle ID: 34616 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=34616	

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> 1. The range of applications of CAD/CAM manufacturing support systems. 2. Use and integration of CAx techniques. 3. Generating NC programs using the CAD/CAM system. 4. Data exchange - between different systems. 5. Design and technological compliance in computer-aided manufacturing. 6. Object modeling - Feature Modeling. 7. Generating variants of technological solutions. 8. Trends in the development of CAx techniques in the field of computer-aided manufacturing. 9. Integration of CAD / CAM systems with CAE systems. 10. The structure of the standard of working time in terms of computer-aided production. 11. Process planning for turning technology with the use of the CAD/CAM system. 12. Process planning for milling technology with the use of the CAD/CAM system. 13. List the steps to be followed when designing technology using the CAM system (EdgeCam) with the use of 2D models. 14. List the steps to be followed when designing technology using the CAM system (EdgeCam) with the use of 3D models. 15. Designations of the axes of the coordinate system for: turning, milling and designation of additional axes. 16. List the types of models used in CAM systems. 17. List the designs of CNC lathes (positioning of the tool head) and the consequences of tools, spindle revolutions, etc. 18. Characterize the solid models. 19. Characterize the surface models. 20. Present the essential differences between the solid model and the surface model. 21. Characteristics of parametric CAD design. 22. Ways of determining the center of the coordinate system on the workpiece. 23. Ways of determining the blank in CAM systems. 24. Tasks of the technical preparation of production (TPP) department.
<p>Work placement</p>	<p>Not applicable</p>