COURSE SPECIFICATION

Course code	full-time programme:	**M#2-S1-ME-KWW-606**
	part-time programme:	
Course title in Polish	**Komputerowe wspomaganie wytwarzania II**	
Course title in English	**Computer-Aided Manufacturing II**	
Valid from (academic year)	**2024/2025**	

GENERAL INFORMATION

Programme of study	**MECHANICAL ENGINEERING**
Level of qualification	**first-cycle**
Type of education	**academic**
Mode of study	**full-time programme**
Specialism	**Computer-Aided Manufacturing**
Department responsible	**Department of Machine Design and Machining**
Course leader	**dr inż. Michał Skrzyniarz**
Approved by	**dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering**

COURSE OVERVIEW

Course type		**specialism-related**
Course status		**compulsory**
Language of instruction		**English**
Semester of delivery	full-time programme	**Semester VI**
	part-time programme	
Pre-requisites		
Examination required (YES/NO)		**NO**
ECTS value		**3**

Mode of instruction		**lecture**	**class**	**laboratory**	**project**	**seminar**
No. of hours per semester	full-time programme	**15**			**30**	
	part-time programme					

LEARNING OUTCOMES

Category of outcome	**Outcome code**	**Course learning outcomes**	**Corresponding programme outcome code**

Knowledge	W01	The student has organised knowledge to support the solution of various engineering problems related to construction processes.	MiBM1_W03 MiBM1_W06 MiBM1_W07
	W02	The student has organised knowledge to support the solution of various engineering problems relating to the manufacture of machine components and the use of computer-aided tools.	MiBM1_W07 MiBM1_W11
	W03	The student is familiar with methods of designing technological processes. They have detailed knowledge of selected topics in the field of manufacturing basic machine components and devices.	MiBM1_W07 MiBM1_W11
Skills	U01	The student will be proficient in the use of computer software in the field of design and manufacture.	MiBM1_U02 MiBM1_U04
	U02	The student is capable of designing a technological process in the field of mechanics and engineering, selecting appropriate machines, technological equipment and tools for this purpose.	MiBM1_U08 MiBM1_U09
	U03	The student will be able to design a project and technological process for machine components using CAM software.	MiBM1_U04 MiBM1_U19
	U04	The student is proficient in the use of selected computer applications to support the design and manufacture of machine components. They will be able to design the machining of parts using Computer Aided Manufacturing (CAM) cycles and carry out machining simulations.	MiBM1_U04 MiBM1_U19
Competence	K01	The student will be prepared to critically evaluate their existing knowledge and the need to improve their professional qualifications. The student is aware of the need to continually expand their knowledge, including familiarising themselves with new applications and innovations in CAM systems.	MiBM1_K01 MiBM1_K03

COURSE CONTENT

Type of instruction lecture	Topics covered
lecture	Discussion of 4 and 5 axis machining. Defining the coordinate system. Determining the safe plane. Indexing axes to the normal vector. Tool axis definition. Path blending control. Machining a flat inclined surface at any angle. Indexing axes tangential to the path. Tool holder and workpiece collision control. Machine kinematics simulation. Change of indexing direction. Spindle-table collision check. Collision analysis in machining simulation. Discussion of simultaneous 4 and 5 axis machining. Tool input/output modification. Collision control with fixtures. Tool deflection. Definition of projection vector. Lead geometry definition. Multiple paths. Machining simulation. Feed control and optimisation.
project	As part of the project classes, a project will be developed using CAM software. Students will create the technological process for machining a selected object using a 4- and 5-axis machine.

ASSESSMENT METHODS

Outcome	Methods of assessment *(Mark with an X where applicable)*

code	Oral examination	Written examination	Test	Project	Report	Other
W01			X			
W02			X			
W03			X			
U01				X		
U02				X		
U03				X		
U04				X		
K01				X		

ASSESSMENT TYPE AND CRITERIA

Mode of instruction	Assessment type	Assessment criteria
lecture	non-examination assessment	The pass mark is a minimum of 50% for the final in-class test.
project	non-examination assessment	A pass mark for the project.

OVERALL STUDENT WORKLOAD

ECTS weighting												
No.	Activity type	Student workload										Unit
		full-time programme					part-time programme					
1.	Scheduled contact hours	L	C	Lb	P	S	L	C	Lb	P	S	h
		15			30							
2.	Other contact hours (office hours, examination)	2			2							h
3.	**Total number of contact hours**	**49**										h
4.	**Number of ECTS credits for contact hours**	**2,0**										ECTS
5.	**Number of independent study hours**	**26**										h
6.	**Number of ECTS credits for independent study hours**	**1,0**										ECTS
7.	**Number of practical hours**	**50**										h
8.	**Number of ECTS credits for practical hours**	**2,0**										ECTS
9.	**Total study time**	**75**										h
10.	**ECTS credits for the course** *1 ECTS credit = 25-30 hours of study time*	**3**										ECTS

READING LIST

1. Krzysztof Augustyn: NX CAM. Programowanie ścieżek dla obrabiarek CNC, Helion

2. Piotr Niesłony: Podstawy programowania maszyn CNC w systemie CAD/CAM Mastercam, BTC 2012
3. Przybylski W., Deja M.: Komputerowo wspomagane wytwarzanie maszyn. Podstawy i zastosowanie. WNT Warszawa 2007.
4. Augustyn K.: NX CAM – Virtual Machine. Podręcznik programisty CNC. Wydawnictwo CAMdivision, Miękinia 2016.
5. Mazur D., Rudy M.: Modelowanie w systemie NX CAD. Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 2016.
6. Menchen P., Budzyński A.: NX 8.5 Ćwiczenia. GMSystem Wrocław 2012.
7. Menchen P.: NX 9.0. Ćwiczenia „Od koncepcji do wytwarzania – krok po kroku”. GM System Wrocław 2013.