GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Control systems for technological equipement, PG_00064797		
Field of study	Mechatronics		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	Specialty subject group 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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
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. Piotr Sender	
	Teachers	dr inż. Piotr Sender	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	4.0	16.0	50

Subject objectives	Familiarization with the basics of programming multi-axis CNC machines and industrial robots operating with the use of various control systems

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W04] demonstrates knowledge encompassing selected issues in the field of detailed knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Mechatronics	The student is able to use codes for various basic control systems for CNC machine tools and industrial robots.	[SW1] Assessment of factual knowledge
[K7_U14] integrates information obtained from literature and other properly selected sources, including those in a foreign language, creatively interpreting and critically evaluating them, and drawing conclusions	The student has knowledge of obtaining information on the necessary parameters of the cutting process on multi-axis machine tools using tooling catalogues and catalogues of machine tool equipment	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K7_U04] creatively designs or modifies, either entirely or at least in part, a mechatronic system or process according to a given specification, considering both technical and non-technical aspects, estimating costs and utilizing design techniques appropriate for tasks within the scope of mechatronics	The student is able to program a basic machining process on CNC machines using basic commercial control systems	[SU1] Assessment of task fulfilment
[K7_W03] demonstrates structured and theory supported knowledge encompassing key issues in the field of Mechatronics, enabling developement and synthesis of stationary and non-stationary mechatronic systems, devices, and processes with continuous and discrete operation	The student has knowledge of the various kinematic systems used in multi-axis CNC machine tools and their application in real-world machining.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

Lecture:Fundamentals of design and operation of multi-axis CNC machine tools. Basic CNC controllers andtheir programming languages. Construction of a CNC machining programme. Basic programming in ISOCode(G-Code). Basic programming in Heidenhain. Parametric programming. Use of logic functions in CNCprogramming. 5-axis indexed and floating programming. Use of special cycles for machining holes andpockets. Use of contour programming in the machining of advanced shapes.Laboratory:Linearinterpolation. Circular interpolation. Tool radius compensation in circumferential machining. Special cycles for machining holes. Special cycles for machining rectangular pockets. Contour programming. Logicfunctions and parameterisation in CNC programming. Industrial robots programing

Prerequisites and co-requisites

Subject knowledge: Machining, Manufacturing Techniques, Machine Tools and Cutting Tools. Modern machine tools and manufacturing processes.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Laboratorium	100.0%	30.0%
Lectur	56.0%	70.0%

Recommended reading

Basic literature	1. Grzesik W., NIesłony P., Kiszka P.: Programowanie obrabiarek CNC. PWN Warszawa, 2020.2. Honczarenko J.: Obrabiarki sterowane numerycznie. WNT Warszawa 20083. Users Manual HEIDENHAIN Conversational TNC 640, 4, 20124. Lathe Operators Manual. December 2018, English, Original Instructions, Haas Automation Inc., U.S.A. HaasCNC.com
Supplementary literature	1. Kaushik Kumar, Chikesh Ranjan, J. Paulo Davim. CNC Programming for Machining. Springer International Publishing, 1stEdition, 2020, p.136. DOI: 10.1007/978-3-030-41279-12. Fundamentals of CNC Machining. A Practical Guide for Beginners. Compliments of Autodesk, Inc. USA, 20143. Graham T. Smith. CNC Machining Technology. Volume 3: Part Programming Techniques. Springer-Verlag London, 1993, p. 137. DOI: 10.1007/978-1-4471-1748-3
eResources addresses	

Example issues/ example questions/ tasks being completed

Write a part of a program describing the peripheral machining process of the contour shown on the drawing

Practical activites within the subject

Not applicable

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