GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Automation and robotization of industry, PG_00055058		
Field of study	Management and Production Engineering		
Date of commencement of studies	October 2024	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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	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. Bogdan Ścibiorski	
	Teachers	dr inż. Bogdan Ścibiorski dr inż. Michał Landowski	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	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	4.0	36.0	100

Subject objectives	Gaining knowledge and skills to analyze, introduce changes and design in the field of reducing human participation in industrial systems through automation and robotization. Getting acquainted with the problems of robotization of industry in conditions of flexible automation

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W10] has basic knowledge necessary to understand the economic determinants of engineering activities and economic law, to improve the work environment affecting productivity, costs and quality of work	Has basic knowledge of the legal conditions affecting the safe construction of robotic stations. The student has knowledge of the impact of risk reduction on the cost of an engineering solution, knows the problem of a robot as an incomplete machine.	[SW1] Assessment of factual knowledge
	[K6_U05] is able to prepare and present a presentation on the results of analysis of the tasks in the area of production engineering, is able to plan and carry out experiments, measurements, computer simulations and analyses and interpret the results and draw conclusions is able to use analytical methods, simulation and experiments for formulating and solving problems associated with production engineering	Can analyze industrial data using the structured query language and prepare basic reports, knows the issues of information flow between the layers of the production automation pyramid, knows the possibilities of data acquisition in automated production for the needs of financial systems. identifies the possibilities of collecting information for the needs of MES, SCADA, is able to calculate the OEE machine utilization rate, is able to simulate the robot's work, is able to carry out an experiment and perform the necessary engineering calculations, to make measurements in automated production conditions.	[SU5] Assessment of ability to present the results of task
	[K6_U07] is able to conduct a preliminary economical analysis of undertaken engineering activities, is able to can conduct a critical analysis and evaluation of existing production processes and courses of selected sections of manufacturing systems, is able to identify the needs of the application of technical solutions for automation and / or robotization production stations and formulate the specifications of the resulting benefits and limitations	Student initially analyzes the cost of configuring the production system, analyzes the course of the process and groups technological processes in robotic production on the production line and in the machining center,	[SU2] Assessment of ability to analyse information
	[K6_W04] has basic knowledge in the field of automation, robotics and control of production processes, has elementary knowledge of electrical and electronic applications in the production system, has basic knowledge of thermodynamics and fluid mechanics as well as the selection and design of hydraulic and pneumatic systems	Is oriented in the basics of robot programming and the possibility of using computer programs for process design and simulation, basic robotics-related algorithms, has a basic knowledge of PLC controllers, robot controllers, SCADA, HMI, industrial networks, can distinguish between analog and digital signals, has basic knowledge of electrical engineering and electronics, can select elements of pneumatics and hydraulics applicable in automated production.	[SW1] Assessment of factual knowledge
	[K6_W06] has knowledge of the life cycle of products and mechanical devices and systems, in the field of machine parts manufacturing techniques, as well as the possibilities and trends in the development of machines and production devices and process control	Has knowledge of the durability of machines, serviceability, repair and replacement of machines due to technical progress, including established practices, collecting information in computer-aided systems about the product from the market in order to improve technical and changes in technological processes.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_K01] feels the need for self-realization by learning throughout life, is looking for modern and innovative solutions in their actions, is able to think creatively and act in an entrepreneurial way	Is able to analyze data from industrial databases in order to look for new solutions, knows the directions of development of robotization in industry, machining centers, can search for information on the development of automation and robotization.	[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Course content – lecture Lecture: Basic concepts. The production system and mechanization, automation and robotization of the industrial process. Numerical control and automatic regulation in technological processes. Discrete and analog control. Pneumatic and hydraulic systems in automated industrial systems. Flexibility in industrial systems, robotic production cell, flexible production system, autonomous machining center, machining station, flexibility of the production line, flexible systems for assembling, packing, palletizing, sorting, welding, welding, cutting and machine operation. Technological, production and organizational flexibility in automated production systems. The degree of automation and robotization. Applications of robot effectors in industry. The automation pyramid. Manufacturing Execution Systems. Queries to industrial SQL databases. Industrial networks. Integrated manufacturing systems. Automation and robotization in the concept of industry 4.0. Trends in the development of industrial robots. Course content – laboratory Preparation of the robot to work: definition and calibration of tools, definition of systems - coordinates. Safety analysis of a robotic production cell. Basics of robot programming. Setting movements and object homing. Analysis of the position of the robot in the nest due to the subject power supply of the production stations, taking into account the working space, including the work table, and the peculiarities of the robot. Testing the availability of the working area during the robot's movements in a flexible nest Design of technological processes in a robotic nest with the use of articulated, linear movements in the Cartesian system, fast quasilinear and interpolation. Analysis and programming of the carton packing and handling process Dividing programs into subroutines for production, tool retrieval, transport and homing. Use of different types of sensors: to find and retrieve items in the program loop. Automation of the manufacturing process on the turning center.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	56.0%	60.0%
Reports on exercises practical	100.0%	40.0%

Recommended reading	Basic literature	1. Robotyzacja procesów produkcyjnych Kaczmarek Wojciech, Panasiuk Jarosław, Wydawca: Wydawnictwo Naukowe PWN, 2017 2. Programowanie robotów przemysłowych Wojciech Kaczmarek, Wydawca: Wydawnictwo Naukowe PWN, 2017, 3. Automatyzacja i robotyzacja procesów produkcyjnych, Jacek Domińczuk, Gabriel Kost, Piotr Łebkowski, 2021 4. Automatyzacja procesów produkcyjnych Mikulczyński Tadeusz, Samsonowicz Zdzisław, Więcławek Rafał, Wydawnictwo Naukowe PWN, 2021
	Supplementary literature	1. Mechanika analityczna - Dynamika maszyn i robotów - tom III. Mechanika teoretyczna i podstawy teorii mechanizmów i robotów. 2. Środowiska programowania robotów Kaczmarek Wojciech, Panasiuk Jarosław, Borys Szymon 3. Wydawnictwo: Wydawnictwo Naukowe PWN, 2017, 4. Automatyzacja nudnych zadań z Pythonem, Robert Górczyński, Helion, 2021 5. Automatyzacja przemysłu spożywczego. Studia przypadków. Rzeczywiste problemy z polskich firm rozwiązane na podstawie prawdziwych danych, Wydawnictwo Naukowe PWN, 2015 6. Sieci przemysłowe Profibus DP, ProfiNet, AS-i i EGD, Włodzimierz Solnik Zajda, BTC, 2018 7. Elastyczna automatyzacja wytwarzania. Obrabiarki i systemy obróbkowe, Honczarenko Jerzy, Wydawnictwo Naukowe PWN 8. Honczarenko J.: Elastyczna automatyzacja wytwarzania. Obrabiarki i systemy obróbkowe, WNT, Warszawa 2000 9. Honczarenko J. Obrabiarki sterowane numerycznie. Wydawnictwo Naukowe PWN, Warszawa 2017. 10. Honczarenko J., Roboty przemysłowe, Wydawnictwo Naukowe PWN, Warszawa 2010
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Practical activites within the subject	Not applicable	

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