GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Robotics and Mechatronics Systems, PG_00038281		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	second-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	Part-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	Department of Mechatronics and High Voltage Engineering -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Dąbkowski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	10.0	0.0	0.0	20

E-learning hours included: 0.0

Adresy na platformie eNauczanie:

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	20	4.0	26.0	50

Subject objectives

The aim of the course is to acquaint students with theoretical and practical issues related to industrial stationary robots (PTP and CPC methods of path lerning), construction of RV-2AJ - industrial stationary robots, hardware structure of their control system, program structure and basic instructions in Melfa Basic IV and Movemaster, structure and usage of COSIROP and COSIMIR programs, as well as the basics of mechatronic design.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K02] can interact and work in a group assuming various roles and identify priorities for the achievement of a specific task	Student realizes practical exercises in a group and develops protocols and reports from them.	[SK1] Assessment of group work skills [SK4] Assessment of communication skills, including language correctness [SK3] Assessment of ability to organize work
[K7_W06] has an extended knowledge of the design of automation components and devices, control and decision support systems control and decision support systems and complex mechatronic systems	The student knows the design process of the robot manipulator. He can diescribe all stages and knows the principles of kinetostatic and dynamic calculations.	[SW1] Assessment of factual knowledge

Subject contents	Lecture: Introduction to robot control and programming. Tasks of control systems: reaction to signals from measurement systems - binary drives, control of continuous motion, control and coordination of robot sub-systems, work sequence - linear and branched programs. Point-to-point control (PTP) and continuous path control (CPC) systems. Classification of control systems - control of teleoperators, sequential control (relay systems, with PLC devices), numerical control systems with hardware and computer structure. An overview of the methods of navigation of industrial mobile robots. Program structure in Mitsubishi programming languages: Melfa Basic IV and Movemaster. Basic functions of Melfa Basic IV and Movemaster language - instructions controlling the position and movement of the manipulator arm, program control instructions, instructions controlling the tool. COSIROP structure for controlling Mitsubishi Melfa robots. The structure and usage of the COSIMIR environment to creating and simulating robotic production workcells. The process of designing the robot manipulator. Design and construction calculations. Laboratory: The laboratory includes a set of exercises related to the programming of stationary robots and the construction of robotic production cells in a computer environment.
Prerequisites and co-requisites	Basics of robotics and mechanics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Receive the credit for the lecture.	60.0%	50.0%
Receive the credit for the practical laboratory.	60.0%	50.0%

Recommended reading

Basic literature	1. Craig J.: Wprowadzenie do robotyki, WNT, Warszawa: 1995. 2. Kozłowski K., Dutkiewicz P., Wróblewski W.: Modelowanie i sterowanie robotów, PWN, Warszawa: 2003. 3. Tchoń K., Mazur A., Dulęba I., Hossa R., Muszyński R.: Manipulatory i roboty mobilne, Akademicka Oficyna Wydawnicza PLJ, Warszawa: 2000. 4. Dąbkowski M. Podstawy robotyki - Laboratorium. Skrypt Politechniki Gdańskiej: 2012. 5. Instruction manual. CR1/CR2/CR3/CR4/CR7/CR8/CR9 Controller. Detailed explanations of functions and operations. Mitsubishi Industrial Robot. Melfa BFP-A5992-M. 2007. 6. Instruction manual. CR1/CR2 Controller. Explanations of Movemaster commands. Mitsubishi Industrial Robot. Melfa BFP-A8056-D. 2005. 7. Tomaszewski K. : Roboty przemysłowe. Projektowanie układów mechanicznych. Wydawnictwa Naukowo-Techniczne. Warszawa: 1993.
Supplementary literature	1. Instruction manual. CR1/ CR1B Controller. Controller setup, basic operation and maintenance. Mitsubishi Industrial Robot. Melfa BFP-A8054-H. 2005. 2. Instruction manual. RV-1A/2AJ Series. Robot arm setup and maintenance. Melfa BFP-A8052-D. 2002.
eResources addresses	

Example issues/ example questions/ tasks being completed	1. Principles of designing process (formulation of a project task, preparation of a conceptual design, preparation of a construction design, preparation of an implementation project), 2. Development of the concept of the manipulation system (design task, preparation of a list of requirements, synthesis of the kinematic structure of the manipulator, kinematic and dynamic calculations of the manipulator), 3. Design and construction calculations: kinetostatic and then dynamic - selection of drives. 4. Layers of control systems of industrial robots. 5. Control methods of stationary robots (PTPC and CPC). 6. Tasks of industrial robot control systems. 7. Methods of interpolation the trajectory of industrial robot motion. 8. Basic instructions in Melfa Basic IV and Movemaster. 9. Division and characteristics of navigation methods for mobile robots.
Work placement	Not applicable