GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Industrial Robotics - Laboratory, PG_00067977		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2027/2028
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	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Signals and Systems -> Faculty of Electronics Telecommunications and Informatics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Fiertek	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	15.0	0.0	0.0	15

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	15	1.0	9.0	25

Subject objectives

The aim of the subject is to teach the operation and programming of industrial robots. Familiarization with simulation environments of industrial robots from Kawasaki and Mitsubishi (K-Roset and RT-ToolBox2 software). After familiarizing themselves with robots in a virtual environment, students start working with real robots: Kawasaki (FA06E, RS03N) and Mitsubishi (RV-12SDL). As part of the classes, students become familiar with the safety rules of robot operation. The tasks performed include: cooperation of the robot with the transport line model and manipulation tasks: moving blocks, stacking a tower, etc., the issue of robot tool calibration and definition of the working coordinate system - as part of the task of drawing a drawing by the robot.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U12] can analyze the operation of components, circuits and systems related to the field of study, as well as measure their parameters and examine technical specifications, and plan and conduct experiments related to the field of study, including computer simulations and measurements, and interpret obtained results and draw conclusions	The student is able to conduct research and experiment in a simulation environment. Draws conclusions from the obtained results, repeats experiments until an acceptable result is obtained.	[SU1] Assessment of task fulfilment
[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study	The student became familiar with simulation environments and programming techniques for Kawasaki and Mitsubishi robots. The student learned how to program Kawasaki and Mitsubishi robots. The student learned basic image processing techniques. The student became familiar with the methodology for calibrating industrial robots. The student became familiar with the method of communicating between the robot and external devices.	[SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>1. Computer classes: K-Roset simulation environment of Kawasaki robots. Familiarization with the environment, familiarization with robot operation, writing a simple program implementing the planned tool trajectory.

2. Computer classes: test of Kawasaki robot operation in the K-Roset environment. Students write a program run on a virtual robot, performing a given task: e.g. moving a block from one, moving the tool in a spiral.

3. Computer classes: RT Toolbox simulation environment of Mitsubishi robots. Familiarization with the environment, familiarization with robot operation, writing a simple program implementing the planned tool trajectory.

4. Laboratory classes: Implementation of a selected task in the field of image processing based on the Adaptive Vision Studio program in Lite version by Future Processing Sp. z o. o..

5. Laboratory classes: Calibration of the robot at a station equipped with the RS03N robot by Kawasaki. Drawing a drawing by a robot. The program for drawing the drawing should be prepared in advance (at home).

6. Laboratory classes: Cooperation of the Kawasaki FA06E robot with a model of a transport line. The robot's task is to move blocks from the warehouse to the transport tray and then unload the tray. At the same time, students perform programmatic operation of the operator interface, defined in the robot's control panel window (the functionality of the operator interface should be programmed in the robot program).

7. Laboratory classes: Operation of the Mitsubishi robot - implementation of tasks related to moving blocks.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Passing the lecture "Fundamentals of industrial robotics".</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Practical exercises, all tasks must be passed with a minimum of 50%</td><td>50.0%</td><td>100.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Fiertek P., Tatara M.: Podstawy Robotyki - Laboratorium. Skrypt Politechniki Gdańskiej: 2017.

2. M. W. Szelerski, Robotyka przemysłowa. Teoria, budowa, eksploatacja, wyd. Kabe, 2021</td></tr>
<tr><td>Supplementary literature</td><td>1. W. Kaczmarek, J. Panasiuk, Programowanie robotów przemysłowych, 2018</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Programming a robot that moves blocks according to the task imposed by the instructor (changing the order of blocks, setting up a tower, etc.),

2. Drawing a picture on a piece of paper using a robot equipped with a marker
3. Developing an image processing algorithm that performs the given task, e.g. detecting missing elements, sorting elements by shape, color and size.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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