GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer Design of Manipulators and Robots, PG_00038126		
Field of study	Automation, Robotics and Control Systems		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biomechatronics -> Faculty of Electrical and Control Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Dąbkowski	
	Teachers	dr inż. Mariusz Dąbkowski	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	30.0	0.0	45

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	45	4.0	26.0	75

Subject objectives

The aim of the course is to show students, how to realize the designing process of mechatronic devices and to teach them how to do it in practice during designinig robot's manipulator.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K02] can work in a group taking on different roles in it	Develops technical text and drawing documentation of the mechanical and drive parts of the manipulator designed by the group.	[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work [SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
[K6_W10] has basic knowledge related to mechatronics and robotics systems	Lists stages of designing stationary robots. Characterizes individual phases of the design process. Performs calculations for the problem of direct and inverse kinematics for a selected 3-degree-of-freedom scheme. Calculates strength indicators of structures. Selects drives and designs drive transmission systems. Prepares technical documentation (calculations and drawings) of the designed manipulator. He uses CAD-AutoCAD and Inventor programs.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U08] can design and build systems and devices in the field related to mechatronics and robotics systems	Designs the mechanical and drive parts of a robot manipulator with 3 degrees of freedom. Uses CAD programs.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools

<table>
<tr><td>Subject contents</td><td>Lecture: Reminder of knowledge about technical drawing. Issues concerning the design of robots: the design methodology (formulation of the design"s task, preparation of conceptual design, preparation of constructional design, preparation of the project of ralization), creating the concept of manipulator (the task of designing, drawing up a list of requirements, the synthesis of kinematic structure of manipulator, the initial calculation of kinematics and dynamics), calculations of the construction (industrial robot functional structure, mechanisms of orienting, manipulator carrier system, propelling manipulator, grippers and their accuracy of positioning). Project: Design of the robot stationary supporting structure to carry out defined task, including: a description of the kinematics and dynamics, the basic calculation of design and construction of the mechanical system, the choice of drives and technical documentation with drawings. Design of the hardware part of the CNC system of the robot.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>A fluent using of AutoCad environment. Knowledge of mechanical calculations of structure strength.</td></tr>
<tr><td>Assessment methods and criteria</td><td>
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<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project</td><td>100.0%</td><td>75.0%</td></tr>
<tr><td>Test</td><td>50.0%</td><td>25.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Spong. M. W., Vidyasagar M.: Dynamika i sterowanie robotów. Wydawnictwa Naukowo-Techniczne. Warszawa: 1997.
2. Morecki A, Knapczyk J.: Podstawy robotyki. Warszawa: WNT 1999.
3. Niederliński A.: Roboty przemysłowe. Warszawa: WSiP 1981.
4. Honczarenko J.: Roboty przemysłowe. Budowa i zastosowanie. WNT Warszawa, 2004.
5. Dobrzański T.: Rysunek techniczny maszynowy. Wydawnictwa Naukowo-Techniczne. Warszawa: 2021.</td></tr>
<tr><td>Supplementary literature</td><td>1. Morecki A., Knapczyk. J.: Podstawy robotyki. Teoria i elementy manipulatorów i robotów. Wydawnictwa Naukowo-Techniczne. Warszawa: 1999.
2. Tomaszewski K. : Roboty przemysłowe. Projektowanie układów mechanicznych. Wydawnictwa Naukowo-Techniczne. Warszawa: 1993.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
KOMPUTEROWE PROJEKTOWANIE MANIPULATORÓW I ROBOTÓW [ARiSS][2024/25] - Moodle ID: 43363
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=43363</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Principles of design process (task definition, preparation of conceptual project, preparation of constructional project, preparation of the executive project),
2. Development of the concept of the manipulator (task design, a list of requirements, the synthesis of the kinematic structure of the manipulator, kinematic and dynamic calculations),
3. Structural calculations: static and dynamic - choosing the drives.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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