



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 2021	Academic year of realisation of subject			2023/2024		
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		Katedra Biomechatroniki -> 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 designing robot's manipulator.						
Learning outcomes		Course outcome		Subject outcome		Method of verification		
		[K6_W10] has basic knowledge related to mechatronics and robotics systems		Student lists the basic 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 basic strength indicators of structures. Selects drives and designs drive transmission systems. Prepares technical documentation (calculations and drawings) of the designed manipulator. He can use CAD-AutoCAD and Inventor programs.		[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
		[K6_K02] can work in a group taking on different roles in it		Student develops technical text and drawing documentation of the mechanical and drive parts of the manipulator designed by the group.		[SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness [SK3] Assessment of ability to organize work [SK1] Assessment of group work skills		
		[K6_U08] can design and build systems and devices in the field related to mechatronics and robotics systems		Student designs the mechanical and drive parts of a robot manipulator with 3 degrees of freedom. Uses CAD programs.		[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		

Subject contents	Lecture: Reminder of basic knowledge about technical drawing. Basic 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 realization), 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.		
Prerequisites and co-requisites	A fluent using of AutoCad environment. Knowledge of mechanical calculations of structure strength.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project	100.0%	75.0%
	Test	50.0%	25.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 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. 	
	Supplementary literature	<ol style="list-style-type: none"> 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. 	
	eResources addresses	Adresy na platformie eNauczanie: KOMPUTEROWE PROJEKTOWANIE MANIPULATORÓW I ROBOTÓW [2023/24] - Moodle ID: 36023 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36023	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 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. 		
Work placement	Not applicable		