

GDAŃSK UNIVERSITY

Subject card

Subject name and code	Manipulators and industrial robots, PG_00055470								
Field of study	Mechatronics								
Date of commencement of studies	October 2021		Academic year of realisation of subject			2023/	2023/2024		
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	6		ECTS credits			3.0			
Learning profile	general academic pro	eneral academic profile		Assessment form			exam		
Conducting unit	Institute of Mechanics	and Machine	Design -> Facı	ulty of Mechani	cal Eng	ineering	g and Ship T	echnology	
Name and surname	Subject supervisor		dr inż. Michał Mazur						
of lecturer (lecturers)	Teachers		dr inż. Michał Mazur						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
	Number of study hours	15.0	0.0	30.0	0.0		0.0	45	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity Participation ir classes includ plan				Self-study SUM				
	Number of study hours	45		2.0		28.0		75	
Subject objectives	The aim of the course is to acquaint students with the construction, basic elements, programming and operating principle of industrial robots and manipulators.								
Learning outcomes	Course outcome		Subject outcome		Method of verification				
	[K6_W10] has a basic knowledge about development trends in terms of engineering and technical sciences and scientific disciplines: Mechanical Engineering, Automation, Electronics and Electrical Engineering, adequate for Mechatronics curse		has a basic knowledge on developments in the field of Robotics.			[SW3] Assessment of knowledge contained in written work and projects			
	[K6_U02] is able to elaborate on specific mechatronic topics as well as topics from engineering and technical sciences and disciplines such as Mechanical Engineering, Automation, Electronics and Electrical Engineering		to select the appropriate components of the proposed			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools			
	[K6_U10] is able - while formulating and solving mechatronic engineering tasks - to notice their systemwide and non- technical aspects		engineering tasks robotics -			[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools			

Prerequisites and correquisites Knowledge of mathematics, physics, mechanics, strength of materials, base machine design. Assessment methods and criteria Subject passing criteria Passing threshold Percentage of the final grade Laboratory Exercises 100.0% 40.0% Recommended reading Basic literature Craig J., Wprowadzenie do robotyki. Mechanika I sterowanie, WNT, Warszawa, 1993. Honczarenko J., Roboty przemysłowe, Budowa I zastosowanie, WNT, Warszawa, 2002. Jarzębowska E., Podstawy dynamik mechanizmów i manipulatorów, Oforya Wydawnicza, A.J., Podstawy robotyki. Teoria i elementy manipulatorów (Norpa Wydawnicza, A.J., Podstawy robotyki. Teoria i elementy manipulatorów, Oforya Wydawnicza, K.J., Podstawy robotyki. Teoria i elementy manipulatorów nobilnych I machanizmów i manipulatorów (WNT, Warszawa, 2002. Supplementary literature Duleba I., Metody i algorytmy planowania ruchu robotów mobilnych I manipulatorytmy planowania ruchu robotos do? 1. What is an industrial robot: 1. What is an industrial robots: 6. Introduce and desorbe the basic kinematic structures of stationary industrial robots. 7. What is dicusse the basic units and system of an industrial robot. 8. Adventages and disadvantages of robots with a parallel structure. 10. Lista applications of mobilis robots. 11. What is a mani	Subject contents	 LECTURES Introduction to robotics, the basic concepts and definitions; Classification of robots and manipulators. Basic systems and units of robots - the control system, the mechanism of motion transmission. The parameters describing the manipulators and robots - the accuracy and repeatability of movements. Effectors of industrial robots; Classification of grippers, Motion transmission and equipment of grippers. Kinematics of robots and manipulators; Rotations and assembling of rotations, Homogeneous transformations, Denavit-Hartenberg notation. Simple and inverse kinematics. The dynamics of robots; Lagrange equations, Newton-Euler equations. Simple and inverse dynamics. Geometric and functional characteristics and manipulators motion planning. Analysis of the manipulator workspace. Sensors used in industrial robotics. Fundamentals of manipulators and robots control. Examples of control systems. The basics of robots programming; Programming languages. Methods of shapes and objects identifying; Tracking of moving objects and determination of movement parameters. Control of mobile robots. Examples of applications of industrial robots and manipulators. LABORATORY EXERCISES The construction and programming of industrial stationary robots. Programming of trajectory of industrial robot effector. Cooperation of the industrial robot with conveyor feeder. The methods of measurement and analysis of functional characteristics of industrial robots. The construction and programming characteristics of industrial robots. The construction and programming of mobile robots. The construction and programming of industrial robot with conveyor feeder. The methods of measurement and analysis of functional characteristics of industrial robots. The construction and programming of mobile robots. The construction and programming of mobile robots. The construction and programming of mobile robots. 						
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Written examination 50.0% 60.0% Recommended reading Basic literature Craig J, Wprowadzenie do robotyki. Mechanika i sterowanie, WNT, Warszawa, 1993. Honczarenko J, Roboty przemysłowe. Budowa i zastosowanie, WNT, Warszawa, 2002. Jarzębowska E., Podstawy dnynaniki mechanizmów i manipulatorów, Ofkoya Wydawnicza Politechniki Warszawa, 1993. Morecki A, Knapczyk J, Politechniki Warszawa, 1993. Morecki A, Knapczyk J, Kędzior K, Teoria mechanizmów i manipulatorów, WNT, Warszawa, 2002. Supplementary literature Dułęba I, Metody i algorytmy planowania ruchu robotów mobilnych i manipulacyjnych, Akademicka Oficyna Wydawnicza EXIT, Warszawa, 2001. eResources addresses Adresy na platformie eNauczanie: Manipulatory i roboty przemysłowe, WL, MTR, sem.06, letni 23/24 (PG_00055470) - Moodle ID: 38055 Example issues/ example questions/ tasks being completed 1. What is an industrial robot? 3. What is a mobile robot? 3. Wata is a manipulator? 4. What does roboties do? 3. Wata is a mobile robot? 5. Applications of industorial tasks being completed 1. What is an industrial robot. 7. What is a mobile robot? 3. Wata is a manipulacy? 8. Wata is a manipulacy? 4. What does roboties do? 9. Wata is a manipulacy? 9. Wata is a manipulacy? 9. Wata is a manipulacy? 1. Whata is a manipulacy? 9. Wata is a manipulacy? 1. Whata is a maninite an expremy			, i i i i i i i i i i i i i i i i i i i	<u> </u>				
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manipulacyinych, Akademicka Oficyna Wydawnicza EXIT, Warszawa, 2001. eResources addresses Adresy na platformie eNauczanie: Manipulatory i roboty przemysłowe, WL, MTR, sem.06, letni 23/24 (PG_00056470) - Moodle ID: 38035 Example issues/ example questions/ tasks being completed 1. What is an industrial robot? What is a mainpulator? 2. What is a mainpulator? 4. What does robotics do? 5. Applications of industrial robots. 6. Introduce and describe the basic kinematic structures of stationary industrial robots. 7. What is the difference between a robot with a kinematic structure. 10. List applications of mobile robots. 11. What is a workspace? 12. What is a manipulator proble when any system of an industrial robots. 7. What is the dust stak of simple kinematics? 13. What is a manipulator space? 14. What is the inverse of kinematics? 15. What is the control system. 16. Describe methods of programming industrial robots. 17. What is repeatability? 20. Applications and types of interpolation in robotics. 13. What is repeatability? 20. Applications and types of interpolation in robotics. 21. List the advantages and disadvantages of a perumatic drive for industrial robots. 22. What is repeatability? 20. Applications and types of int	Recommended reading	Warszawa, 1993. Honczarenko J., Roboty przemysłowe. Budowa i zastosowanie, WNT, Warszawa, 2002. Jarzębowska E., Podstawy dynamiki mechanizmów i manipulatorów, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 1998. Morecki A., Knapczyk J., Podstawy robotyki. Teoria i elementy manipulatorów i robotów, WNT, Warszawa, 1993. Morecki A., Knapczyk J., Kędzior K., Teoria						
Manipulatory i roboty przemysłowe, WL, MTR, sem.06, letni 23/24 (PG_00055470) - Moodle ID: 38055 https://enauczanie.gg.edu.pl/moodle/course/view.php?id=38055 Example questions/ tasks being completed 1. What is an industrial robot? 2. What is a mobile robot? 3. What is a mobile robot? 3. What is a manipulator? 4. What does robotics do? 5. Applications of industrial robots. 6. Introduce and describe the basic kinematic structures of stationary industrial robots. 7. What is the difference between a robot with a kinematic structure in the Cartesian system and a robot with a kinematic structure in an anthropomorphic system? 8. List and discuss the basic units and systems of an industrial robot. 9. Advantages and disadvantages of robots with a parallel structure. 10. List applications of mobile robots. 11. What is the task of simple kinematics? 12. What is a manipulation space? 13. What is the task of simple kinematics? 14. What is the task of simple kinematics? 15. Tasks of the control system. 16. Describe methods of programming industrial robots. 17. What are serve drives? 18. What is positioning accuracy? 19. What is peetability? 20. Applications and types of interpolation in robotics. 21. List the advantages and disadvantages of a pneumatic drive for industrial robots. <t< td=""><td></td><td>Supplementary literature</td><td colspan="5">manipulacyjnych, Akademicka Oficyna Wydawnicza EXIT, Warszawa,</td></t<>		Supplementary literature	manipulacyjnych, Akademicka Oficyna Wydawnicza EXIT, Warszawa,					
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