Subject card

Subject name and code	Basics of Robotics, PG_00047578
Field of study	Automatic Control, Cybernetics and Robotics

Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam

Conducting unit	Department of Automatic Control -> Faculty of Electronics, Telecommunications and Informatics
Name and surname of lecturer (lecturers)	Subject supervisor: dr inż. Piotr Fiertek
	Teachers: dr inż. Piotr Fiertek

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30	3.0	42.0	75

Subject objectives	The aim of the course is introduction into the basic issues concerning stationary industrial robots such as: various divisions of robots, their tasks, construction, safety issues, methods of their study, tasks of control systems, Denavit-Hartenberg notation.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W01] Knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student specifies and characterizes the causes and stages of development of robots. He defines and classifies industrial robots. He characterizes the construction of industrial manipulators. He describes the basic kinematic schemas. He characterizes the drives of industrial robots, grippers, and technology heads. He characterizes the methods of securing robotic systems. He characterizes robot"s power units. He lists and characterizes tasks of stationary robot"s control systems.	[SW1] Assessment of factual knowledge
	[K6_W03] Knows and understands, to an advanced extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	He defines the task of simple and inverse kinematics of stationary robots. He defines the Denavit-Hartenberg"s description of the manipulator to solve the task of simple kinematics.	[SW1] Assessment of factual knowledge

Subject contents	Introduction: Robotics in the XXI century. Historical outline of development in robotics and the current situation. The scope and problems of robotics researches. Laws of robotics. Industrial robots as a tool: Interpretation of different forms of human work. Reasons for the development of robots. Stages of development of industrial robots. Construction of industrial robots: the basic assemblies and systems of industrial robots. Monolithic manipulators with serial kinematic structure. Robots and manipulators with parallel kinematic structures. The mechanical design of the robot. Drives industrial robots: Hydraulic drives. Pneumatic actuators. The pneumatic cascade and pneumatic power amplifier. Electric drives. The mechanisms used to transmit motion. Grippers and heads of industrial robots: Purpose and overall handling characteristics. Construction. Examples of grippers and tools. Robot"s control systems: Tasks of control systems. Computer numerical control. Programming robots by learning. Some aspects of the introduction of robots to industry: Methodology introduction of industrial robots to the industry. Characteristics of industrial robots and their tests. Safety at robotic workstations: Danger on robotic workstations. Causes of accidents at work in robotic systems. General principles of safe robot system integration. The methods of securing robotic systems. The problem of simple and inverse kinematics of manipulators.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		50.0%	100.0%
Recommended reading	Basic literature	1. Craig J.: Wprowadzenie do robotyki. Mechanika i sterowanie. Wydawnictwo Naukowo-Techniczne. Warszawa. 1993. 2. Spong. M. W., Vidyasagar M.: Dynamika i sterowanie robotów. Wydawnictwo Naukowo-Techniczne. Warszawa. 1997. 3. Honczarenko J.: Roboty przemysłowe. Budowa i zastosowanie. Wydawnictwo Naukowo-Techniczne. Warszawa. 2004.	
		2. Spong. M. W., Vidyasagar M.: Dynamika i sterowanie robotów. Wydawnictwo Naukowo-Techniczne. Warszawa: 1997.	
		3. Morecki A., Knapczyk. J.: Podstawy robotyki. Teoria i elementy manipulatorów i robotów. Wydawnictwo Naukowo-Techniczne. Warszawa: 1999.	
		3. Honczarenko J.: Roboty przemysłowe. Budowa i zastosowanie. Wydawnictwo Naukowo-Techniczne. Warszaawa: 2004.	
	Supplementary literature	1. Dąbkowski M.: Podstawy Robotyki - Laboratorium. Skrypt Politechniki Gdańskiej. 2012.	
		2. Niederliński A.: Roboty przemysłowe. Warszawa: WSiP 1981.	
	eResources addresses	Adresy na platformie eNauczanie:	

Example issues/ example questions/ tasks being completed	1. Basic kinematic schemas of serial and parallel industrial stationary robots.
	2. Generations of robots.
	3. Reasons for the development of robots.
	4. Drives of robots.
	5. Robot hands.
	6. Methodology for the introduction of robots to industry.
	7. Parameters of robots and methods of their study.
	8. Tasks of robot control systems.
	9. Interpolation methods of trajectory for stationary robot movement.
	10. Simple kinematics - using DH notation to describe the basic schemas of serial robots.
	11. Inverse kinematics of basic kinematic schemas of serial robots.
Work placement	Not applicable