



Subject card

Subject name and code	Robotocs, PG_00057371						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Michał Mazur				
	Teachers		dr inż. Marek Chodnicki dr inż. Michał Mazur				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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	4.0		16.0	50	
Subject objectives	Expanding knowledge about robots and manipulators. Some specific issues relating to the actors, sensors and control systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W05] possesses profound knowledge on the operation of complex systems and mechanical devices, including process equipment	Students know how robots work.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_W06] possesses organized, profound knowledge necessary for designing and optimization of complex technological processes, modelling and calculations using numerical methods, knows modern manufacturing methods and tools for designing manufacturing processes of machines, devices, their elements and components	Students have theoretically founded knowledge related to the field of robots.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U05] is able to plan and conduct the experimental research determining the parameters of a device or system, assesses the usability and correctly selects methods and tools, is able to interpret the results and estimate the measurement errors and is able to apply computer systems to simulate the operation of a machine or technology	Students analyze the knowledge contained in scientific publications in order to solve the problems posed to them.			[SU2] Assessment of ability to analyse information		

Subject contents	<p>LECTURE: 1 Introduction 2 Modern trends in the development of two industrial robots 3 Sensors 4 Signal Conditioning 5 Tactile and haptic sensors 6 Methods of localization of mobile robots 7 Effectors 8 Elements of power supply systems 9 Drive chain elements used in robots 10 Tools for robot programming and simulation</p> <p>Laboratory: 1 Programming delta type robot task for ABB IRB360 robot 2 Programming collaborative robot tasks for HCR3a robot using OnRobot vision system 3 Programming of industrial robot movements with force sensor feedback for Nachi NC04 robot</p>		
Prerequisites and co-requisites	Basics of mathematics, mechanics and automation, the ability to program engineering calculations.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Team projects	50.0%	40.0%
	Midterm colloquium	50.0%	60.0%
Recommended reading	Basic literature	<p>Craig J., J., Wprowadzenie do robotyki. Mechanika i sterowanie, WNT, 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 mechanizmów i manipulatorów, WNT, Warszawa 2002 Vidyasagar M., Spong Mark W.: Dynamika i sterowanie robotów. WNT, Warszawa 1997</p>	
	Supplementary literature	<p>Dulęba I., Metody i algorytmy planowania ruchu robotów mobilnych i manipulacyjnych, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2001 Giergiel M. J., Hendzel Z., Żylski W.: Modelowanie i sterowanie mobilnych robotów kołowych. PWN, Warszawa 2002 Tchoń K., Mazur A., Dulęba I., Hossa R., Muszyński R.: Manipulatory i Roboty Mobilne. Modele, planowanie ruchu, sterowanie. Warszawa: Akademicka Oficyna Wydawnicza PLJ 2000</p>	
	eResources addresses	<p>Adresy na platformie eNauczanie: Robotyka, WL, MiBM, sem.01, letni 2023/24 (PG_00057371) - Moodle ID: 38060 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=38060</p>	
Example issues/ example questions/ tasks being completed	<p>What is a sensor? Advantages and disadvantages of digital sensors? Advantages and disadvantages of analog sensors? Discuss conditioning. Haptic systems. Robots development trends. Advantages and disadvantages of ultrasonic sensors for distance measurement. List the location methods. Techniques for measuring distance. Advantages and disadvantages of monolithic architecture. Advantages and disadvantages of distributed architecture. Robust programming - fault detection techniques. Application of real-time systems in robot control. What is SLAM? What do we use quaternions for? Discuss Spherical Linear Interpolation Applications of dual quaternions. What is ROS? Discuss MoveIT Discuss 2D Navigation in a ROS environment Discuss the control of the quadcopter What is Zero Moment Point?</p>		
Work placement	Not applicable		

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