GDAŃSK UNIVERSITY OF TECHNOLOGY

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	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 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
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	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
Supplementary literature	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
eResources addresses	Adresy na platformie eNauczanie: Robotyka, WL, MiBM, sem.01, letni 2023/24 (PG_00057371) - Moodle ID: 38060 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38060

Example issues/ example questions/ tasks being completed	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 qaudrocopeter What is Zero Moment Point?
Work placement	Not applicable