GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056133		
Field of study	Mechatronics		
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	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. 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	0.0	0.0	30

Subject objectives

Introduction to navigation and location systems used in mobile robotics.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U06] is able to identify and formulate specification of simple, practical engineering tasks, distinctive for mechatronics	is able to identify and formulate the specification of simple engineering tasks during the design and selection of components for navigation systems of mobile robots	[SU2] Assessment of ability to analyse information
[K6_W11] has a basic knowledge about the life cycle of mechatronic systems and objects	He has basic knowledge about the life cycle of mobile robots and their navigation systems.	[SW1] Assessment of factual knowledge
[K6_U05] is able to use properly choosen tools to compare design solutions of elements and mechatronics systems according to given application and economic crtierions (e.g. power demand, speed, costs)	can use properly selected tools to compare the solutions of navigation systems of mobile robots	[SU4] Assessment of ability to use methods and tools
[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 of development trends in the field of navigation systems and the location of mobile robots	[SW1] Assessment of factual knowledge
[K6_W08] knows and understands design and production processes of elements and simple mechatronic devices	knows and understands the processes of designing and building navigation systems for mobile robots	[SW1] Assessment of factual knowledge

Subject contents	1 Basics of ROS2 system programming2. Support for vision systems in the ROS2 environment, creating an OctoMap obstacle map using the OnRobot Eyes vision system3. Navigation of mobile robots using Navigation-ROS2 on the example of the ROSBot2 Pro mobile robot with normal wheels and special wheels4. Techniques for creating maps and locating mobile robots5. Algorithms for generating trajectories of mobile robots4. Modeling of manipulators in the MoveIt-ROS2 environment on the example of the Hanwha HCR3A collaborative robot5 Planning manipulator trajectories in the MoveIt-ROS2 environment on the example of the HCR3A, NC04 and IRB360 robots6 Robot control using deep reinforcement learning techniques7 Programming inspection tasks using the ROSBot2 Pro mobile robot8 Behavioral control on the example of ROSBot2 Pro
Prerequisites and co-requisites	Knowledge and experience on Fundamentals of automatic control. Knowledge and experience in Informatics (sem. II, IV). Knowledge on Mechatronic systems components.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Midterm colloquium	60.0%	60.0%
Team projects	100.0%	40.0%

Recommended reading	Basic literature	Kozłowski K.: Modelowanie i sterowanie robotów, PWN, Warszawa, 2003. Dulęba I.: Metody i algorytmy planowania ruchu robotów mobilnych i manipulacyjnych, EXIT, Warszawa, 2001 M. J. Giergiel, Z. Hendzel, W. Żyliński: Modelowanie i sterowanie mobilnych robotów kołowych. Wydawnictwo Naukowe PWN, Warszawa 2002. K. Tchoń, A. Mazur, I. Hossa, R. Dulęba: Manipulatory i roboty mobilne. Wydawnictwo PLJ, Warszawa 2000. T. Zielińska: Maszyny Kroczące. Podstawy, projektowanie, sterowanie i wzorce biologiczne. Wydawnictwo Naukowe PWN, Warszawa 2003.
	Supplementary literature	J. Borenstein, Where am I - Systems and Methods for Mobile Robot Positioning.1996
	eResources addresses	Adresy na platformie eNauczanie: Systemy nawigacji w robotyce mobilnej, WL, MTR, sem.06, letni 23/24 (PG_00056133) - Moodle ID: 38058 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38058
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	