GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Robotics and haptics systems, PG_00057036
Field of study	Mechatronics

Date of commencement of studies	February 2023	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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment

Conducting unit	Zakład Mechatroniki -> 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	30.0	0.0	0.0	45
	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	45	10.0	45.0	100

Subject objectives	The aim of the subject is to familiarize students with the construction, application and principle of operation of haptic systems used in robotics.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W10] knows development trends and most important new achievements in technical sciences and science disciplines: Mechanical Engineering, Automation, Electronics and Electrical Engineering and related: Informatics and Materials Engineering	knows developmental trends and the most important new achievements in the field of hapting solutions	[SW1] Assessment of factual knowledge
	[K7_U02] potrafi przygotować opracowanie naukowe w języku polskim i krótkie doniesienie naukowe w języku obcym dotyczące szczegółowych zagadnień z zakresu Mechatroniki, a także – dziedzin nauk technicznych i dyscyplin naukowych: Inżynieria Mechaniczna oraz Automatyka, Elektronika i Elektrotechnika, i pokrewnych, właściwych dla mechatroniki, przedstawiające wyniki własnych badań naukowych	is able to prepare a scientific study in Polish and a short scientific report in a foreign language regarding detailed issues related to haptics in use for control of robots	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K7_W06] has detailed, supported by the theory knowledge in terms of mechatronic design, mechatronic systems and machines, devices and process where they are used	has theoretically included detailed knowledge related to the design issues of devices using haput solutions	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation

Subject contents	Lecture1. Basic knowledge about haptics and robotics2. Design of haptic systems3. Software4. Overview of solutionsLab1. Exercises with 3D Touch haptic sensor 2. Programming the HCR3a collaborative robot using a force sensor3. Gesture control of the Unitree GO1 robot4. Implementation of tasks with feedback from the force sensor installed on the NC04 robot5 Following a human on the example of the ROSBot2 Pro or Unitree GO1 mobile robot
Prerequisites and co-requisites	Knowledge in the field of mechatronic design, automation and robotics, programming and vibration analysis.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	50.0%	60.0%
	Report	50.0%	40.0%

Recommended reading	Basic literature	Janschek, Klaus. *Mechatronic systems design: methods, models, concepts*. Springer Science & Business Media, 2011. Hatzfeld, Christian, and Thorsten A. Kern. *Engineering haptic devices*. Springer London Limited, 2016.
	Supplementary literature	Kaltenbacher, Manfred. *Numerical simulation of mechatronic sensors and actuators*. Vol. 2. Berlin: Springer, 2007. Eric Vezzoli, Chris Ullrich, Gijs den Butter, Rafal Pijewski. XR Haptics, Implementation & Design Guidelines. 2022
	eResources addresses	Adresy na platformie eNauczanie: Systemy robotyki i haptyki, WL, MTR, sem.03, letni 2023/24 (PG_00057036) - Moodle ID: 38059 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38059

Example issues/ example questions/ tasks being completed	1. What is a haptic?2. What are the differences between the sense of touch and the sense of sight?3. Discuss the differences between kinesthetic and tactile sensors.4. What is the difference between haptic devices whose construction is based on impedance and those based on admittance?5. List the applications of haptic systems.6. What frequency ranges can be used in haptic systems?7. Types of drives used in haptic systems.8. How is sliding control implemented?9. What is image segmentation.
Work placement	Not applicable