GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Robotics, PG_00057441		
Field of study	Mechanical Engineering		
Date of commencement of studies	February 2022	Academic year of realisation of subject	2021/2022
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	Part-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	Zakład Mechaniki, Wytrzymałości i Sterowania Złożonych Obiektów Technicznych -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Mirosław Gerigk	
	Teachers	dr inż. Yurii Tsybrii dr hab. inż. Mirosław Gerigk	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	10.0	0.0	0.0	20

E-learning hours included: 0.0

Robotyka, PG_00057441 - Moodle ID: 23563
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23563

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	20	4.0	26.0	50

Subject objectives

The aim of the lectures is to teach the students on the basic problems connected with the robotics including the robots and manipulators. These concern the methodology, methods, modeling and analysis.

The aim of the course is to familiarize students with the basic issues related to the research, design and operation of unmanned vehicles.

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	The student has the ability to analyze basic research problems related to the mechanics, construction and mechatronics of combined advanced systems. These problems relate in particular to: Critical assessment of the knowledge of unmanned vehicles. Maritime unmanned vehicles. Unmanned ground vehicles - UGV. Unmanned aerial vehicles - UAV. Unmanned vehicles - research issues (phenomena, parameters, characteristics, features). Unmanned vehicles - design. Unmanned vehicles - construction and construction. Unmanned vehicles - operation, operational environment, missions, tasks. Unmanned vehicles - Challenges: structures of the near future. Unmanned vehicles - Challenges: interoperability and PB clouds. Unmanned vehicles - Challenges: PB intelligent. Unmanned vehicles - Overview of the concept of selected PB vehicles - air, land, sea.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [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	The student has the ability to solve basic problems related to the research, design and operation of unmanned vehicles, in terms of assessing the functionality, performance and safety of unmanned vehicles, including performing simple engineering tasks including the experiments. The student has the ability to analyze the basic issues related to the research, design and operation of unmanned objects , entrire mechatronics, in the field of theory and solving practical problems, including the selection of methods and tools. This includes the topics listed in the objective and item sheet.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[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	The student has the ability to analyze basic issues related to the research, design and operation of unmanned vehicles in the field of theory and solving simple tasks and practical problems. This includes the topics listed in the objective and item sheet. The student is able to work in a group observing all the rules that determine professionalism.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects

Subject contents	During the lectures the following problems concerning the robotics will be presented: - fundamentals of robotics - robots - robots and manipulators - robots and manipulators - methods of solutions concernig the applied mechanics and mechatronics - robots and manipulators - classification - manipulators and grippers - classification - sources of energy supply for robots - propulsion of robots, robotic drives - sensors and effectors devoted to robots - advanced methods of robot design - advanced modeling of robot operations - applications of robots
Prerequisites and co-requisites	The student should have basic information in the field of physics and applied mathematics, mathematical analysis, numerical methods, solid state mechanics, including kinetics and dynamics, construction and construction of complex technical objects, technical drawing and the basics of programming as well as mechatronics and automation.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
half term exam, final exam	56.0%	100.0%

Recommended reading	Basic literature	Brzezina J. M. Atak dronów. Wojskowy Instytut Wydawniczy, Warszawa 2013. Cwojdziński L. Bezzałogowe Systemy Walki - charakterystyka, wybrane probelmy użycia i eksploatacji. Wojskowa Akademia Techniczna, Warszawa 2014. Dougherty M.J. Drony - ilustrowany przewodnik po bezzałogowych pojazdach powietrznych i podwodnych (Drones. An illustrated Guide to the Unmanned Aircraft That Filling Our Skies). Wydawnictwo BELLONAS.A., © 2015 Amber Books Ltd. Gerigk M.K. Modeling of performance and safety of a multi-task unmanned autonomous maritime vehicles (in Polish: Modelowanie ruchu i bezpieczeństwa wielozadaniowego bezzałogowego autonomicznego pojazdu wodnego). Journal of KONBIN, Safety and Reliability Systems, No. 1 (33), Warsaw 2015. Gerigk M.K., Wójtowicz S. An Integrated Model of Motion, Steering, Positioning and Stabilization of an Unmanned Autonomous Maritime Vehicle. TRANSNAV the International Journal on Marine Navigation and Safety of Sea Transportation. Volume 9, Number 4, December 2015, DOI: 10.12716/1001.09.04.18. Gerigk M.K. Challenges associated with the design of a small unmanned autonomous maritime vehicle. Scientific Journals of the Maritime University of Szczecin, No. 46 (118) 2016, DOI: 10.17402/113, Published: 27.06.2016. Gerigk M.K. Modeling of combined phenomena affecting an AUV stealth vehicle. TRANSNAV the International Journal on Marine Navigation and Safety of Sea Transportation, Vol. 10, No. 4, December 2016, DOI: 10.12716/1001.10.04.18. Gerigk M.K. Modeling of performance of a AUV vehicle towards limiting the hydro-acoustic field. TRANSNAV the International Journal on Marine Navigation and Safety of Sea Transportation, Volume 12, Number 4, December 2018, DOI: 10.12716/1001.12.04.06. Gerigk M.K. Modeling of performance of an AUV stealth vehicle. Design for operation. Proceedings of IMAM 2017, 17th International Congress of the International Maritime Association of the Mediterranean, Lisbon, Portugal, 9-11 October 2017. Volume 1, @ 2018 Taylor & Francis Group, London. A Balkema Book, ISBN 978-0-8153-7993-5, pp. 365-369. Kalicka R. Podstawy automatyki i robotyki. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2016. Ty Audronis. Drony- wprowadzenie, Technologia i rozwiazania (Building Multicopter Video Drones). Wydawnictwo HELION, © 2015 Helion S.A.
	Supplementary literature	AUVSI/ONR,2007. Engineering Primer Document for the Autonomous Underwater Vehicle (AUV) Team Competition Association for Unmanned Vehicle Systems International (AUVSI) US Navy Office of Naval Research (ONR), Version 01 - July 2007. Szulist N., Gerigk M.K., 2015. Metodyka nadawania cech stealth małym bezzałogowym pojazdom wodnym. Logistyka, nr 4, Poznań 2015.
	eResources addresses	

Example issues/ example questions/ tasks being completed	1. Define the Unmanned Maritime Vehicle. 2. Describe the types of unmanned maritime vehicles UMV: - unmanned surface vehicles USV - unmanned underwater vehicles UUV - autonomous underwater vehicles 3. Describe the key technologies deciding about the development of the maritime unmanned vehicles UMV.
Work placement	Not applicable