GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Robotics in space exploration, PG_00050053		
Field of study	Space and Satellite Technologies, Space and Satellite Technologies		
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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Wiktor Sieklicki	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	0.0	60

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	60	5.0	10.0	75

Subject objectives

The aim of this course is to provide students with a knowledge about robotics, automatics, system control, manipulators kinematics, sensors and actuators as well as to show how to design robotic devices for use in space.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K03] Can analyse and implement assigned tasks while maintaining high technical standards. Is able to work and interact in a group, taking on different roles. Adheres to the principles of professional ethics and respects the diversity of views and cultures.	Student recognizes methods for designing robotic devices and signal analysis. Student can define group tasks and is able to manage designing robotic systems in group	[SK2] Assessment of progress of work [SK1] Assessment of group work skills [SK3] Assessment of ability to organize work
K7_U09	Student is able to design original devices and analyze processes occuring in space robotics	[SU4] Assessment of ability to use methods and tools
K7_W03	Student can analyse and design stationary mechatronic systems	[SW3] Assessment of knowledge contained in written work and projects
K7_U08	Student can analyze tasks of mechanics and electronics that robots in space require.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
K7_W06	Student can identify and understands working principles and design basics of robotic systems in space industry	[SW1] Assessment of factual knowledge

Subject contents

kinematics - joints, degrees of freedom, matrices, coordinate systems definition and transformation, D-H transformation, introduction to space robotics, identification of space environment, challenges in designing for space industry, space vehicles types and measures of displacement, sensors and actuators in robotics, unmanned space crafts

Prerequisites and co-requisites

Mechanics and Strength of the Materials, Automatics and Control, Informatics, Mechatronics

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		50.0%	50.0%
		50.0%	50.0%
Recommended reading	Basic literature	Craig J., Wprowadzenie do robotyki. Mechanika i sterowanie, WNT, Warszawa 1993Genta G., Introduction to the Mechanics of Space Robots, Springer Press, 2012Morecki A., Knapczyk J., Podstawy robotyki. Teoria i elementy manipulatorów i robotów, WNT,Warszawa 1993Giralt G., Hirzinger G., Robotic Research, Springer Press, 1996Jazar Reza, Theory of Applied Robotics, Kinematics, Dynamics and Control, Springer Press, 2010Jarzębowska E., Podstawy dynamiki mechanizmów i manipulatorów, Oficyna WydawniczaPolitechniki Warszawskiej, Warszawa 1998	
	Supplementary literature	Siciliano B., Khatib O., Springer Handbook of Robotics. Berlin, Springer 2008Morecki A., Knapczyk J., Kędzior K., Teoria mechanizmów i manipulatorów, WNT, Warszawa 2002Jarzębowska E., Mechanika analityczna. Warszawa, Oficyna Wydawnicza Politechniki Warszawskiej2003Arkin R., Behavior-Bassed Robotics, MIT Press, 1998K. Kozłowski, P. Dutkiewicz, W. Wróblewski, Modelowanie i sterowanie robotów, PWN Warszawa,2003Bishop R.,The Mechatronics Handbook. CRC Press 2002Schmidt D., Mechatronika. REA, Warszawa 2011	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Define kinematics of SCARA manipulator, its working envelope, joints, degrees of freedom type and number, redundancy, singularities, create D-H matrix Define differences between analog and digital signal What are accelerometers - their design, working principle. Describe a system for meaasuring a reaction force between pilot and joystick he is handling while piloting an aircraft - use a accelerometer. What are the features of robots that allow them to be used in space.		
Work placement	Not applicable		