GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechatronics in Space Applications, PG_00050012		
Field of study	Space and Satellite Technologies		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Obligatory subject group 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	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mariusz Dąbkowski	
	Teachers	dr inż. Mariusz Dąbkowski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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	5.0	15.0	50

Subject objectives	The aim of the course is to familiarize students with the concepts of: mechatronics, mechatronic design and mechatronic products designed for the needs of space technologies, discussion of basic measurement and drive systems used in mechatronics, systematization of knowledge related to the use of computer simulation and optimization in the design of mechatronic devices in space applications, discussion of the computational and design process of manipulators, discussion of the problem of space debris and ideas for its removal.

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.	Knows how to work in a group by solving the assigned tasks	[SK1] Assessment of group work skills
[K7_W02] Has well-ordered and theoretically based knowledge of mechatronics in space applications, as well as mechanical technologies and the design of space mechanisms and structures.	Has knowledge of mechatronics	[SW1] Assessment of factual knowledge
[K7_U06] Is able to estimate the costs of designing and implementing the engineering activities undertaken. Is able to propose improvements to existing engineering solutions in from the field of space and satellite technology.	Is able to estimate the cost of making a mechatronic improvement	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W06] Has well-ordered and extended knowledge on ICT in space and satellite engineering. Has well-ordered and extended knowledge about potential, methods and application areas of satellite remote sensing and Earth observation as well as about the structure of individual segments, principles of operation and applications of satellite navigation systems.	Recognizes basic satellite subsystems.	[SW1] Assessment of factual knowledge

Subject contents

LECTURES:1) Introduction to mechatronic education.2) Mechatronic design - approach, stages of manipulator design and their characteristics. Design and construction calculations on the example of 2R and 3R systems.3) Mechanics of orbital motion.4) Components and subsystems of space devices - satellites, manned vehicles (space station, space shuttle), Mars rovers, space manipulators - on the example of Canadarm and Canadarm 2.5) Space mechanisms.6) Thermal and structural analysis of space mechanisms. 7) Space debris - characteristics, methods of disposal.8) Computer modeling of mechatronic mechanisms - methods.PROJECT:During classes, students implement 1 mechatronic project in established interdisciplinary teams, with simultaneous division of competences between individual team members. As part of the project, students design a mechatronic device that can be used in space exploration.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	56.0%	40.0%
	100.0%	60.0%

Recommended reading

Basic literature

Literatura podstawowa

1. Heimann B., Gerth W., Popp K.: Mechatronika. Komponenty metody przykłady. Warszawa: Wyd. Nauk. PWN 2001.

2. Gawrysiak M.: Mechatronika i projektowanie mechatroniczne. Białystok: Wyd. Polit. Białostockiej 1997.

3. Projektowanie mechatroniczne. Zagadnienia wybrane. (Red. T. Uhl). Kraków: Kated. Robotyki i Mechatroniki AGH 2006, 2007, 2008, 2010, 2011.

	Supplementary literature	1. Schmidt D. (red.), Mechatronika, Warszawa 2002, REA 2. David G. Alciatore, Michael B. Histand, Introduction to Mechatronics and Measurement Systems (Engineering), Mc Graw-Hill, New York 2003 3. Tarnowski W., Podstawy Projektowania Technicznego, Warszawa 1997, WNT 4. Niederliński A., Systemy i sterowanie, Warszawa 1983, PWN 5. Wybrane zagadnienia analizy modalnej konstrukcji mechanicznych. (Red. T. Uhl). Kraków: Kated. Robotyki i Mechatroniki AGH 2005, 2006, 2008, 2009, 2010
	eResources addresses	
Example issues/ example questions/ tasks being completed	-	
Work placement	Not applicable	

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