GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechatronic designing, PG_00055473		
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	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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Krzysztof Kaliński	
	Teachers	prof. dr hab. inż. Krzysztof Kaliński dr inż. Marek Chodnicki	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	30.0	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	2.0	28.0	75

Subject objectives	The aim of the course is to familiarize students with the concept of mechatronics and mechatronic design.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W09] knows and understands methods of mechatronic modelling and design of systems / stationary processes as well as utilized methods and techniques including structural modelling, modal analysis, optimal control, digital control and knows modelling languages as well as computer tools for design and simulation of systems / mechatronic processes	The student recognizes the methods of designing the structure of mechatronic systems and the observed signals. The student defines team mechatronic design tasks	[SW1] Assessment of factual knowledge
[K6_U07] is able to design elements of mechatronic systems taking into consideration given application and economic criteria, using appropriate methods, techniques and tools	The student make projects original mechatronic systems / processes. The student solves mechatronic design tasks in interdisciplinary teams.	[SU4] Assessment of ability to use methods and tools
[K6_U06] is able to identify and formulate specification of simple, practical engineering tasks, distinctive for mechatronics	The student modifies conventional electromechanical systems into mechatronic systems	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_U10] is able - while formulating and solving mechatronic engineering tasks - to notice their systemwide and non-technical aspects	The student identifies the phenomena related to the functioning of mechatronic systems	[SU4] Assessment of ability to use methods and tools
[K6_W03] has organized and theoretically supported knowledge in terms of automation and control theory of stationary , continuous and discrete mechatronic systems, mechatronic design, developments and exploitation of mechatronic systems	The student presents the mastery of the methods of mechatronic design of stationary systems.	[SW1] Assessment of factual knowledge

Subject contents

LECTURES. Basic definitions and terms of mechatronic design. The problems of mechatronic design. Interdisciplinarity in mechatronic design. Integration of mechanic, electric, electronic, control and programming components in mechatronic design. Means of the mechatronic projects performance. Technologies of the mechatronic projects performance. Methods of structural modelling in mechatronic design. Modal analysis in mechatronic design. Measuring techniques in the tasks of mechatronic design. Examples of the mechatronic projects performance. PROJECT The students perform 2 mechatronic projects in their own interdisciplinary teams, at simultaneous distribution of competences between several members. The first project concerns transformation of electro-mechanical functioning system into the mechatronic one, by replacement of conventional executive items with microprocessor systems. The second project relates to design of original mechatronic system, on a basis of defined rule of the performance. The items of automatic control are dominant. A supervisor recommends suitable computer software (e.g. Matlab, C etc.). During the projects performance the students ought to focus their attention on application of mechatronic design components (e.g. structural modelling, simulation, optimisation, modal analysis), which makes the latter different with respect to conventional design. Modern solutions are preferred. Exemplary projects refer to application of mechatronic design components in the problems of manipulator grippers and tools, wheeled and stepping mobile platforms, intelligent systems of machines and processes surveillance, as well as computer aided modern production techniques.

Prerequisites and co-requisites

Knowledge on Mechanics and Strength of materials. 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
Written examination	50.0%	75.0%
2 team projects	100.0%	25.0%

Recommended reading

Basic literature

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 (dostępna w internecie).
3. Kaliński K. J.: Nadzorowanie procesów dynamicznych w układach mechanicznych. Gdańsk: Wydawnictwo Politechniki Gdańskiej 2012.
4. Projektowanie mechatroniczne. Zagadnienia wybrane. (Red. T. Uhl). Kraków: Katedra Robotyki i Mechatroniki AGH, rokrocznie od 2006 r.
5. Wybrane zagadnienia analizy modalnej konstrukcji mechanicznych. (Red. T. Uhl). Kraków: Kated. Robotyki i Mechatroniki AGH, rokrocznie od 2005 r.
6. Galewski M., Kaliński K.: Nadzorowanie drgań przy frezowaniu szybkościowym smukłymi narzędziami ze zmienną prędkością obrotową. Gdańsk: Wydawnictwo Politechniki Gdańskiej 2009.

	Supplementary literature	1. Mechatronika. Analiza, projektowanie i badania wybranych elementów i systemów. (Red. K. Kluszczyński). Warszawa: Wydawnictwo PAK 2013. 2. Skoczyński W.: Sensory w obrabiarkach CNC. Warszawa: Wydawnictwo Naukowe PWN S.A. 2018. 3. Ossowski J. C.: Wybrane zagadnienia z makroekonomii. Pojęcia, problemy, przykłady i zadania. Sopot: Wyższa Szkoła Finansów i Rachunkowości 2004.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	1. Development of functional systems design. Mechatronic design tasks 2. Interdisciplinarity and integration of components in a mechatronic product 3. An example of a mechatronic design based on knowledge about the system and the work process 4. Procedure for predicting the results of a mechatronic project. General description 5. Stages of supervising vibrations of a robot manipulator using modal control. Time domain control	
Work placement	Not applicable	