GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechatronic design, PG_00038864		
Field of study	Mechatronics, Mechatronics		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
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	5	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
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	prof. dr hab. inż. Krzysztof Kaliński	
	Teachers	dr inż. Natalia Stawicka-Morawska prof. dr hab. inż. Krzysztof Kaliński	

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	6.0	49.0	100

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_W03	The student presents the mastery of mechatronic design methods of stationary systems	[SW1] Assessment of factual knowledge
K6_W09	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_U05	The student modifies conventional electromechanical systems into mechatronic systems	[SU4] Assessment of ability to use methods and tools
K6_U07	The student make projects original mechatronic systems / processes. The student solves mechatronic design tasks in interdisciplinary teams	[SU3] Assessment of ability to use knowledge gained from the subject
K6_U06	The student identifies the phenomena related to the functioning of mechatronic systems	[SU3] Assessment of ability to use knowledge gained from the subject

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. AMESim, Matlab, Visual 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:

Projektowanie mechatroniczne, W, Mechatronika, sem. 05, zimowy 22/23, (M:31645W0) - Moodle ID: 22736
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22736

Example issues/ example questions/ tasks being completed

1. The force regulation system while winding the belt on the drum as an example of transforming conventional into mechatronic systems.
2. Component integration on the example of vibration monitoring with variable spindle speed.
3. Computing systems operation problems.
4. Procedure for forecasting the results of a mechatronic project. General description.
5. Development of the design of functional systems. Mechatronic design tasks.
6. Component integration on the example of high-speed milling supervision of flexible objects.
7. An example of a mechatronic project based on the knowledge of the system and work process.
8. Finite element type "straight bar" in mechatronic design. General description.

Work placement

Not applicable