



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						
		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						
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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 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		