

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Methods of monitoring dynamic processes , PG_00042733							
Field of study	Mechatronics							
Date of commencement of studies	February 2024		Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies		Subject group					
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			2.0		
Learning profile	general academic profile		Assessment form			assessment		
Conducting unit	Zakład Mechatroniki -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology							
Name and surname	Subject supervisor		prof. dr hab. inż. Krzysztof Kaliński					
of lecturer (lecturers)	Teachers							
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0		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		0.0		0.0		30
Subject objectives	Deepening selected e theoretically based ge of supervising dynam mechatronics.	elements of dise eneral knowled ic processes; k	crete mathema ge of mechatro nowledge of d	atics, optimizati onic design; dei evelopment tre	on, num tailed th nds and	erical a eoretica I achiev	and measurer al knowledge vements in m	ment methods; about methods odern

Learning outcomes	Course outcome	Subject outcome	Method of verification			
	[K7_U04] is able to utilise known methods and mathematical models, as well as computer simulations for analysis and evaluation of non-stationary continuous and discrete mechatronic systems and processes	The student recognizes the tasks of supervising dynamic processes targeted at various solutions.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools			
	by the theory knowledge in terms of mechatronic design, mechatronic systems and machines, devices and process where they are used	methods for supervising dynamic processes and uses them in mechatronic design issues, taking into account at the same time non- technical aspects.	knowledge [SW3] Assessment of knowledge contained in written work and projects			
	 [K7_W01] has extended knowledge in terms of selected areas of mathematics, including discrete and applied mathematics, optimisation methods, mathematical and numerical methods essential for: 1) modelling and analysis of nonstationary mechatronics, continuous and discrete time systems as well as physical phenomena; 2) description and analysis of mechatronic systems that include programmable devices 3) description and analysis of signal processing algorithms 4) synthesis of non-stationary mechatronic systems 	The student expands and deepens knowledge in selected areas of dynamic process supervision	[SW3] Assessment of knowledge contained in written work and projects			
	[K7_W10] knows development trends and most important new achievements in technical sciences and science disciplines: Mechanical Engineering, Automation, Electronics and Electrical Engineering and related: Informatics and Materials Engineering	The student recognizes development trends and explores the most important new achievements in the field of supervising dynamic processes in stationary and mobile robotics, as well as in modern mechanical processing.	[SW3] Assessment of knowledge contained in written work and projects			
Subject contents	 LECTURE Supervision - basic information. Modeling of controlled mechatronic systems by mixed finite element method. Stationary systems. Linear non- stationary systems. Nonlinear systems. Optimal control at energy performance index. Linear, non-stationary control with continuous and discrete operation. Control in a nonlinear system. Supervising the movement of a 2-wheel mobile platform using optimal control at energy performance index. Supervision of vibrations of carrying systems of industrial robots with the use of optimal control at energy performance index. Vibration monitoring during high speed milling with slender tools using variable spindle speed. LABORATORY During the course, students carry out practical classes on methods for creating and solving computational models of discrete mechatronic systems, optimal control at energy performance index in stationary and non-stationary linear systems, and in non-linear systems. Supervision methods are tested in the application of wheeled mobile platforms and selected mechanical processing operations. The tasks performed are dominated by elements of mechanics, automation and control. Requires virtual prototyping technique. 					
Prerequisites and co-requisites	Knowledge of the subject Control theory (1st degree). Knowledge and skills in Computer Science (1st degree). Knowledge and skills in the subject: Modeling of mechatronic systems (1st degree) Knowledge and skills in the subject of Mechatronic Design (1st degree). Knowledge and skills in the subject: Manipulators and industrial robots (1st degree). Knowledge and skills in the subject: Mechatronic design techniques" (2nd degree).					
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
and criteria	Laboratory reports	100.0%	40.0%			
	Final colloquium	50.0%	60.0%			

Recommended reading	Basic literature	Kaliński K. systems. G House 201: Kaliński K. mechanica University o Galewski M milling with University o	 J.: Supervision of dynamic processes in mechanical dańsk: Gdańsk University of Technology Publishing 2. : Supervision of vibration of discretely modeled I systems. Series Monographs No. 22. Gdańsk: Gdansk of Technology Publishing House 2001. 1., Kaliński K.: Supervision of vibrations during speed slender tools with variable speed. Gdańsk: Gdańsk of Technology Publishing House 2009. 			
	Supplementary literature	Maabatrani	is design. Selected issues. (Edited by T. Ubl). Krekewy			
		Mecharoni The Chair of 2006. Selected is (Edited by Mechatroni Design and K. Mendrok AGH 2019. Lisowski W modal anal Krakow 200 Giergiel M. mobile whe PWN 2002 Articles fron ongoing ba	 a design. Selected issues. (Edited by 1. 0h). Kraków. b f Robotics and Mechatronics AGH, every year since sues of modal analysis of mechanical structures. T. Uhl). Kraków: The Chair of Robotics and ics AGH, every year since 2005. d dynamics of mechatronic devices. Ed. M. Mańka and k. Kraków: The Chair of Robotics and Mechatronics d.: Selected problems of automation of experimental ysis. AGH University of Science and Education. 06. Dissertations Monographs 158. J., Hendzel Z., Żylski W.: Modeling and control of eeled robots. Warsaw: Polish Scientific Publishers m scientific and technical journals (recommended on an isis) 			
	eResources addresses	dresy na platf	ormie eNauczanie:			
Example issues/ example questions/ tasks being completed	 Modeling of variable systems during configuration. Sliding and turning kinematic pairs. Optimal control at energy performance index in a non-stationary linear system with discrete operation. Mathematical description in state coordinates. Supervising the movement of a 2-wheeled mobile platform. Platform dynamics. Supervision of vibrations of carrying systems of industrial robots. Identification of modal model parameters. Tool-workpiece vibration supervision. Optimal spindle speed control. 					
Work placement	Not applicable					

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