

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Methods of dynamic processes monitoring , PG_00064795							
Field of study	Mechatronics							
Date of commencement of studies	February 2025		Academic year of realisation of subject		2025/2026			
Education level	second-cycle studies		Subject group			Specialty subject group 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	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 inclu	uded: 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		4.0		16.0		50
Subject objectives	Deepening selected e theoretically based g of supervising dynam mechatronics.	elements of dis eneral knowled iic processes; k	crete mathema ge of mechatro nowledge of d	atics, optimizati onic design; de levelopment tre	on, num tailed th nds and	erical a eoretica I achiev	nd measure al knowledge ements in m	nent methods; about methods odern

Learning outcomes	Course outcome	Subject outcome	Method of verification		
	[K7_W01] explains and describes, based on general knowledge in the field of scientific disciplines forming the theoretical foundations of Mechatronics, the construction and principles of operation of mechatronic systems, processes and their components, as well as methods and means of their integration	The student illustrates the use of general knowledge in the field of mechanics, electronics, control theory and computer science to solve selected problems of supervising dynamic processes in stationary and non-stationary systems with continuous and discrete operation.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models for analysis and evaluation of stationary and non-stationary mechatronic systems/processes with continuous and discrete operation	The student plans to use selected elements of discrete mathematics, optimization, numerical and measurement methods to supervise selected dynamic processes in stationary and non- stationary systems with continuous and discrete operation.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
	[K7_W04] demonstrates knowledge encompassing selected issues in the field of detailed knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Mechatronics	The student recognizes detailed knowledge about modern scientific achievements technical, in terms of their use in supervising dynamic processes	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[K7_U15] evaluates the feasibility of advanced methods and tools for solving complex engineering tasks of a practical nature, characteristic of the field of study, and selects and applies appropriate methods and tools for this purpose	The student tests in mechatronic design tasks the use of methods for supervising dynamic processes in wheeled mobile robots, robot manipulators, dynamic weighing systems for railway sets and during high-speed milling.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
Subject contents	 LECTURE Supervision - basic information. Modeling of controlled mechatronic systems by mixed finite element method. Stationary systems. Linearnonstationary systems. Nonlinear systems. Optimal control at energy performance index. Linear, non-stationary control with continuous and discreteoperation. Control in a nonlinear system. Supervising the movement of a 2-wheel mobile platform using optimal control at energy performanceindex. Supervision of vibrations of carrying systems of industrial robots with the use of optimal control atenergy 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 computationalmodels of discrete mechatronic systems, optimal control at energy performance index in stationary and nonstationarylinear systems, and in non-linear systems. Modeling and optimal control methods are verified in application for supervising the movement of mobile wheeled platforms. The tasks performed are dominated by elements of mechanics, automation and control. Requires virtual prototyping technique. Appropriate software (e.g. Matlab, Visual C etc.) is recommended by the teacher.				

Proroquisitos						
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 of 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).					
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					
i totoninionaca reading						
		1 Kaliński K. L.: Supervision of a	dunamia processes in mechanical			
		systems. Gdańsk:Gdańsk Univ	versity of Technology Publishing			
		House 2012.	ration of discretally modeled			
		mechanical systems. Series M	onographs No. 22.Gdańsk: Gdansk			
		University of Technology Publi	shing House 2001.			
		milling with slender tools with v	variable speed.Gdańsk: Gdańsk			
		University of Technology Publi	shing House 2009.			
		1. Mechatronic design. Selected	issues. (Edited by T. Uhl). Krakow:			
		2009, 2010, 2011, 2012, 2017, 2018 and later.				
		2. Selected issues of modal analy	ysis of mechanical structures.			
		andMechatronics AGH 2005, 2	e Chair of Robolics 2006, 2008, 2010 and later.			
		3. Lisowski W .: Selected problem	ns of automation of experimental			
		2006. Dissertations Monograp	ty of Science and Education. Krakow			
		4. Giergiel M. J., Hendzel Z., Żyls	ski W .: Modeling and control of			
		mobile wheeled robots. Warsa 2002	w: Polish ScientificPublishers Pvvn			
		5. Magazine articles recommende	ed on an ongoing basis			
	eResources addresses	Adresy na nlatformie eNauczanie:				
	enesources addresses	Adresy na platformie eivauczanie:				

Example issues/	 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.
example questions/	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
tasks being completed	parameters. Tool-workpiece vibration supervision. Optimal spindle speed control.
Work placement	Not applicable

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