

Subject card

Subject name and code	, PG_00052095								
Field of study	Nanotechnology								
Date of commencement of studies	October 2020		Academic year of realisation of subject			2022/2023			
Education level	first-cycle studies		Subject group			Optional 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	3		Language of instruction			Polish			
Semester of study	6		ECTS credits			4.0			
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 of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Krzysztof Kaliński						
	Teachers		prof. dr hab. i dr inż. Natalia	nż. Krzysztof ł a Stawicka-Mo	Kaliński rawska				
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
of instruction	Number of study hours	30.0	0.0	15.0	0.0		0.0	45	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity Participation ir classes include plan		I didactic Participation in ed in study consultation hours		Self-study SUM				
	Number of study 45 hours		5.0		50.0		100		
Subject objectives	Familiarizing students with modeling of mechatronic systems								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	K6_U05		The student recognizes the methods modeling the structure of systems and mechatronics observed signals			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment			
	K6_W09		The student identifies phenomena related to functioning mechatronic systems			[SW1] Assessment of factual knowledge			
	K6_U04		The student develops models physical layouts mechatronics			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools			
Subject contents	Basic concepts. Creating computational models: Models of mechatronic system elements. Analogies between physical environments. Equations of dynamics in generalized coordinates. Vibrations mechanical: Free vibrations of systems with 1 degree of freedom. Forced vibrations of 1 degree systems freedom. Free and forced vibrations of systems with 2 degrees of freedom. Finite number systems degrees of freedom: Modeling of multi-mass systems. Structural models. Modal models. Basics automation: Operator transfer. Static characteristics. Control of mechatronic systems: Multidimensional control systems. Optimal linear control. Modal control. Layouts with feedback. Designing control systems. System modeling examples Mechatronics: Industrial Robot. Selected issues of vehicle dynamics.								
Prerequisites and co-requisites									
Assessment methods and criteria	Subject passing criteria		Passing threshold			Percentage of the final grade			
	Passing the laboratory		50.0%		33.33%				
	Lecture - 2 written colloquia		50.0%			66.67%			

Recommended reading	Basic literature	 Heimann B., Gerth W., Popp K.: Mechatronics. Components of the method examples. Warsaw: Scie. Publ. PWN 2001. Gawrysiak M.: Mechatronics and mechatronic design. Bialystok: Publ. of Białystok UT 1997. (available at internet) Cannon R. H.: Dynamics of physical systems. Warsaw: WNT 1973. Kaliński K. J.: Supervision of dynamic processes in mechanical systems. Gdańsk: Publishing House of Gdańsk University of Technology 2012. Kruszewski J., Wittbrodt E.: Vibrations of mechanical systems in computer terms. Volume I. Linear Problems. Warsaw: WNT 1995. Kaczorek T.: Theory of control and systems. Warsaw: Scie. Publ. PWN 1993. 				
	Supplementary literature	Mechatronics. Analysis, design and testing of selected elements and systems. (Ed. K. Kluszczyński). Warsaw: PAK Publishing House 2013. Skoczyński W.: Sensors in CNC machine tools. Warsaw: Scientific Publishing House PWN S.A. 2018. Grzegożek W., Adamiec-Wójcik I., Wojciech S.: Computer modeling of vehicle dynamics. Cracow: Cracow University of Technology named T. Kosciuszko 2003				
	eResources addresses	Adresy na platformie eNauczanie: Modelowanie Układów Mechatronicznych, W, NANO Ist, sem.06, letni 2022/23(00052095) - Moodle ID: 30081 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30081				
Example issues/ example questions/ tasks being completed	 Elements of mechatronic systems storing potential energy Vibrations excited by the force harmonic signal Modeling of multibody systems. Eigenvibrations of systems with a finite number of degrees of freedom Multidimensional control systems. Optimal linear control Modeling of closed loop systems . Schematic diagram and block diagram Modeling of the robot's carrying system. Modal control 					
Work placement	Not applicable					