



## 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. inż. Krzysztof Kaliński dr inż. Natalia Stawicka-Morawska					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	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 in didactic classes included in study plan	Participation in consultation hours		Self-study	SUM	
	Number of study hours	45	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	<ol style="list-style-type: none"> <li>1. Heimann B., Gerth W., Popp K.: Mechatronics. Components of the method examples. Warsaw: Scie. Publ. PWN 2001.</li> <li>2. Gawrysiak M.: Mechatronics and mechatronic design. Bialystok: Publ. of Bialystok UT 1997. (available at internet)</li> <li>3. Cannon R. H.: Dynamics of physical systems. Warsaw: WNT 1973.</li> <li>4. Kaliński K. J.: Supervision of dynamic processes in mechanical systems. Gdańsk: Publishing House of Gdańsk University of Technology 2012.</li> <li>5. Kruszewski J., Wittbrodt E.: Vibrations of mechanical systems in computer terms. Volume I. Linear Problems. Warsaw: WNT 1995.</li> <li>6. Kaczorek T.: Theory of control and systems. Warsaw: Scie. Publ. PWN 1993.</li> </ol>
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Mechatronics. Analysis, design and testing of selected elements and systems. (Ed. K. Kluszczyński). Warsaw: PAK Publishing House 2013.</li> <li>2. Skocznyński W.: Sensors in CNC machine tools. Warsaw: Scientific Publishing House PWN S.A. 2018.</li> <li>3. Grzeżożek W., Adamiec-Wójcik I., Wojciech S.: Computer modeling of vehicle dynamics. Cracow: Cracow University of Technology named T. Kosciuszko 2003</li> </ol>
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Modelowanie Układów Mechatronicznych, W, NANO Ist, sem.06, letni 2022/23(00052095) - Moodle ID: 30081  <a href="https://enauzanie.pg.edu.pl/moodle/course/view.php?id=30081">https://enauzanie.pg.edu.pl/moodle/course/view.php?id=30081</a></p>
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Elements of mechatronic systems storing potential energy</li> <li>2. Vibrations excited by the force harmonic signal</li> <li>3. Modeling of multibody systems. Eigenvibrations of systems with a finite number of degrees of freedom</li> <li>4. Multidimensional control systems. Optimal linear control</li> <li>5. Modeling of closed loop systems . Schematic diagram and block diagram</li> <li>6. Modeling of the robot's carrying system. Modal control</li> </ol>	
Work placement	Not applicable	