



Subject card

Subject name and code	Control Theory , PG_00038862						
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	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Rafał Hein				
	Teachers		dr hab. inż. Rafał Hein				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	0.0	0.0	45
	E-learning hours included: 0.0 Address on the e-learning platform: <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=7918">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=7918</a>						
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	Presentation of the state variable method in an application to modelling of dynamic systems. Introducing the method of designing feedback control systems. Acquainting with the methods of state variables reconstruction by using a full and reduced order observer. Getting practical skills in designing, synthesis and analysis of multidimensional feedback control systems.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W01	Student mastered the mathematical methods and tools necessary to design and analysis multidimensional control systems. He can apply the method of state variables to design control systems with a controller and state observer.			[SW1] Assessment of factual knowledge		
	K6_W03	Student has knowledge about modeling and designing of one dimensional, feedback control systems with single input and single output (SISO) as well as multidimensional feedback control systems with multiple inputs and multiple outputs (MIMO).			[SW1] Assessment of factual knowledge		
	K6_U09	Student knows and is able to use computer programs for analysis, modeling and simulation of control systems.			[SU4] Assessment of ability to use methods and tools		
Subject contents	Modeling of dynamic systems using the state variables method. Converting state-space model to transfer function. Converting transfer function to state-space model. Diagonalization and uncoupling of the state-space equations. Eigenvalues and eigenvectors. Controllability and observability. State variable feedback controller. Observer. Solving state-space equations.						
Prerequisites and co-requisites	Required knowledge of linear algebra including operations on matrices and vectors as well as problems related to solving systems of linear equations and inequalities.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	56.0%	40.0%
	Laboratory	56.0%	20.0%
	Exercises	56.0%	40.0%
Recommended reading	Basic literature	<p>1. Kaczorek T.: Teoria układów regulacji automatycznej, WNT, Warszawa 1977,</p> <p>2. Kaczorek T.: Teoria sterowania, Tom 1, Układy liniowe, ciągłe i dyskretne, PWN, Warszawa 1977,</p> <p>3. Kaczorek T.: Teoria sterowania, Tom 2, Układy nieliniowe, procesy stochastyczne oraz optymalizacja statyczna i dynamiczna, PWN Warszawa 1981,</p> <p>4. Orlikowski C., Wittbrodt E.: Podstawy automatyki i sterowania. Laboratorium Tom 1, Gdańsk 1999,</p> <p>5. Orlikowski C., Wittbrodt E.: Podstawy automatyki i sterowania. Laboratorium Tom 2, Gdańsk 2008,</p> <p>6. Amborski K., Marusak A.: Teoria sterowania w ćwiczeniach, PWN, Warszawa 1978,</p> <p>7. Nagrath I.J, Gopal M.: Control Systems Engineering, Anshan LTD 2008.</p>	
	Supplementary literature	1. Kaczorek T.: Teoria wielowymiarowych układów dynamicznych liniowych. WNT Warszawa 1983.	
	eResources addresses	Adresy na platformie eNauczanie: Teoria sterowania 2022/23 - Moodle ID: 26550 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26550">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=26550</a>	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		