



## Subject card

Subject name and code	, PG_00059973						
Field of study	Environmental Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Obligatory subject group 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	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Piotr Jasiński					
	Teachers	dr inż. Grzegorz Jasiński prof. dr hab. inż. Piotr Jasiński					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	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	5.0		19.0		54
Subject objectives	The course will discuss issues related to the processes of control of indoor microclimate. The topics of the course will include the basic issues of climate and microclimate of closed rooms, measurements of physical quantities (including humidity and air temperature, gas concentration) affecting the climate and human well-being, indicators of human comfort and discomfort. A description and issues related to microclimate control systems will be presented, both in the form of theoretical considerations, but also practical solutions actually used will be presented.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_W04	has the ability to assess the stability of automatic control systems regulation			[SW1] Assessment of factual knowledge		
	[K7_W11] has knowledge to analyze, evaluate and optimize processes, objects and systems of environmental engineering and knows the principles of rational energy management and resources	has the ability to assess damage to peripheral elements of automation			[SW1] Assessment of factual knowledge		
	K7_U06	has the basic skills to implement and test the known automatic control systems, to correct the characteristics, to evaluate the stability of the systems			[SU3] Assessment of ability to use knowledge gained from the subject		
Subject contents	Basic concepts of automation, basic principles of automatic control, classification of automation systems. Elements of automatic control systems: measuring devices, controllers, actuators. Basic members of linear automatic control systems. Analysis of linear control systems in the time domain. Open-loop and closed-loop systems. Impulse response. Step response. Frequency analysis of linear control systems. Stability of linear automatic control systems: concept and stability criteria. Automation actuators. Sensors in automation. Control systems in heating, ventilation and air conditioning.						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Exam	50.0%			70.0%		
	Tests	50.0%			30.0%		

Recommended reading	Basic literature	Kwiatkowski W.: Wprowadzenie do Automatyki, Warszawa 2005. Craig J.: Wprowadzenie do robotyki. WNT, Warszawa 1995 Morecki A. I in.: Podstawy robotyki, WNT, Warszawa 2002 (wyd. II) Olszewski I in.: Podstawy mechatroniki, REA, Warszawa 2006.
	Supplementary literature	Bishop H.R.: Mechatronic Systems, Sensors and Actuators, CRC Press 2008
	eResources addresses	Adresy na platformie eNauczanie: Automatyka i systemy kontroli w ogrzewnictwie, wentylacji i klimatyzacji [2023/24] - Moodle ID: 33903 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33903">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33903</a>
Example issues/ example questions/ tasks being completed	Calculate stability of regulation system	
Work placement	Not applicable	