GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Automatics and Measurement of Physical Quantity, PG_00060849		
Field of study	Chemical Technology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Bartosz Szulczyński	
	Teachers	dr inż. Bartosz Szulczyński	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	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	40.0	90

Subject objectives

Discussion of the operating principle and application of sensors and measuring devices for controlling basic process parameters in the chemical industry. Presentation of the possibilities of using the mathematical description of fluid flow and heat transfer to analyze unsteady states of processes. Familiarization of students with basic concepts related to control, steering and automatic regulation of chemical industry process operations.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W04] understands processes occurring in the life cycle of equipment and facilities and has knowledge of mechanical engineering, chemical apparatus, technical thermodynamics and chemical engineering and chemical reactor engineering necessary to analyse technological processes and correctly design installations and systems in the chemical industry	Student has the technical knowledge necessary to analyze technological processes and design chemical industry installations.	[SW1] Assessment of factual knowledge
[K6_U10] is able to select elements of automatic control systems for simple technological processes. Is able to use computer programmes supporting the implementation of tasks typical of control and optimisation of chemical processes	Student is able to select elements of automatic control systems and use specialized software to optimize chemical processes.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W10] Has knowledge in the areas of electrical engineering, electronics, automation and computer science. He knows the principles of operation of control and measurement systems and electronic control systems	Student has knowledge of control, measurement and control devices used in the chemical and related industries.	[SW3] Assessment of knowledge contained in written work and projects
[K6_U04] performs basic design calculations of selected processes and unit operations, is able to calculate and select the basic apparatus of chemical industry in a process line	Student is able to perform basic design and technological calculations	[SU1] Assessment of task fulfilment

Subject contents

Basic concepts and quantities. Feedback, regulation and control systems. Block diagrams. Basics of mathematical description of dynamic properties of control system elements. Steady and transient states of processes. Control setting and process regulation - controllers and executive devices. Methods of testing and analyzing transient states of processes. Selection of controllers. Stability and quality of control. Criteria for assessing the quality of regulation. Types of regulation. Measurements of basic process parameters. Temperature measurement and control, thermometric sensors, construction, principle of operation. Dynamics of thermometric sensors. Pressure measurement, construction and principle of operation of manometers. Measurement of the volume flow of fluids, liquid level, density, viscosity, humidity.

Prerequisites and co-requisites

Movement of electric charges, hydrostatics and hydrodynamics, heat movement, physical quantities, basic units, basic concepts of differential calculus

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lab test	60.0%	30.0%
Lecture Test	60.0%	70.0%

Recommended reading

Basic literature	1. Dunn William: Fundamentals of Industrial Instrumentation and Process Control, 2. Gregory K. Mcmillan, P. Hunter Vegas: Process / Industrial Instruments and Controls Handbook 3. Dale R. Patrick;Stephen W. Fardo: Industrial Process Control Systems 4. Katariya Sanjay B: Industrial Automation Solutions for Plc, Scada, Drive and Field Instruments: Easy to Learn Industrial Automation
Supplementary literature	There are no requirements
eResources addresses	

Example issues/ example questions/ tasks being completed

1. The first-order inertial object transfer function has the form2. Describe the Hurwitz stability criterion3. Determine the Laplace transform of the given function4. Determine the dependence of the signal on the measured quantity for resistive temperature sensors

Work placement

Not applicable

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