University of Gdańsk

Subject card

Subject name and code	Microcontroller-based chemical diagnostics, PG_00117814		
Field of study	Chemistry		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2025/2026
Education level	Master's studies	Subject group	Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	English
Semester of study	2	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	Faculty of Chemistry -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Adam Sieradzan	
	Teachers	dr hab. Adam Sieradzan prof. dr hab. Cezary Czaplewski	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	30.0	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	15.0	50

Subject objectives	Convergent to: IT, digital chemistry, computer sciences, data analysis

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_U05] Presents the results of research in the form of an independently written paper containing a description and justification of the purpose of the work, adopted methodology, results and their significance in comparison to other similar research.	Builds simple electronic circuits using an Arduino microcontroller. Uses self-built and programmed electronic circuits to conduct experiments.	[SU2] presentation/project/paper/ report
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	Develops the ability to make precise and logical conclusions.	[SK4] test/exam - oral or written
[CHEMMU2_W03] Demonstrates extended knowledge in the field of modern measuring techniques used in chemical analysis.	Names and describes data types and structures based on the Python language and Arduino environment	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.	Distinguishes between Python language and Arduino environment control instructions	[SW4] test/exam - oral or written
[CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.	Designs simple algorithms, writes them using Python and Arduino environment and then compiles and tests the obtained programs	[SU2] presentation/project/paper/ report
[CHEMMU2_W06] Applies mathematics to the extent necessary to understand, describe and model chemical processes of medium complexity.	Learn basic instructions and command in Python and Arduino to control microcontroler	[SW5] implementation of a problem task
[CHEMMU2_K06] Undertakes research tasks consciously and responsibly, understanding the social aspects of the practical application of the acquired knowledge and skills and the responsibility related to it.	Learns the principles of safe, responsible and effective work with devices digital (microcontrollers). Develops the ability to work in a team	[SK2] presentation/project/paper/ report

Subject contents

Assembly, coding and testing of electronic systems used in the chemical diagnostics:
Basis of Arduino microcontroler coding (variables, operator, conditions, loops and functions)
Arduiono computer computer comunication with use of Python scritps (advanced data with lists as example, matplotlib library for drawing plots,
objective coding)
Analog and digital sensors with temperater and humidity sensors as an example

Assembly and calibration of alcohol sensor with use of Arudino and sensor based on reistance change with ris-ing ethanol vapor concentration.
Other sensors: methane and other flammable gases sensor, carbon oxide sensor
Assembly and calibration of colorimeter based on Arduino microcontroler, RGB diode and color sensor.
Color sensoring and calibration following the
Lamberta-Beera rule for selected die.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Oral exam	50.0%	50.0%
Cuircuit project	50.0%	50.0%

Recommended reading

Basic literature	Python Arduino for beginners

	Supplementary literature	Python Programming for Arduino
	eResources addresses	
Example issues/ example questions/ tasks being completed	Example projects: colorimeter, cetrifudge, AC controler	
Work placement	Not applicable	

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