

Subject card

Subject name and code	Microcontroller-based chemical diagnostics, PG_00117814						
Field of study	Chemistry						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
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 English		
Semester of study	2	ECTS credits			2.0		
Learning profile	academic	Assessment form					
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_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
	[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 microcontroller	[SW5] implementation of a problem task
	[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_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_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_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_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	
Subject contents	<p>Assembly, coding and testing of electronic systems used in the chemical diagnostics: Basis of Arduino microcontroller coding (variables, operator, conditions, loops and functions) Arduino computer communication with use of Python scripts (advanced data with lists as example, matplotlib library for drawing plots, objective coding) Analog and digital sensors with temperature and humidity sensors as an example</p> <p>Assembly and calibration of alcohol sensor with use of Arduino and sensor based on resistance change with rising ethanol vapor concentration. Other sensors: methane and other flammable gases sensor, carbon oxide sensor Assembly and calibration of colorimeter based on Arduino microcontroller, RGB diode and color sensor. Color sensing and calibration following the Lambert-Beer rule for selected die.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Circuit project	50.0%	50.0%
	Oral exam	50.0%	50.0%
Recommended reading	Basic literature	Python	
		Arduino for beginners	

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

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