KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

UNIA EUROPEJSKA
EUROPEJSKI
FUNDUSZ SPOŁECZNY

Course title	ECTS code
Advanced electronic chemical diagnostics	13.3.1019

Name of unit administrating study

null

Studies

faculty	field of study		
Wydział Chemii	Biznes chemiczny	type	drugiego stopnia
		form	stacjonarne
		specialty	wszystkie
		specialization	wszystkie

Teaching staff

prof. dr hab. Cezary Czaplewski, profesor uczelni; dr hab. Artur Giełdoń; dr hab. Adam Sieradzan, profesor uczelni; mgr Łukasz Dziadek

Forms of classes, the realization and number of hours

Forms of classes

Laboratory classes, Lecture

The realization of activities

classroom instruction

Number of hours

Lecture: 15 hours, Laboratory classes: 45 hours

ECTS credits

6
classes - 60 h
tutorial classes - 30 h
student's own work - 60 h
TOTAL: 150 h - 6 ECTS

The academic cycle

2022/2023 summer semester

Type of course

obligatory

Language of instruction

polish

Teaching methods

- Work in the computer laboratory (building, programming and use of microcontroller based devices for physicochemical measurements) combined with the analysis of the measurement results and discussion.
- multimedia-based lecture

Form and method of assessment and basic criteria for eveluation or examination requirements

Final evaluation

- Graded credit
- Examination

Assessment methods

- oral exam
- -oral exam
- completion of the final project (building, programming and testing of a selected microcontroller-based device used in chemical diagnostic)
- completion of all assigned projects during classes in the computer lab
- written report for each assigned project

The basic criteria for evaluation

The basic criteria for evaluation
- correctness of the reports on assigned projects; the final grade of the lab. is based on the partial grades received from each report; failure to complete the experimental part means failing the laboratory exercises
- pass mark for the final project (lecture)
- pass mark for the oral exam (lecture)
- the final grade of the lecture is based on partial grades from the project and oral exam (50% of the contribution to the grade)

Method of verifying required learning outcomes

Required courses and introductory requirements

A. Formal requirements
Information technology

B. Prerequisites

none

Aims of education

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Introduction to the construction and programming of microelectronic devices based on the Arduino microcontroller and their use for physicochemical measurements in the chemical diagnostics. Developing skill of unassisted designing experiments and interpretation of the obtained results of physicochemical measurements.

Course contents

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Programming microcontrollers in the Arduino environment: using variables, conditional instructions, loop instructions, defining your own functions. Building, programming and testing electronic devices based on the Arduino microcontroller. The use of microcontroller based devices in chemical diagnostics for measurements of physicochemical quantities such as temperature, humidity, concentration of selected chemical substances. The use of analog and digital sensors. Construction, programming and calibration of the breathalyzer with a digital display or a display based on a set of LEDs and a sensor that changes resistance depending on the concentration of ethyl alcohol vapors. Construction and programming of the sensor detecting methane and other flammable gases. The use of a color sensor and RGB diode to build a colorimeter. Calibration of the constructed colorimeter according to Lambert-Beer law for various dilutions of several dyes. Construction, programming and calibration of a pH meter. Construction, programming and calibration of the conductivity meter. Construction and programming of a syringe pump using a stepper motor controlled by the Arduino microcontroller. Programming the communication of Arduino microcontrollers with a computer using Python scripts for the analysis and visualization of measurement results (complex data structures on the example of a list, matplotlib library for drawing charts, elements of object-oriented programming and numerical methods).

Bibliography of literature

Bibliography of literature

Literature required to pass the course

B. Extracurricular readings

Python. Wprowadzenie, M. Lutz, Helion, 2009

Arduino dla początkujących. Podstawy i szkice. Monk Simon, Helion, 2014

The learning outcomes (for the field of study and specialization)	Knowledge
	Skills
	Social competence

Contact

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