University of Gdańsk

Subject card

Subject name and code	Elements of Automation of Measurements, PG_00182160						
Field of study	Medical Physics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2027/2028			
Education level	Bachelor's 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	2		Language of instruction	Polish			
Semester of study	4		ECTS credits	2.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Krzysztof Dorywalski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	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		0.0		30.0	60
Subject objectives	The aim of the course is to introduce students to the fundamentals of computer-based measurement automation systems, to develop skills in digital acquisition and processing of measurement signals, and to provide practical knowledge of microcontroller-based control of actuating devices, enabling students to independently design and implement simple measurement systems.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMEDL3_W05] Knows and understands the most important computational and programming techniques used to solve physical and medical problems, present results, and analyse data.	The student possesses knowledge and skills in modern microcontroller and programming tools, used for acquisition, processing, analysis, and presentation of measurement signal results.	[SW2] presentation/project/paper/ report [SW3] text preparation/written work [SW5] implementation of a problem task
[FIZMEDL3_K01] He is ready for a critical evaluation of his own knowledge and the information he receives, and understands the need for further education and for improving professional and personal competencies.	The student can critically evaluate their knowledge in the field of electronics and automation, understands the need for further learning, and independently takes actions to enhance their competencies.	[SK3] text preparation/written work [SK5] implementation of a problem task [SK6] demonstration of practical skills
[FIZMEDL3_U09] Can communicate effectively with colleagues and other employees, works in a team, including interdisciplinary teams, and manages his/her own and his/her colleagues' time appropriately.	The student can: - work effectively in a team to complete a project or laboratory task; - communicate clearly and professionally with team members and individuals from other disciplines; - Plan and organize their own work and that of the team, taking deadlines and task priorities into account; - facilitate the exchange of knowledge and information within the group, considering the competencies and experience of team members.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task [SU6] demonstration of practical skills
[FIZMEDL3_W09] Knows at an advanced level the construction and operating principles of measurement instruments, electronic systems, and diagnostic and therapeutic equipment used in physics research and in medical diagnosis and therapy.	The student possesses knowledge and skills in electronics and automation, enabling the design and construction of simple signal acquisition systems and control of actuating devices. The student knows: - the basics of the operation of digital measurement automation systems; - the components and actuators of measurement systems; - basic applications of electronics and automation in diagnostic and therapeutic equipment.	[SW2] presentation/project/paper/ report [SW3] text preparation/written work [SW5] implementation of a problem task

Subject contents

- Introduction to microcontroller-based measurement automation systems

- Handling digital input/output devices

- Acquisition of analog signals A/D converters

- Presentation of measurement data displays, UART communication

- Computer-based control of actuating devices DC motors, servo drives

- Systems with graphical user interface

- Acquisition of measurement signals using data acquisition cards

Prerequisites and co-requisites

Fundamental knowledge of electrodynamics. Basic programming skills in a selected high-level programming language.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
not applicable	0.0%	10.0%
not applicable	51.0%	80.0%
not applicable	51.0%	10.0%

Recommended reading	Basic literature	**A.1. Used during classes:** • Instructor-provided instructions and materials **A.2. Recommended for self-study:** • S. Monk, *Programming Arduino: Getting Started with Sketches. Second Edition*. McGraw-Hill Education, 2016 • M. Evans, J. Noble, J. Hochenbaum, *Arduino in Action*. Manning Publications, 2011 • S. Monk, *Programming Arduino Next Steps: Going Further with Sketches. Second Edition*. McGraw-Hill Education, 2018
	Supplementary literature	- W. Tłaczała, Środowisko LabView w eksperymencie wspomaganym komputerowo. PWN, 2017 - M. Chruściel, LabView w praktyce. BTC, 2008 - P. Horowitz, H. Winfield, Sztuka elektroniki, WKŁ, 2018
	eResources addresses	
Example issues/ example questions/ tasks being completed	Design and implement a simple microcontroller-based system for acquiring an analog signal, processing it, and presenting the results on a computer or display.	
Work placement	Not applicable	

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