University of Gdańsk

Subject card

Subject name and code	Application of Electronics in Data Acquisition, PG_00182188						
Field of study	Medical Physics						
Date of commencement of studies	October 2027		Academic year of realisation of subject	2027/2028			
Education level	Master'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	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	3.0			
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	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		0.0		30.0	75
Subject objectives	The aim of the course is to introduce students to the fundamentals of computer-based measurement automation systems and to develop skills in acquiring, processing, analyzing, and presenting experimental measurement results.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMEDMU2_W04] Knows and understands in depth the theoretical foundations and principles of operation of measurement systems and research, diagnostic and therapeutic equipment specific to the field of physics and medicine.	The student possesses advanced knowledge in the following areas: - modern microcontroller and programming tools used for the acquisition, processing, analysis, and presentation of measurement signal results; - components and actuating elements of measurement systems; - the application of electronics and automation in diagnostic and therapeutic equipment.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [SW2] presentation/project/paper/ report [SW3] text preparation/written work [SW5] implementation of a problem task
[FIZMEDMU2_W07] Knows and understands the principles of occupational health and safety to a degree that allows for independent work in medical facilities and research laboratories.	The student knows and applies safety and occupational health rules in the electronics laboratory. They use measurement equipment consciously and responsibly.	[SW5] implementation of a problem task
[FIZMEDMU2_U02] Can plan and conduct an experiment using new or adapt existing methods and tools, and critically analyse the results of measurements, observations or numerical calculations, assessing the accuracy of the results using known methods and tools.	The student is able to: - select components for a measurement signal acquisition system, - write a program enabling the measurement of a physical quantity using a selected computer interface, - assemble a microcontrollerbased system for recording and presenting measurement data, as well as controlling actuating devices.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU5] implementation of a problem task [SU6] demonstration of practical skills [SU8] observation of student's independent or team work
[FIZMEDMU2_W03] Knows and understands to an in-depth degree advanced experimental and numerical techniques that allow for planning and performing complex physical experiments.	The student possesses knowledge and skills in electronics applied to data acquisition, can plan and conduct measurements using electronic systems, and process the results.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion [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

Basics of programming in a selected high-level language. Knowledge of the fundamental laws of electric current flow.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
short quiz	51.0%	30.0%
active participation	0.0%	10.0%
laboratory report	51.0%	60.0%

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 microcontroller-based system for the acquisition of a selected physical quantity, its processing, and the presentation of results on a computer or display.	
Work placement	Not applicable	

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