University of Gdańsk

Subject card

Subject name and code	Hardware Lab, PG_00178495						
Field of study	Informatics and Econometrics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study		
Mode of study	part-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		6.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Dariusz Kralewski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	40.0	0.0	0.0	40
	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	40		2.0		108.0	150
Subject objectives	The purpose of the course is for the student to gain an understanding of the essence of digital and microprocessor circuits, which are the basis for the operation of all information systems, especially computers and embedded systems ubiquitous in household appliances, automotive, medical, transportation.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[IiEL3_U02] Students can select or construct econometrics, informatics or statistics tools and apply them to describe and solve economic and social problems.	- The student acquires the knowledge necessary to perform tasks - The student uses technical documentation effectively - The student creates programs for microprocessor systems - The student carries out programming projects using recognised methodologies	[SU5] implementation of a problem task
	[IiEL3_U11] The student can engage and collaborate in teams, assuming different roles.	- The student openly cooperates in a team consisting of programmers, designers and mobile application testers - The student maintains professional contact with the client and translates their expectations into application features	[SU6] demonstration of practical skills
	[IiEL3_U12] The student can design and implement IT systems to enhance business operations and effectively utilize modern ICT technologies for management and business communication.	- The student describes and understands the operation of digital systems, the architecture of microprocessor systems, peripheral modules and memory - The student programs microprocessor systems, taking into account aspects of system architecture and cooperation with the hardware layer - The student defines the functional and non-functional requirements of the software being developed	[SU5] implementation of a problem task

Subject contents	Digital technology, • Number systems with different bases, • methods of converting numbers between different notations, • Boolean algebra (basic theorems, de Morgan's laws), • logic gates, • implementation of simple functions, • Karnaugh's method, • examples of applications. Microprocessor technology, • modern microcontrollers with special emphasis on the types of microcontrollers available in the laboratory. IDE and the Arduino ecosystem • The hardware layer of modules and extensions, • programming environment, • compiling programs, • use of programmer/loader, • use of a serial port monitor, • modules with microcontrollers, • components and subassemblies available in the laboratory. Arduino programming • discussion/reminder of the basic syntax of the C/C++ language with specific reference to Arduino, • demonstration and discussion of examples of programs and standard libraries. I/O devices, peripheral circuits.Analog-to-digital and digital-analog processing.Measurement of physical quantities and control of actuators.User interface • buttons, • knobs (potentiometers, encoders), • keyboard, • alphanumeric, graphic and touchscreen displays. Elements of classic digital technology (in combination with microprocessor technology) • discussion and demonstration with exercises of digital circuits (counters, I/O buffers, multiplexers, demultiplexers, etc.) Advanced Arduino programming • Atmel Studio environment, • discussion of low-level programming elements, • hardware registers, • hardware and software interrupt handling, • operation of I/O devices without using Arduino library functions. Solving practical problems in the design, construction and operation of computer systems. Organization of project groups. Selection of project topics Dividing into roles in project groups. Division of tasks. Establishing preliminary schedules for the work of the groups, establishing communication procedures Completion of literature related to the project topic on an ongoing basis. Presentation on an ongoing basis of the implementation of the planned tasks Preparation of documentation of the completed part of the project and development of the reportPresentation and settlement of project tasks Translated with www.DeepL.com/Translator (free version)
Prerequisites and co-requisites	Basic knowledge of computer programming and software, knowledge of object-oriented programming principles
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
project	51.0%	100.0%

Recommended reading	Basic literature	A.1. used during classes 1. Wrycza S., Maślankowski J. (red.), Informatyka ekonomiczna. Teoria i zastosowania, PWN Warszawa 2019 2. Monk S., Arduino dla początkujących. Kolejny krok, Helion 2015 3. Monk S., Arduino, 36 projektów dla pasjonatów elektroniki, Helion 2015. A.2. studied independently by the student 1. https://forbot.pl/blog/technika-cyfrowa-wstep-spis-tresci-id18070 2. https://forbot.pl/blog/kurs-arduino-podstawy-programowania-spis-tresci-kursu-id5290
	Supplementary literature	1. Jeremy Blum, Odkrywanie Arduino. Narzędzia i techniki inżynierii pełnej czaru. Wydanie II, Helion, 2020 2. Michael Margolis, Brian Jepson, Nicholas Robert Weldin, Arduino. Przepisy na rozpoczęcie, rozszerzanie i udoskonalanie projektów. Wydanie III, Helion, 2021 3. Martin Evans, Joshua Noble, Jordan Hochenbaum, Arduino w akcji, Helion, 2014 4. Simon Monk, Elektronika z wykorzystaniem Arduino i Rapsberry Pi. Receptury, Helion, 2018
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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