



Subject card

Subject name and code	Electronic systems programming (VHDL, C / Arduino, Python), PG_00053326						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2022/2023		
Education level	second-cycle studies		Subject group		Optional subject group Subject group related to scientific research 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	1		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Microelectronic Systems -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Piotr Kurgan				
	Teachers		dr inż. Piotr Kurgan				
			dr hab. inż. Marek Wójcikowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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		4.0		41.0	75
Subject objectives	The objective of the course is to introduce a student to the basics of programmable electronic systems based on circuits in FPGA and Arduino technology.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	Student programs circuits in FPGA and Arduino technology in an entry-level degree.	[SU1] Assessment of task fulfilment
	[K7_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	Student discusses fundamental elements of VHDL and Arduino Programming Language.	[SW1] Assessment of factual knowledge
	[K7_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of advanced technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	Student uses Vivado Design Suite software to implement basic functionalities of FPGA circuits based on VHDL. Student employs Arduino IDE software to program electronic systems in Arduino technology.	[SU1] Assessment of task fulfilment
	[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.	Students knows basic range of problems on Arduino peripheral device operation.	[SW1] Assessment of factual knowledge
Subject contents	<ol style="list-style-type: none"> 1. Introduction to programmable microelectronic systems. 2. Programming platform for Arduino embedded systems. 3. Programming Arduino using C. 4. Description of digital circuits using VHDL. 5. Introduction to Arduino: hardware, programming environment, code structure. 6. Digital and analog I/O. Basic operations on I/O. 7. Communicating and controlling peripheral devices. Discussing selected peripheral devices. 8. Data transmission. MIMO communication. Wireless communication. 9. Introduction to Python. Discussing language capabilities based on selected examples. 		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture - test in the middle of the semester	50.0%	25.0%
	Lecture - test in the end of the semester	50.0%	25.0%
	Laboratory - assessment of laboratory task realization	50.0%	50.0%

Recommended reading	Basic literature	<p>[1] K., Skahill, <i>VHDL for Programmable Logic</i>, Addison-Weseley Publishing, Inc., 1996</p> <p>[2] M. Margolis, <i>Arduino Cookbook</i>, O'Reilly, 2012</p> <p>[3] J. Purdum, <i>Beginning C for Arduino</i>, Apress, 2012</p> <p>[4] P. Desai, <i>Python programming for Arduino</i>, Packt Publishing Limited, 2015</p>
	Supplementary literature	M. Banzi, <i>Getting Started with Arduino</i> , O'Reilly, 2008
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	