



Subject card

Subject name and code	Applications of Embedded Systems, PG_00053906						
Field of study	Informatics						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2022/2023		
Education level	first-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	3		Language of instruction		Polish		
Semester of study	5		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Geoinformatics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Krzysztof Bikonis				
	Teachers		dr inż. Andrzej Kwiatkowski mgr inż. Mateusz Groth dr inż. Krzysztof Bikonis dr inż. Jerzy Demkowicz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	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	60		10.0		55.0	125
Subject objectives	The aim of the course is to acquaint the student with the application areas and directions of the development of embedded systems and embedded systems programming methods performing certain tasks.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W06] Knows and understands the basic processes occurring in the life cycle of devices, facilities and systems specific to a given field of study.		The student knows and understands the areas of application and development directions of embedded systems.		[SW1] Assessment of factual knowledge		
	[K6_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		The student knows and understands the principles of programming embedded systems performing specific tasks on the example of programmable PSoC systems (CY3271, CY8CKIT-003), STR910-Eval system, iMX system, JN5148 system (wireless embedded modules), ADISUSBZ system (sensors from the iSensors ADIS 16300 series, ADIS 16400).		[SW1] Assessment of factual knowledge		
	[K6_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		Student programs, compiles, runs and tests programs on the embedded system performing specific tasks.		[SU2] Assessment of ability to analyse information		

Subject contents	<div>1. Areas of application and development directions of embedded systems.</div> <div>2. Characteristics of PSoC embedded systems.</div> <div>3. Characteristics of the STR910-Eval system.</div> <div>4. Characteristics of the iMX system.</div> <div>5. Selected processor architectures in embedded systems (DSP, ARM, MIPS).</div> <div>6. Dedicated systems programmed in the hardware description language (ASIC, PLD, FPGA) .</div> <div>7. Mass storage in embedded systems (disks, file systems).</div> <div>8. Inertial sensors in embedded systems.</div> <div>9. Wireless data exchange in embedded systems (Bluetooth, Zigbee).</div> <div>10. ATM networks.</div> <div>11. Sensor and sensor networks based on embedded systems.</div> <div>12. Selected technologies for producing touch screens.</div> <div>13. Multitasking in embedded systems (threads, processes).</div> <div>14. Methods for increasing the performance of embedded systems, multiprocessor systems.</div> <div>15. Design methods for embedded time-based systems (HRT-HOOD).</div> <div>16. Embedded systems in industry and automotive (PLC, SCADA, CAN).</div> <div>17. Embedded systems in home entertainment (video game consoles).</div> <div>18. Mobile telephony as an example of embedded mobile systems.</div> <div>19. The process of compiling the embedded system from the point of view of programming tools.</div> <div>20. Microframes and operating systems for embedded systems. Similarities and differences.</div> <div>21. Examples of embedded operating systems (CFR). Methods of selecting CFR from the point of view of matching it to specific applications.</div>		
Prerequisites and co-requisites	Passing the course "Embedded Systems and Microprocessors"		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	51.0%	50.0%
	Midterm colloquium	51.0%	25.0%
	Written exam	51.0%	25.0%
Recommended reading	Basic literature	1. A. N. Doboli, E. H. Currie, Introduction to mixed-signal, embedded design, Cypress, 2007 2. A. S. Berger, Embedded Systems Design: An Introduction to Processes, Tools and Techniques, CMP Books, 2002 3. J. Majewski, P. Zbysiński, Układy FPGA w przykładach, BTC, 2007 4. M. Barr, A. Massa, Programming Embedded Systems: With C and GNU Development Tools, 2nd Edition, O'Reilly, 2008 5. T. Noergaard, Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers (Embedded Technology), Elsevier, 2005	
	Supplementary literature	1. Manual for Adelaida starter kit 2. Manula for Jupiter starter kit 3. Nota katalogowa procesora: ATmega 128 4. Nota katalogowa procesora: PIC16F877A 5. R. Baranowski, Mikrokontrolery AVR ATmega w praktyce, BTC, 2005 6. T. Jabłoński, Mikrokontrolery PIC16F8x w praktyce, BTC, 2002 7. V. Ess, A. N. Doboli, E. H. Currie, Laboratory manual for introduction to mixed-signal, embedded design, Cypress, 2008	
	eResources addresses	Adresy na platformie eNauczanie: Aplikacje Systemów Wbudowanych 2022 - Moodle ID: 23782 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=23782	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		