



Subject card

Subject name and code	Programming of Microcontrollers, PG_00042367						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2022/2023		
Education level	second-cycle studies		Subject group				
Mode of study	Part-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Controlled Electric Drives -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Marcin Morawiec				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	10.0	0.0	0.0	20
	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	20		20.0		85.0	125
Subject objectives	The aim of the course is to discuss selected microcontrollers with ARM core. Discussion of the ARM architecture and the possibility of using it in automation systems. Deepening the skills of programming in the C language by developing control functions. The programming of peripheral devices of the interface with the STM32 processor by the student allows the student to develop programming skills of modern electronic devices.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_U04		The student is able to use the acquired knowledge to improve qualifications		[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools		
	K7_U07		The student is able to perform an engineering project in the field of automation and robotics		[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment		
	K7_W06		The student is able to design an electronic circuit		[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation		
	K7_W11		The student has the knowledge and skills of programming automation and robotics systems		[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation		

Subject contents	<p>1.ARM architecture</p> <p>2. ARM architecture.</p> <p>3.I/O Ports</p> <p>4. Programming in C and operations on bits</p> <p>5. Microcontroller interfaces (serial, parallel)</p> <p>6. A/C and D/A converter</p> <p>7. A/C and C/A converter continued.</p> <p>8. Interrupts, Timers, Clocks, etc.</p> <p>9. Overview of sample programs</p> <p>10. Discussion of sample programs cont.</p> <p>11. Cooperation of the microcontroller with the FPGA</p> <p>12. Wired and wireless interfaces (I2C, I2S, CAN)</p> <p>13. Wired and wireless interfaces (I2C, I2S, CAN) cont.</p>		
Prerequisites and co-requisites	Basic skill in C/C++		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	50.0%	25.0%
	Laboratory	60.0%	75.0%

Recommended reading	Basic literature	<p>1. Pełka R.: "Mikrokontrolery - architektura, programowanie, zastosowania". Wydawnictwa Komunikacji i Łączności, Warszawa 2003.</p> <p>2. Baranowski R.: "Mikrokontrolery AVR ATmega w praktyce", BTC, Warszawa 2006.</p> <p>3. Doliński J.: "Mikrokontrolery AVR w praktyce". BTC, Warszawa, 2004.</p> <p>4. Paprocki K. "Mikrokontrolery STM32 w praktyce", Wydawnictwo BTC 2009.</p> <p>5. www.arm.com</p> <p>6. www.st.com</p> <p>7. Yiu J.: The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors, Third Edition 2013.</p>
	Supplementary literature	1. www.st.com www.arm.com http://stm32f4-discovery.com https://my.st.com
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>1. Discuss the ARM architecture</p> <p>2. Discuss the principles of programming I/O ports</p> <p>3. C programming and bit operations</p> <p>4. Microcontroller interfaces (serial, parallel)</p> <p>5. A/C and D/A converter</p> <p>6. A/C and D/A converter continued.</p> <p>7. Interrupts, Timers, Clocks</p>	
Work placement	Not applicable	