



Subject card

Subject name and code	Microprocessor Engineering, PG_00038098						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2023/2024		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study 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	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Control Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Andrzej Kopczyński				
	Teachers		dr inż. Jacek Zawalich dr inż. Robert Smyk dr inż. Paweł Kowalski dr inż. Andrzej Kopczyński				
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		8.0		57.0	125
Subject objectives	Understanding the basic concepts and issues concerning the operation of microcontrollers and microprocessor systems. Getting to know the methods and tools for programming microprocessors and their peripherals.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W05] has basic knowledge of the principles of operation of basic electronic, energy and power electronic components and systems		Student explain the rules of microprocesor system work, distinguish base types of microprocesor systems architectures, describes base glases of memories and I/O uP system devices, knows base inteferences.		[SW3] Assessment of knowledge contained in written work and projects		
	[K6_U01] can obtain information from literature, databases and other sources; integrate the information obtained, interpret it and draw conclusions, formulate and justify opinions		Student is able to applicate a proper literature and develope simpleprograms using C language an Assembler for microcomupers 8051 family and ARM Cortex M3.		[SU1] Assessment of task fulfilment		
	[K6_K02] can work in a group taking on different roles in it		Student can work in group and use specialized tools for family 8051 and ARM microprocesors for creation and starring programs.		[SK1] Assessment of group work skills		

Subject contents	<p>LECTURE Microprocessor - the idea and history. Methods of data representation in microprocessor systems. Data encoding standards. Basic arithmetic and logical operations on binary data. Microprocessor system, the basic components and architecture. Internal structure and operating principle of a typical microprocessor. Programming in assembler and C language. Tools to build and run the software. Implementation of embedded software in the system. Microcontrollers from 8051 family: internal structure, modes of operation, the list of instructions. Characteristics of integrated peripheral components: ports, time-counters, interrupt controller, serial transmission system. Memory of microprocessor systems - types, characteristics, structure. Principles of cooperation between central processing unit, memory and I/O devices. Coupling of typical peripheral devices to the microprocessor. Methods of parallel and serial data transmission. Methods of measuring time and frequency. A/C and C/A converters. Microcontrollers of other families: AVR, PIC, ARM. Examples of the use of microcontrollers in automation systems.</p> <p>LABORATORY The aim of the laboratory is to acquire the practical skills of microcontroller programming and knowledge of tools used for this purpose. Laboratory classes consist of the preparation and testing of simple programs written in C and Assembler. The programs are tested on evaluation boards with microcontrollers from 8051 and STM32F1 family and typical elements of the input/output.</p>		
Prerequisites and co-requisites	1. Basic knowledge of digital technology. 2. Ability to program in C language.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	50.0%
	Practical exercise	60.0%	50.0%
Recommended reading	Basic literature	1. Starecki T.: Mikrokontrolery 8051 w praktyce, Wydawnictwo BTC, Warszawa 2002 2. Bogusz J.: Programowanie mikrokontrolerów 8051 w języku C w praktyce, BTC, Warszawa 2005 3. Gałka P., Gałka P.: Podstawy programowania mikrokontrolera 8051, MIKOM, Warszawa 2002 4. Rydzewski A.: Mikrokomputery jednoukładowe rodziny MCS-51. WNT, Warszawa 1992 5. Paprocki P.: Mikrokontrolery STM32 w praktyce, BTC, Warszawa 2009 6. Galewski M.: STM32. Aplikacje i ćwiczenia w języku C, BTC, Warszawa 2011	
	Supplementary literature	1. Bogusz J.: Lokalne interfejsy szeregowo, BTC, Warszawa 2004 2. Dąca W.: Mikrokontrolery - od układów 8-bitowych do 32-bitowych. Wydawnictwo MIKOM, Warszawa 1992 3. Hadam P.: Projektowanie systemów mikroprocesorowych, Wydawnictwo BTC, Warszawa 2004	
	eResources addresses	Adresy na platformie eNauczanie: TECHNIKA MIKROPROCESOROWA [ARISS][I][2023/24] - Moodle ID: 36032 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36032	
Example issues/ example questions/ tasks being completed	Sample topics of laboratory exercises: 1. The use of the microcontroller input/output ports 2. Logic controller function implementation 3. 7-segment LED display driver implementation 4. The use of LCD alphanumeric display 5. The use of the microcontroller timers 6. Interrupts handling 7. Communication via UART interface		
Work placement	Not applicable		