



Subject card

Subject name and code	Microprocessor Technologies, PG_00038402						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2022/2023		
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	Part-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Przekształtników i Magazynowania Energii -> Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Artur Cichowski					
	Teachers	dr inż. Wojciech Śleszyński dr inż. Artur Cichowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	20.0	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	4.0		56.0		100
Subject objectives	The aim of the course is to teach students the synthesis and analysis of logic circuits and learn the basics of microcontrollers programming in C.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_K01	The student is aware of the necessity to extend their knowledge in digital techniques and microprocessors			[SK5] Assessment of ability to solve problems that arise in practice		
	K6_U04	The student can design and analyze digital circuits, is able to program microprocessors in C language			[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task		
	K6_W07	The student has knowledge of design and analyze digital circuits and programming microprocessors in C language			[SW3] Assessment of knowledge contained in written work and projects		
	K6_U01	The student is able to analyze the structure and function of the microprocessor control system. He can use tools for programming and debugging digital circuits in the Quartus			[SU4] Assessment of ability to use methods and tools		

Subject contents	LECTURE Fundamentals of digital electronics: combinational logic design, sequential logic design, basic medium-scale integration logic circuits (multiplexers/demultiplexers, decoders, adders, memories, registers, counters). Architectures of microprocessors and microcontrollers. Central processing unit, bus, memory, input/output systems. Arithmetic-logic unit, general-purpose registers, program counter, stack / stack pointer. Interrupts. C language programming of microprocessors (based on the ATmega128 microcontroller). Data addressing modes. Fundamentals of microprocessor arithmetics. Interrupt service routines. LABORATORY ACTIVITIES Use of the Quartus II design environment for the design, FPGA implementation and testing of basic logic circuits (gates, flip-flops, registers, counters, memories, and other combinational and sequential circuits). C-language programming of the ATmega128 microcontroller. Use of I/O ports, interrupt service routines, keyboard handling, software implementation of a 24-hour clock, alphanumeric display routines, configuring and use of the embedded A/D converters and PWM channels. Application of the microcontroller in the control of a buck converter.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	40.0%
	Practical exercise	60.0%	60.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Cichowski A., Śleszyński W., Szczepankowski P.: "Technika cyfrowa i mikroprocesorowa - laboratorium", Gdańsk 2010. 2. Kernighan B. W., Rietchie D. M. Język ANSI C. WNT, Warszawa 1998. 3. Witkowski A.: Mikrokontrolery AVR programowanie w języku C- przykłady zastosowań, Katowice 2006. 	
	Supplementary literature	<ol style="list-style-type: none"> 1. Skorupski A.: Podstawy techniki cyfrowej. Warszawa: WKŁ 2001. 2. Krzyżanowski R.: Układy mikroprocesorowe. MIKOM, Warszawa 2004. 3. Pelka R.: Mikrokontrolery: architektura, programowanie, zastosowania. WKŁ, Warszawa 2000. 4. Materiały firmowe Atmel Corporation (Datasheet for ATmega128 and AVR Instruction Set). 	
	eResources addresses	Adresy na platformie eNauczanie: TECHNIKI MIKROPROCESOROWE [ET][Niestacjonarne][2022/23] - Moodle ID: 28503 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28503	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Combinational logic design (canonical forms of Boolean functions, minimization of Boolean functions using Karnaugh tables, drawing logic diagrams). 2. Sequential logic circuits design (drawing an array aisles and exits, coding array aisles and exits, determination of output functions and excitation functions of flip-flops, drawing logic diagrams based on excitation functions and output functions). 3. I / O microcontroller service. 4. Interrupt system. 5. Alphanumeric displays service. 		
Work placement	Not applicable		