



## Subject card

Subject name and code	Microprocessor techniques, PG_00058353						
Field of study	Hydrogen Technologies and Electromobility						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2024/2025		
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		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						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45		6.0		49.0	100
Subject objectives	The objective of the course is for students to acquire knowledge and competencies in microprocessor techniques.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U01] Is able to obtain information from literature, databases and other sources, integrate them, interpret them and draw conclusions and formulate opinions; has the ability to self-educate m.in. in order to improve professional competences		can design and analyze digital circuits and is able to program microprocessors in C language		[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject		
	[K6_K01] is aware of the need for continuous education and self-improvement in the field of the profession of an electrician and knows the possibilities of further education		is aware of the necessity to extend their knowledge in digital techniques and microprocessors		[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice		
	[K6_W07] knows the basics of computer programming, digital circuits, microprocessor technology, design of simple algorithms, principles of operation of computer networks		has knowledge of design and analyze digital circuits and programming microcontrollers in C language		[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	LECTURE Architectures of microprocessors and microcontrollers. Central processing unit, bus, memory, input/output systems, registers, program counter, stack / stack pointer, interrupts. C language programming of microprocessors (based on the STM32L496ZGT6 microcontroller in the STM32CubeIDE environment). Subroutines. Interrupt service routines. Fundamentals of digital electronics: combinational logic design, sequential logic design, basic medium-scale integration logic circuits (multiplexers/demultiplexers, decoders, adders, memories, registers, counters). LABORATORY 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 STM32L496ZGT6 microcontroller. Use of I/O ports, interrupt service routines, buttons and switches handling, Software implementation of a daily clock with seven-segment displays, alphanumeric display routines, configuring and use of the embedded A/D converters and PWM channels.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium during semester	60.0%	20.0%
	Laboratory practical exercises	60.0%	80.0%
Recommended reading	Basic literature	1. Cichowski A., Śleszyński W., Szczepankowski P.: Technika cyfrowa i mikroprocesorowa, Politechnika Gdańska, Wydział Elektrotechniki i Automatyki, Gdańsk 2010. 2. Galewski. M.: STM32. Aplikacje i ćwiczenia w języku C z biblioteką HAL. BTC; Legionowo 2019. Kurczyk A.: Mikrokontrolery STM32 dla początkujących. BTC; Legionowo 2019	
	Supplementary literature	1. Skorupski A.: Podstawy techniki cyfrowej. Warszawa: WKŁ 2001. 2. Paprocki. K.: Mikrokontrolery STM32 w praktyce. BTC; Legionowo 2009. 3. Documentation of electronic modules 4. STMicroelectronics documentations (product specifications, reference manuals for STM32L496ZGT6) 5. Kernighan B. W., Ritchie D. M.: Język ANSI C. WNT, Warszawa 1998.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1) Write a program to control the LEDs as a function of logical operations of the microcontroller inputs. 2) Write a LED control program with variants of preset sequences changed in case of pressing monostable switches.		
Work placement	Not applicable		