



## 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	<p>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 displayroutines, configuring and use of the embedded A/D converters and PWM channels.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 622 794 651">Subject passing criteria</th> <th data-bbox="799 622 1137 651">Passing threshold</th> <th data-bbox="1142 622 1481 651">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 658 794 687">Colloquium during semester</td> <td data-bbox="799 658 1137 687">60.0%</td> <td data-bbox="1142 658 1481 687">20.0%</td> </tr> <tr> <td data-bbox="456 694 794 723">Laboratory practical exercises</td> <td data-bbox="799 694 1137 723">60.0%</td> <td data-bbox="1142 694 1481 723">80.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Colloquium during semester	60.0%	20.0%	Laboratory practical exercises	60.0%	80.0%
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	<p>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 20193. Kurczyk A.: Mikrokontrolery STM32 dla początkujących. BTC; Legionowo 2019</p>										
	Supplementary literature	<p>1. Skorupski A.: Podstawy techniki cyfrowej. Warszawa: WKŁ 2001.2. Paprocki. K.: Mikrokontrolery STM32 w praktyce. BTC; Legionowo 20093. Documentation of electronic modules4. STMicroelectronics documentations (product specifications, reference manuals for STM32L496ZGT6)5. Kernighan B. W., Ritchie D. M.: Język ANSI C. WNT, Warszawa 1998.</p>										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed	<p>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 monostableswitches.</p>											
Work placement	Not applicable											