



Subject card

Subject name and code	Built-in systems, PG_00055453						
Field of study	Mechatronics						
Date of commencement of studies	October 2021	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	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Galewski					
	Teachers	dr hab. inż. Marek Galewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	2.0		18.0		50
Subject objectives	Teaching students basic concepts of embedded systems and microcontrollers programming i C language						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W06] has organized knowledge in terms of informatic and methods of analog and digital signal processing		Student describes selected elements of embedded systems architecture, especilay based in MCUs		[SW1] Assessment of factual knowledge		
	[K6_U09] is able to formulate an algorithm, knows low and high level programming languages and appropriate IT tools for developing computer programmes to control mechatronic system		Student writes simple software for MCU		[SU1] Assessment of task fulfilment		
Subject contents	Definitions of embeded systems, ways of implementation Microcontrollers - types, structure, ARM family Specificity of MCU programming Peripherals of micronotroller and it's main features - GPIO, IRQ, universal timers, real time clock, watchdog, DMA, ADC, data transmission (SPI, I2C, USART), energy saving modes Designs and manufacturing of embeded systems						
Prerequisites and co-requisites	Basic C programming skills (passed Computer Systems Programming course)						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Written exam		51.0%		65.0%		
	Laboratory execrcises		51.0%		35.0%		
Recommended reading	Basic literature		Galewski M. STM32. Aplikacje i ćwiczenia w języku C z biblioteką HAL, BTC, Legionowo, 2019 Huss E., The C Library Reference Guide http://www.ehuss.org/c_guide/ Kernigham B. W., Ritchie D. M., Język ANSI C, WNT Warszawa, 2000 www.arm.com www.st.com/stonline/				
	Supplementary literature		Martin T., The Insider's Guide to the STM32 ARM Based Microcontroller, Hitex, 2008				

	eResources addresses	Adresy na platformie eNauczenie: Systemy Wbudowane, WL, MTR, I st., sem. 05, zimowy 2023/24 (PG_00055453) - Moodle ID: 31330 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=31330
Example issues/ example questions/ tasks being completed	<p>What is an Embedded System?</p> <p>What is a microcontroller? Present it's most characteristic features and elements</p> <p>What are the most important features or ARM Cortex architecture?</p> <p>What elements are needed to build an embedded system based on microcontroller</p> <p>What are GPIO used for?</p> <p>Full list of example questions are presented to students before the end of semester</p>	
Work placement	Not applicable	