



## Subject card

Subject name and code	Embedded systems, PG_00057121						
Field of study	Mechatronics						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-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	1	Language of instruction			Polish		
Semester of study	1	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Mechanics and Mechatronics -> 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	4.0		16.0		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		
	[K7_W10] knows development trends and most important new achievements in technical sciences and science disciplines: Mechanical Engineering, Automation, Electronics and Electrical Engineering and related: Informatics and Materials Engineering		Student describes the process of embedded system design and manufacture		[SW1] Assessment of factual knowledge		
	[K7_U06] is able to evaluate feasibility and possibility of application of new achievements (technical and technological) in terms of mechatronics		Student chooses parameters of the embedded system elements and develops programs in C language for ARM MCUs		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K7_W04] has detailed, supported by the theory knowledge in terms of electronic circuits, microelectronics and optoelectronics		Student describes principles of operation of MCU and its peripherals		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
Subject contents	Definitions of embedded systems, ways of implementation Microcontrollers - types, structure, ARM family Peripherals of microcontroller and its main features - GPIO, IRQ, timers, DMA, ADC, data transmission Designs and manufacturing of embedded systems						
Prerequisites and co-requisites	Basic C programming						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	Laboratory exercises		51.0%		35.0%		
	Written exam		51.0%		65.0%		

Recommended reading	Basic literature	Galewski M. STM32 Aplikacje i ćwiczenia w języku C z biblioteką HAL Marek Galewski, BTC, Legionowo, 2019 Huss E., The C Library Reference Guide <a href="http://www.acm.uiuc.edu/webmonkeys/book/c_guide/">http://www.acm.uiuc.edu/webmonkeys/book/c_guide/</a> Kernighan B. W., Ritchie D. M., Język ANSI C, WNT Warszawa, 2000 <a href="http://www.arm.com">www.arm.com</a> <a href="http://www.st.com/stonline/">www.st.com/stonline/</a>
	Supplementary literature	Ali Mazidi M. Stm32 Arm Programming for Embedded Systems, 2018
	eResources addresses	Adresy na platformie eNauczanie: Systemy Wbudowane, W/L, MTR, II st., sem. 01, letni 2023/24 (PG_00057121) - Moodle ID: 34735 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34735">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34735</a>
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	