



## Subject card

Subject name and code	Embedded Systems and Microprocessors, PG_00047672						
Field of study	Informatics						
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	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		exam		
Conducting unit	Department of Geoinformatics -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Krzysztof Bikonis				
	Teachers		dr inż. Krzysztof Bikonis  dr inż. Maciej Kokot  dr inż. Andrzej Kwiatkowski  mgr inż. Tobiasz Dryjański				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	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		4.0		51.0	100
Subject objectives	The aim of the course is to familiarize students with the basics features of embedded systems based on microcontrollers, construction, organization and architecture of modern microcontrollers, acquire skills programming PIC microcontrollers and AVR.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study	Student programs in C language and compiles programs up to the level of processor instructions, runs and tests programs.	[SU4] Assessment of ability to use methods and tools
	[K6_W04] Knows and understands, to an advanced extent, the principles, methods and techniques of programming and the principles of computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, and organisation of systems using computers or such devices	The student knows and understands the principles, methods and techniques of programming microcontrollers on the example of PIC 18F4520, ATmega128 systems and embedded systems on the example of ADISUSBZ systems (sensors from the series iSensors ADIS 16300, ADIS 16400), JN5418 (wireless embedded modules).	[SW1] Assessment of factual knowledge
	[K6_W06] Knows and understands the basic processes occurring in the life cycle of devices, facilities and systems specific to a given field of study.	The student knows and understands development trends and the specifics of microprocessors, microcontrollers, embedded systems.	[SW1] Assessment of factual knowledge
	[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Student is able to create and verify connections between systems included in the laboratory stand.	[SU1] Assessment of task fulfilment
	[K6_W42] Knows and understands, to an advanced extent, architecture, design principles and methods of hardware and software support for local and distributed information systems, including computing systems, databases, computer networks and information applications, as well as the principles of human cooperation with computers and computer-aided teamwork	The student knows and understands the architecture, design principles of simple embedded systems based on microprocessors and microcontrollers.	[SW1] Assessment of factual knowledge
Subject contents	1. History and development trends of microprocessors. 2. Architecture of the microprocessor system. 3. Blocks supervising microprocessor operation. Interrupt system. 4. Types of memory. I / O system. 5. Programming microprocessors. Assembler. 6. Microcontrollers. Basic definitions. 7. Architecture of PIC and AVR microcontroller. 8. Specialized I / O systems - SPI, UART, 1-wire, i2c, USB. 9. Definition of the embedded system. 10. Embedded systems design, hardware platforms, software, testing. 11. Basic peripheral systems. 12. Selected aspects of operating system functioning for embedded systems. 13. Real-time systems for embedded systems. 14. Development environments for creating applications for embedded systems. 15. Modeling methods for embedded systems. 16. Energy saving methods in embedded systems 17. Program testing methods for embedded systems.		
Prerequisites and co-requisites	No requirements		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	51.0%	50.0%
	Practical exercise	51.0%	50.0%

Recommended reading	Basic literature	<p>1. J. W. Valvano, Introduction to embedded systems interfacing to the freescale 9S12, Cengage Learning, 2010</p> <p>2. R. Baranowski, Mikrokontrolery AVR ATmega w praktyce, BTC, 2005</p> <p>3. S. Pietraszek, Mikroprocesory jednoukładowe PIC, Helion 2002</p> <p>4. T. Jabłoński, K. Pławsiuk, Programowanie mikrokontrolerów PIC w języku C, BTC 2005</p> <p>5. Tomasz Francuz, Język C dla mikrokontrolerów AVR, od podstaw do zaawansowanych aplikacji, Helion 2011</p> <p>6. Rafał Baranowski, "Mikrokontrolery AVR ATmega w praktyce", BTC 2005</p>
	Supplementary literature	<p>1. Dokumentacja procesora PIC18F4520</p> <p>2. Dokumentacja procesora ATmega128</p> <p>3. Dokumentacja układu ADISUSBZ</p> <p>4. Dokumentacja układu JN5418</p>
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Systemy Wbudowane i Mikroprocesory 2023 - Moodle ID: 27175</p> <p><a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27175">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27175</a></p>
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	