GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Embedded Systems and Microprocessors, PG_00047672		
Field of study	Informatics		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	

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 selected microcontrollers.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W44] 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-computer interaction, the operation and evaluation criteria of data processing, storage and transfer methods, including computational algorithms, artificial intelligence and data mining as well as standards and methods of IT systems administration, monitoring of processes and robustness to undesirable phenomena and activities	The student knows and understands the architecture and design principles of simple embedded systems based on microcontrollers.	[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_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 the Arduino module with the ATmega328 microcontroller and the system for the Internet of Things using Bluetooth Low Energy (nRF52840) and Arduino MKR WIFI 1010 with the inertial sensor (BNO055).	[SW1] Assessment of factual knowledge
	[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
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		

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Practical exercise</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>Written exam</td><td>51.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. M. Margolis, B. Jepson, N. R. Weldin, Arduino. Przepisy na rozpoczęcie, rozszerzanie i udoskonalanie projektów, 2020

2. R. Baranowski, Mikrokontrolery AVR ATmega w praktyce, BTC, 2005

3. S. Pietraszek, Mikroprocesory jednoukładowe PIC, Helion 2002

4. T. Jabłoński, K. Pławsiuk, Programowanie mikrokontrolerów PIC w języku C, BTC 2005

5. Tomasz Francuz, Język C dla mikrokontrolerów AVR, od podstaw do zaawansowanych aplikacji, Helion 2011

6. Rafał Baranowski, "Mikrokontrolery AVR ATmega w praktyce", BTC 2005</td></tr>
<tr><td>Supplementary literature</td><td>1. Dokumentacja procesora ATMega328
2. Dokumentacja układu nRF52840(PCA10059)
3. Dokumentacja układu IMUBNO055</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2"></td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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