GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Microprocessor Control Systems, PG_00038348		
Field of study	Electrical Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Paweł Szczepankowski	
	Teachers	dr hab. inż. Paweł Szczepankowski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	10.0	0.0	0.0	20

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	20	4.0	51.0	75

Subject objectives

Improving knowledge of industrial electronics, microprocessor control systems and the ability to design circuit boards, programmable logic and microprocessor systems

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] has in-depth knowledge of industrial electronics, microprocessor control systems, programmable logic systems and printed circuit design and prototyping computer-aided prototyping	The student is able to replace the basic digital systems used in practice. He has the ability to recognize symbols of digital elements on the diagram. The student is able to design digital circuits using the Quartus program. He knows the structure and fundamentals of creating printed circuits. He knows the 32-bit NIOS soft-processor and is able to write a program for him in ANSI C.	[SW2] Assessment of knowledge contained in presentation
[K7_U04] is able to select industrial electronics equipment and prepare their software, design systems microprocessor systems	The student is able to replace basic industrial electronics devices. He/she has a basic knowledge of low and higher-level languages such as an assembler and C language. He/she can describe the digital layout with the help of wizards built into the design environment. The student is able to replace FPGA (Field Programmable Gate Array), DSP (Digital Signal Processor), DSC (Digital Signal Controller), MCU (Microcontroller Control Unit) and indicate differences between them and possible practical applications.	[SU4] Assessment of ability to use methods and tools

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Elementary digital circuits. Fundamentals of voltage and current measurements in microprocessor systems. Industrial ADC converters. Roles, functions, and characteristics of signal processors, microcontrollers, and programmable logic devices. Microprocessor-based control systems in power electronics using the TMS320F28379D processor as an example. Control system architecture. Local serial communication interfaces. Digital signal isolation. Peripherals used in power electronics. Voltage inverter control. Introduction to FPGA systems. Tools supporting programming and synthesis of digital structures. NIOS2 processor as a configurable digital structure. Architecture of the NIOS2 processor. Programming the NIOS2 processor in C language. Telemetry and IoT systems in power electronics.

Course content – laboratory
Construction, initialization, and application development for the NIOS2 processor in the Quartus environment using the MAX-DE10Lite development board. JTAG interface and design-support tools such as SignalTap Logic Analyzer. Creation of test programs. IoT system with the ESP32 processor. Development of simple IoT applications using the Arduino programming language. PWM modulator using an evaluation board with the TMS320F28379D processor.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of C programming language.

Fundamental knowledge of electronics.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>final project</td><td>50.0%</td><td>75.0%</td></tr>
<tr><td>final test</td><td>50.0%</td><td>25.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Hamblen J. O., HALL T. S., Furman M. D.: Rapid Prototyping of Digital Systems. SOPC edition. Springer.
2. Kernighan B.W., Ritchie D.M.: Język ANSI C. WNT, Warszawa, 2007.
3. Zbysiński P, Pasierbiński J.: Układy programowalne, pierwsze kroki, Wydawnictwo BTC, Warszawa 2002, Second edition 2004.</td></tr>
<tr><td>Supplementary literature</td><td>1. Zieliński B., Układy mikroprocesorowe. Przykłady rozwiązań. Helion, Warszawa 2002.
2. Zieliński T. P., Cyfrowe Przetwarzanie Sygnałów. Od teorii do zastosowań. Wydawnictwa Komunikacji i Łączności, Warszawa 2005, second edition 2007.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>List and describe examples of devices used to perform measurements in digital circuits. Give an example, explain the main features and functionality provide JTAG emulators. Replace the tool manually short caused the excess solder. List and describe the components of the IDE. Replace the desired functionality of simulation programs. Provide technical documentation and the source of problem. Describe the construction of the multi-layer PCB printing. Replace the types used in the PCB vias. Give the differences between the types of vias and justify its use as an example PCB design. Offer a conductive layer arrangement for projects with a frequency response of the discrete less than 300 MHz. Give the advantages and disadvantages of such a solution. Offer a conductive layer arrangement for projects with a frequency response of the discrete greater than 300 MHz. Give the advantages and disadvantages of such a solution. Give at least 3 major design assumptions associated with the construction of the PCB. Which file usually consists of printed circuit board design.What are the types of buffers and when to consider their application. Give the differences between a LATCH system and a system REGISTER. Discuss an example of the registry function HC574. Give an example of the application of the HC573. Characterize voltage translators. 74LS47 characterize transcoder. What is a dynamic display with 7-segment displays. Give two examples of the use of analog switches.List three examples of the use of digital switches. Replace 3-way separation of digital signals.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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