GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|---|---|---|---|
| Subject name and code | Microprocessors And Microcontrollers, PG_00047916 | | | | | | |
| Field of study | Electronics and Telecommunications | | | | | | |
| Date of commencement of studies | October 2022 | | Academic year of realisation of subject | | 2023/2024 | | |
| Education level | first-cycle studies | | Subject group | | Obligatory subject group in the field of study<br>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 | | 2.0 | | |
| Learning profile | general academic profile | | Assessment form | | exam | | |
| Conducting unit | Department of Metrology and Optoelectronics -> Faculty of Electronics, Telecommunications and Informatics | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Grzegorz Lentka | | | | |
| | Teachers | | dr hab. inż. Grzegorz Lentka | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15 |
| | 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 | 15 | | 2.0 | | 33.0 | 50 |
| Subject objectives | Getting familar with architectures, construction and examples of nowadays microprocessors and microcontrollers | | | | | | |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [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 | Uses layered model of microcontroller, classifies specific properties of microcontrollers. | [SU2] Assessment of ability to analyse information |
| [K6_U07] can apply methods of process and function support, specific to the field of study | Explains microprocessor communication with memories and peripheral devices. | [SU2] Assessment of ability to analyse information |
| [K6_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment | Describes performance improvement techniques using examples of modern processors. | [SU2] Assessment of ability to analyse information |
| [K6_U08] while identifying and formulating specifications of engineering tasks related to the field of study and solving these tasks, can:n- apply analytical, simulation and experimental methods,n- notice their systemic and non-technical aspects,n- make a preliminary economic assessment of suggested solutions and engineering work n | Points out design tool and their usage. | [SU3] Assessment of ability to use knowledge gained from the subject |
| [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 | Student identifies basic functional components of microprocessor, differentiates between von Neumann and Harvard architectures and compares CISC and RISC processors. Defines microcontroller, microcontrollers families with examples. Identifies peripherals of microcontrollers with examples. | [SW1] Assessment of factual knowledge |

## Subject contents

1. Microprocessor. History and development of microprocessors. Basic functional components of microprocessor 2. Programming model of microprocessor. Von Neumann and Harvard architectures. 3. Evolution of microprocessors of x86 family. 8, 16, 32, 64bit processors. Extensions of CISC architecture and instruction set 4. RISC microprocessors. Load-store architecture. 5. Performance improvement techniques: pipeline processing, cache memory, multithreading, multicore, parallel processing of instructions and data. 6. Comparison of advanced constructions of microprocessors (ARM, ARM, PowerPC, MIPS, Itanium, SPARC). 7. Microprocessor communication with memories and peripheral devices. Universal and specialized input-output circuits. Interrupt system of microprocessor. External and internal interrupts. Interrupt masking. Interrupt servicing. Direct memory access. DMA controller. 8. Microcontrollers. Architecture and usage. Layered structure of micro-controllers. Microcontrollers families. 9. Specificity of microcontrollers: universal ports, reset circuitry, supervising circuits (BOR, LVD, watchdog), clock oscillator and clock distribution circuits, power saving techniques and special modes. 10. Peripheral circuits of microcontrollers. Timer-counter circuits. 11. Serial communication ports: UART, SPI, I2C, USB. 12. Microcontroller family examples (PIC, AVR, ARM). 13. Description and construction of example microcontroller. 14. Specificity of software development for microcontrollers. 15. Tools for development and evaluation of microcontroller systems.

## Prerequisites and co-requisites

No requirements

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Exam | 66.0% | 100.0% |

## Recommended reading

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| Basic literature | 1. J. Crisp: Introduction to Microprocessors and Microcontrollers, Newnes 2004 2. S. Furber: ARM System-on-Chip Architecture (2nd Edition), Addison-Wesley Professional 2000 |
| Supplementary literature | 1. A. Sloss, D. Symes, C. Wright: ARM System Developer"s Guide: Designing and Optimizing System Software , Morgan Kaufmann 2004 2. J. Majewski: Programowanie mikrokontrolerów LPC2000 w języku C, pierwsze kroki, BTC 2010 3. L. Bryndza: LPC2000 Mikrokontrolery z rdzeniem ARM, BTC, Warszawa 2007 |
| eResources addresses | |

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| Example issues/ example questions/ tasks being completed | |
| Work placement | Not applicable |