POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Microprocessor technology [N2Eltech2>TM]

Course

Field of study	Year/Semester
Electrical Engineering	2/3
Area of study (specialization)	**Profile of study**
High Voltage Engineering	general academic
Level of study	**Course offered in**
second-cycle	Polish
Form of study	**Requirements**
part-time	compulsory

Number of hours

Lecture	Laboratory classes	Other
10	10	0
Tutorials	**Projects/seminars**	
0	0	

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics, physics, fundamentals of electrical engineering and electronics, including digital. The ability to understand and interpret knowledge transmitted in the classroom. The ability to effectively self-education in a field related to the chosen field of study. The awareness of the need to expand their competence, their willingness to cooperate within the team.

Course objective

Thorough knowledge of theoretical and practical problems associated with the construction elements, components and microprocessor systems and the basis of their programming and design.

Course-related learning outcomes

Knowledge:
1. has knowledge in the field of: construction and operating principles of the basic components and logical components of the processor,
2. knows the operation of microprocessor processes and systems,
3. has knowledge in the field of high-level programming using elements of object-oriented programming.

Skills:
1. has the skills to apply knowledge of the theory of digital systems necessary to determine the essential parameters of data transmission and orders, obtaining information from literature and the Internet,
2. is able to work individually, independently solve tasks in the field of theory of analysis and design of microprocessor systems and devices.

Social competences:
1. able to think and act in an entrepreneurial manner in the area of analysis microprocessors.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture is verified by a credit lasting about 45-60 minutes, consisting of 10-15 questions (test and open), variously scored. Passing threshold: 50% of points. The issues on the basis of which questions are prepared will be sent to students by e-mail using the university's e-mail system.
Skills acquired as part of the laboratory classes are verified on the basis of the final test, consisting of the task of implementing the microcontroller software with peripheral systems. Passing threshold: 50% of points.
In addition, the following are taken into account for the final evaluation of laboratories: rewarding the knowledge necessary to implement the problems posed in a given area of laboratory tasks, rewarding the increase in the ability to use known principles and methods, assessment of knowledge and skills related to the implementation of the exercise task.
In addition, students can earn extra points for activity during classes, especially for: offering to discuss additional aspects of an issue, the effectiveness of applying the acquired knowledge when solving a given problem, the ability to work within a team that practically performs a specific task in the laboratory, comments related to improving teaching materials, diligence aesthetic of the developed tasks within self-study.

Programme content

The module program covers issues related to the structure, principles of operation, applications and programming of: microprocessors, microcontrollers, selected communication interfaces, memory and peripheral elements.

Course topics

The lecture program includes the following issues:
The idea of pipeline processing. Microprocessor architectures. Construction, types (classifications), features and basic functionality of a microcontroller. Closed microcontrollers (embedded). Core microprocessor. Oscillator and clock signal distribution systems. Ways to reduce power. Special microcontroller operating modes. RESET signal. RESET sources. Systems that supervise the correct operation of the microcontroller. Watchdog. Methods of cooperation with peripheral devices. Nested programming. Basic programming languages. Running and testing programs. Interface
CAN: properties, systems, types of frames, communication model, error detection mechanisms, node structure concepts, electromagnetic interference, advantages. LIN interface. Interrupt systems. Presenting innovative solutions in the field of microprocessor technology used in
the latest solutions in various industries.
Using students' knowledge from other subjects, initiating discussions, asking questions to increase students' activity and independence.
The laboratory program includes the following issues:
Getting to know the architecture of an example microcontroller and programming the microcontroller in C in terms of operating internal and external devices. Implementation of maintenance programs for selected internal systems, including: timers and interrupt system, serial transmission, AC converter, LCD display. Servicing external devices, including: LCD display, light-emitting diodes, potentiometers, buttons, sensors, etc. Implementation of an exemplary project of cooperation between a microprocessor system and an external device.

Teaching methods

Lecture: a multimedia presentation containing drawings, diagrams, photos, supplemented with practical examples on a board, slides and computer programs, which makes it easy to link theory and practice. The lecture supplemented with additional materials provided to students for independent study.
Laboratories: Work on physical positions with microcontrollers and specialized software on PCs. Using tools enabling students to perform tasks at home (microprocessor system emulator, specialized software for programming microcontrollers). Classes at the university supplemented with materials for independent performance of tasks on the provided free software packages.

Bibliography

Basic:
1. Jabłoński T., Pławsiuk K., Programowanie mikrokontrolerów PIC w języku C, BTC, Warszawa 2005.
2. Krzyżanowski R., Układy mikroprocesorowe, Mikom, Warszawa 2004.
3. Pietraszek S., Mikroprocesory jednoukładowe PIC, Wyd. Helion, Gliwice, 2002.
4. Hussain F., PIC Microcontroller: Programming + Practical, FHQ e-Press, 2020.
5. Anbazhagan K., PIC Microcontroller with MPLAB and XC8 projects handson, Nirali Prakashan, 2020.

Additional:
1. Jabłoński T., Mikrokontrolery PIC16F8x w praktyce, Wyd. BTC, Warszawa, 2002.
2. Francuz T., Język C dla mikrokontrolerów, od podstaw do zaawansowanych aplikacji, Helion, Gliwice 2011,
3. Tatjewski P., Sterowanie zaawansowane obiektów przemysłowych. Struktury i algorytmy, Akademicka Oficyna Wydawnicza EXIT, Warszawa, 2002.
4. Piasecki A., Trzmiel G., Remote building control using the bluetooth technology, Monograph Computer Applications in Electrical Engineering, Poznan University of Technology 2016, vol. 14, pp. 457-468.
5. Trzmiel G., Kurz. D., Smoczyński W., The use of the EMG signal for the arm model control, ITM Web of Conferences, vol. 28, 2019 (01024), 15.07.2019, DOI: https://doi.org/10.1051/itmconf/20192801024.
6. Internet: specialist subject literature, datasheets, standards.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	20	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00