COURSE DESCRIPTION CARD - SYLLABUS

Course name
Microprocessors technique [S1MiKC2>TM]

Course

Field of study
Microelectronics and Digital Communication

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
24

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr hab. inż. Adrian Kliks prof. PP
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Lecturers

Prerequisites

The student has knowledge of the basics of programming and software engineering. Knows the rules of syntax in high-level languages (e.g. C), knows the rules of creating executable code. Has basic knowledge of digital systems - their functioning and creation. Has basic knowledge of electronics.

Course objective

The aim of the course is to familiarize students with the architecture (hardware), application and programming of selected microprocessors and microcontrollers.

Course-related learning outcomes

Knowledge:
The student knows the principle of operation of a simple mircoprocessor, knows the differences between a microprocessor and a microcontroller.
In the field of Intel 8051 microcontrollers: knows the architecture, instruction set and the principle of operation: timers, serial port, interrupt system, knows assembler commands, programming tools and application examples.
The student knows the basic features of Intel microprocessors: 16, 32 and 64-bit.

In the field of ARM microcontrollers: the student knows the role of the most important registers, knows the operation of the hardware interrupt controller (NVIC), memory structure, instruction set. The student knows the reasons for the migration from the 8051 microcontroller to Cortex microcontrollers.

Skills:
The student is able to recognize the properties of a microprocessor or microcontroller based on the manufacturer's data and available literature and propose an appropriate system to perform the task that the microcontroller/microprocessor is to perform.
The student is able to use the Intel 8051/52 microcontroller in applications appropriate for this microcontroller - is able to propose an appropriate system and program it in assembler language.
The student is able to program ARM Cortex M3 and M4 microcontrollers in C language.

Social competences:
The student understands the need to study technical literature offered by microprocessor and microcontroller manufacturers. Understands that the field of microprocessors and microcontrollers is one of the fastest growing branches of electronics

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Verification of learning outcomes takes place - regarding lecture content - on the basis of a written assessment (example form - 5 descriptive questions, each for two points, assessment above 50% with a typical university scale). Questions will be developed based on slides published in the eKursy system. Grading scale: <50% - 2.0 (ndst); 50% to 59% - 3.0 (dst); 60% to 69% - 3.5 (dst+); 70% to 79% - 4.0 (db); 80% to 89% - 4.5 (db+); 90% to 100% - 5.0 (bdb).
Laboratory assessment takes place through the implementation of individual laboratory exercises. Current assessment of students' work (commitment, quality of prepared programs, unannounced tests checking mastery of the material) affect the final grade.

Programme content

Presentation of the architecture, organization and programming methods of selected types of microprocessors.

Course topics

Lecture:
Introduction to microprocessors and microcontrollers (2 units). Intel 8051/52 microcontrollers - architecture (hardware), instruction set, assembly language programming, programming tools, application examples (3 units). A short review of Intel 80x86 microprocessors (1 unit).
ARM Cortex M4 microcontrollers - architecture, register structure, programming tools, application examples (4 units). Other microprocessors architectures (2 units)
Labs: application of assembly instructions in creating a microprocessor program (5 units), tools for programming controllers in C, creating code for ARM microcontrollers in the Code Composer Studio environment (10 units).
The student has the opportunity to benefit from the assistance of the instructors during consultations.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board; problem-solving with students on topics related to microprocessor technology; joint problem-solving based on dialogue and analysis of examples. Possible presentation of examples during classes using emulators.
2. Laboratory: practical tasks in groups of 1-2 people consisting of creating your own software for simple microprocessors (using the example of Intel 8051) and advanced microprocessors (using the example of Cortex Mx).

Bibliography

Basic:
"MCS-8051 Microcontroller"s Family User Manual"
Intel datasheets (16- and 32-bit mikroprocessors), datasheets on 64-bit microprocessors;

"ARM Cortex-M for Beginners", "Application Note 237 - Migrating from 8051 to Cortex Microcontrollers"
Piotr Gałka, Paweł Gałka, "Podstawy programowania mikrokontrolera 8051", WN PWN
Joseph Yiu, "Definitive Guide to ARM (R) Cortex (R)-M3 and Cortex (R)-M4 Processors", Elsevier Science & Technology, 2013

Additional:
Any book or publications/data from the internet regarding the discussed microcontrollers and microprocessors, e.g. Fisher Mark, "ARM® Cortex® M4 Cookbook", Packt Publishing

Breakdown of average student's workload

	Hours	ECTS
Total workload	104	4,00
Classes requiring direct contact with the teacher	54	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00