COURSE DESCRIPTION CARD - SYLLABUS

Course name
Microprocessors

Course

Field of study
Electronics and Telecommunications

Year/Semester
2/4 and 3/5

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	30	
Tutorials	**Projects/seminars**	
15	-/-	

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Maciej Krasicki,
maciej.krasicki@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

Essentials on digital circuits and software development (writing the sorce code)

Course objective

The course objective is to acquaint the students with hardware, applications, and programming of selected microprocessors and microcontrollers

Course-related learning outcomes

Knowledge

A student knows functional principles of a simple microprocessor, knows the differences between a microcontrollers and a microprocessor. Regarding Intel 8051 microprocessors: a student knows its architecture, the list of control instructions, the properties of timers and serial interface, programming and debugging tools. A student knows basic features of 16-, 32-, and 64-bit Intel microprocessors.

Regarding ARM Cortex-M3 and M4, a student knows the role of the main registers, knows functional principles of the hardware incterrupt controller (NVIC), memory structure, and the list of control instructions.

A student knows the reasons for 8051 to Cortex migration. He/she also knows the architecture and selected peripherals of the SAM3S1A microcontroller, manufactured by Atmel and equipped with Cortex-M3 microcontroller.

Skills

A student can evaluate microprocessors' and microcontrollers' features basing on datasheets/available literature, and chose the most accurate one to perform a given task.

A student can apply an Intel 8051/52 microcontroller for simple tasks, accurate for 8-bit microcontrollers - he/she can develop the assembler code.

A student can develop the C code for ARM Cortex M3/M4 microcontrollers.

Social competences

A student understands the need to refer to the datasheets delivered by the microcontroller/microprocessor developers. He/she understands that the branch of microcontrollers/microprocessors is one of the fastest growing branches of electrical engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

A written exam takes place after semester 4. On the exam the students are asked to briefly describe the results of attached assembler code examples. There are also some questions related to the microprocessor architecture and/or some peripherals. The students can obtain 0-1 or 0-2 points for each question, depending on its difficulty; to pass, they must obtain at least half of available points.

To evaluate the students' progress on the tutorials, two written tests, covering the tutorial topics, are organized.

During the lab classes, offered in semester 5, the students' progress is evaluated judging by their diligence and the quality of developed code. A few ad-hoc tests are also planned to verify if the students have gathered necessary knowledge.

Programme content

Lecture: introduction to microprocessors and microcontrollers; Intel 8051/52 microcontrollers: the architecture, a set of control instructions, assembler programming, programming tools, application examples; review of 16-, 32-, and 64-bit Intel microprocessors; ARM Cortex-M3/M4: architecture, register stack, program development tools, application examples.

Tutorials: developing microcontroller programs by writing assembler code.

Lab classes: 8051/52 and ARM code development and debugging, Code Composer Studio

Teaching methods

Conventional lecture: architecture of microcontrollers is presented basing on available datasheets, some assembler code examples are discussed.

Lab classes: individual students' work with PCs and evaluation boards featured with either 8051 or Cortex-M4 microprocessors. The students develope their own code, upload it onto the board and evaluate its performance. The teacher suggests improvements and is responsible for final assessment of the students' code. At the beginning, the students write the assembler code. At the second stage, they develop the code written in C language and debug it on hardware by means of Code Composer Studio application.

Bibliography

Basic

- "MCS-8051 Microcontroller's Family User Manual", "ARM Cortex-M for Beginners", "Application Note 237 - Migrating from 8051 to Cortex Microcontrollers", "ARM and Thumb-2 Instruction Set Quick Reference Card", all available on the Internet

- datasheets related to Intel 16- and 32-bit microprocessors (distributed by the teacher), and selected 64-bit microprocessors, Atmel SAM3S1A datasheet (all available on the web)

Additional

- any handbook or other literature/web sources related to microprocessors and microcontrollers presented in class.

Breakdown of average student's workload

	Hours	ECTS
Total workload	141	5,0
Classes requiring direct contact with the teacher	86	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for mid-semester tests and the exam) [1]	55	1,0

[1] delete or add other activities as appropriate