Microprocessor techniques - course description

General information

Course name	Microprocessor techniques
Course ID	06.5-WE-ELEKTP-MicTech-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2019/2020

Course information

Semester	4
ECTS credits to win	5
Course type	obligatory
Teaching language	english
Author of syllabus	• dr inż. Mirosław Kozioł

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Credit with grade
Laboratory	30	2	-	-	Credit with grade

Aim of the course

- To provide knowledge about basic elements of microprocessor system and their mutual cooperation.
- To provide knowledge about the various methods of microprocessor system expansion with additional peripherals and methods of peripherals' handling by the central processor unit.
- To provide knowledge about the architecture of an exemplary microcontroller.
- To develop and shape the skills in the software design for microprocessor systems.

Prerequisites

By entering this course, student should know the following isssues:

- basic laws of electrical circuits (e.g. Ohm's law, Kirchoff's laws),
- fundamental information about semiconductors (transistor and diode),
- fundamentals of digital electronics (logic gates, flip-flops, counters, three-state buffer),
- operational amplifier basics (buffer, inverting and noninverting configuration, summing amplifier),
- analog-to-digital and digital-to-analog converters,
- fundamentals of programing in the C language.

Scope

Microprocessor system and its basic components. The role of the tri-state buffers in accessing the data bus. Microprocessor vs. microcontroller. Basic architectures of microprocessor systems (von Neuman, harvard and modified harvard architecture).

Instructions. Instruction set. Execution of the instruction by the central processor unit of the microprocessor system. Basic addressing modes. Basic groups of instructions in the instruction set.

Memories in microprocessor systems. Basic memory types. Basic memory parameters. Exemplary timing charts during read and write operations. Examples of memory chips used in microprocessor systems based on microcontrollers.

Interfacing peripherals to the system bus. Isolated and memory mapped input-output devices. Address decoder design on the basis of middle scale digital logic circuits and SPLDs with examples.

Handling of peripherals. Polling. Interrupt system.

Transmission of information between microprocessor systems. Transmission of information with and without acknowledgement. Synchronous and asynchronous transmission. Parallel and serial transmission. Serial interfaces (RS-232C, RS-485).

MCS-51 family of microcontrollers as an example of single-chip microcomputer. The most significant features of their architecture. Functional blocks. Interfacing of external program and data memory. Available addressing modes. Instruction set. Embedded peripheral systems, i.e. timer-counters and serial interface. Interrupts. Parallel ports. Programming examples of embedded peripherals in assembler and C.

Basic user interface in microprocessor system. Keyboard. LED and LCD displays.

Teaching methods

- Lecture: conventional/traditional lecture with elements of discussion.

- Laboratory: laboratory exercises, work in groups with elements of discussion.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Student can name and explain methods for servicing of peripherals in microprocessor system.		• an evaluation test	• Lecture
Student can write a program for a microprocessor system based on a microcontroller.		• an ongoing monitoring during classes • carrying out laboratory reports	• Laboratory
Student can name and explain various methods for extending of microprocessor systems by additional peripherals.		• an evaluation test	• Lecture
Student knows the exemplary microcontroller architecture.		• a quiz • an ongoing monitoring during classes	• Laboratory
Student can name basic sub-components of microprocessor system, describe their functional purpose and co-operation.		• an evaluation test	• Lecture

Assignment conditions

Lecture: to receive a final passing grade student has to receive positive grade from written tests conducted at least once a semester.

Laboratory: to receive a final passing grade student has to receive positive grades in all laboratory exercises provided for in the laboratory syllabus.

Calculation of the final grade = lecture 45% + laboratory 55%

Recommended reading

1. Godse A.P., Godse D.A.: *Microprocessor, Microcontroler & Applications*, Technical Publications Pune, 2008.
2. Deshmukh A.V.: Microcontrollers. Theory and Applications. Tata McGraw-Hill, 2007.
3. Huang H-W.: *Embedded System Design with the C8051*, Cengage Learning, 2009.
4. James M.: Microcontroller Cookbook. PIC & 8051, Newnes, 2001.

Further reading

Notes

Modified by dr inż. Mirosław Kozioł (last modification: 28-10-2019 19:23)