| I045 | **Modern Computer Systems** | L | S | E | ECTS |
|------|---------------------------|---|---|---|------|
|      |                           | 2 | 0 | 2 | 6    |

**Course objectives.** Course objectives are to teach students how to build a modern computer system, from the ground up, as well as to teach students how to understand all the key concepts of any modern computer architecture.

**Course prerequisites.** Introduction to Computer Science. Mathematical Logic for Computer Science.

**Syllabus.**

1. Introduction. Boolean Logic. Boolean Arithmetic and ALU.
2. Sequential logic.
3. Memory elements. CPU. Machine language. Computer Architecture. Assembler.
4. Virtual Machine: Stack Arithmetic. Program Control.
5. High-level Language.
6. Compiler: Syntax Analysis. Code Generation.
7. Operating System

**EXPECTED LEARNING OUTCOMES**

| No. | LEARNING OUTCOMES |
|-----|-------------------|
| 1.  | To demonstrate the knowledge and understanding which can serve as the foundation for developing and application of original ideas. |
| 2.  | To apply the knowledge, understanding and skills in a broad variety of problems in the field of computer science. |
| 3.  | To integrate new knowledge in successfull solving of programming problems in programming languages Python and C/C++. |
| 4.  | To be able to present conclusions and findings to experts and laymen based on knowledge and experience. |
| 5.  | To apply the acquired skills onto further education in this field. |

**COUPLING OF THE EXPECTED LEARNING OUTCOMES, TEACHING PROCESS ORGANIZATION AND THE EVALUATION OF THE TEACHING OUTCOMES**

| TEACHING PROCESS ORGANIZATION | ECTS | EXPECTED LEARNING OUTCOMES ** | STUDENT ACTIVITY * | EVALUATION METHOD | SCORE | |
|---|---|---|---|---|---|---|
| | | | | | min | max |
| Lecture attendance | 1 | 1-5 | Class atendance, discussion, solving the problems individually and in a team | Lists with signatures, observing the activity during the lectures | 0 | 4 |
| Homework | 1 | 1-4 | Solving the problems individually | Grading | 12 | 20 |
| Repeated exams | 2 | 1-4 | Preparation for the written exam | Grading | 19 | 38 |
| Final exam | 2 | 1-4 | Revising | Oral exam | 19 | 38 |
| TOTAL | 6 | | | | 50 | 100 |

**Teaching methods and student assessment.** Lectures will contain many examples with in-depth explanations. Exercises will be held in specialized computer-based laboratories where students will use hardware description language (HDL) to implement the structure and behavior of electronic circuits and digital logic circuits. Final exam will be held after the completion of lectures and exercises and it will contain practical tasks each student will have to complete independently.

**Can the course be taught in English:** Yes

**Basic literature**:
1. Nisan, Noam; Schocken, Shimon.  Elements of Computing Systems. MIT Press. London. 2005

**Recommended literature:**
1. Burch, Carl. 2005. Logisim 2.7.1: http://www.cburch.com/logisim/
2. Computer Architecture: A Quantitative Approach (5th Ed.), Morgan Kaufman, Elsevier, 2012.