**Computer architecture (ECTS credits 6)**

Language: the course is offered in Serbian and Hungarian.

**Course description:**

The course covers introduction to the architecture and components of the digital computers.

The course consist of theoretical classes and practical classes that are held in the laboratory.

Students will be introduced to computer model, the machine representation of the data and computer organization: processor, memory, coding and machine commands formats, processor organizing, CISC, RISC, input-output subsystem, buses, interrupts.

Also students will acquire insights into memory hierarchy: work, mass, associative and virtual memory.

Practical classes are held at the computer lab and follow the lectures. It includes the construction of ALU, RAM memory and stack memory simulation, and also operations with serial and parallel communication protocols that are used in microcomputer environments.

Theoretical teaching covers following topics:

1. Introductory considerations. Introducing students to the structure and dynamics of the course.
2. Representation of the natural numbers. Converting between numerous DEC, BIN and HEX number systems.
3. Addition of binary numbers, half- and full adder.
4. Representation of integers. Converting between DEC, BIN and HEX.
5. Subtracting binary numbers using a full adder.
6. Computing automation. Definition of basic terms.
7. Basic of the computer architectures. Computer with Neumann architecture.
8. Representation of real numbers and alphanumeric data.
9. Representation and execution of instructions.
10. Modern techniques: RISC, instruction set, pipeline, superscalar technique.
11. Registers, cache, main memory, indexing, virtual memory.
12. System interrupts. Buses.
13. Input/output. Peripheries.
14. Serial and parallel data transmission.
15. Editor, assembler, macro preprocessor, linker, loader, debugger, operating system.

Topics covered in the laboratory:

1. Introduction to the digital simulation environment.
2. Logic gates, switch, LED, resistor.
3. Addition of binary numbers, half- and full adder.
4. Subtracting binary numbers using a full adder.
5. Comparing binary numbers.
6. ALU model with functions: arithmetic, logic and comparison.
7. Three-state buffer, two-way bus driver.
8. RS, R’S ’and D flip-flop. Latch and register.
9. SRAM model using latch / register.
10. Realization of ALU shifting functions. Binary and decimal counters.
11. RS-232, serial data transmission. Terminal.
12. Parallel data transmission.
13. Digital multiplexer.
14. Digital demultiplexer, decoder with positive / negative logic.
15. Realization of combination logic function with: digital multiplexer, decoder and (EP)ROM memory.

**Aims:**

Understanding the organization of hardware elements in the digital computer along with the technical and technological problems in the construction of computers. Acquired knowledge of the basic protocols used in microcomputer environments.