

## **Title: Embedded Systems**

**Lecturer:** Prof. Dr. Tadej Tuma

**Assistant:** Assist. Prof. Dr. Janez Puhon

### **Aim of the course:**

This is a compulsory course in the 5. semester of the Bachelor's degree curriculum "Applicative Electronics". It is an advanced course based on the course "Basic Microprocessor Electronics" from the 4. semester. The aim of this course is to introduce students to advanced embedded system architecture and programming.

### **Required (pre)knowledge:**

Basic knowledge of digital structures, the course "Basic Microprocessor Electronics"

### **Lectures:**

In three-hour weekly lectures the following themes are covered:

- Short overview and a quick recap of the course "Basic Microprocessor Electronics" from the previous semester.
- External microcontroller bus: address bus design, complete/incomplete, symmetric/asymmetric, implicit/explicit, static/dynamic decoding schemes.
- Memory with serial/direct/random access, cache memory.
- Central processing unit: command pipelines, registers, stack, interrupts, machine coding.
- The principle of time slicing and the consequences: Preemptive and non-preemptive context switching, performance assurance, assembly language level vs. C level, multi-stack structures, stochastic interrupts, response time analysis and scheduling.

### **Laboratory work:**

There are two-hour weekly sessions of laboratory work, where the following is covered:

- Introduction to the development prototype system S-ARM.
- Connecting peripherals to the microcontroller (group work).
- Designing and presenting a selected embedded system (individual project).

### **Examination:**

The students have to complete and present their individual laboratory projects. Then they apply for an oral examination covering the lecture topics.

### **Selected references:**

- J. Puhon, T. Tuma, Introduction to Microcontroller Systems – Architecture and Programming, Založba FE/FRI, 2007, (PDF)
- Webpage of the development system S-ARM ([www.s-arm.si](http://www.s-arm.si)).
- LPC213xx Users Manual, Philips, 2005, (PDF).