

Microcontroller Systems

Course Workload		Assessment form (examination/ graded test/ ungraded test)
ECTS	Hours	
6	216	Credit

The Microcontroller Systems course is dedicated to teaching the principles of programming microcontrollers, describing what microcontrollers are, how they work, what peripherals they have, how they can be connected to other devices and how they can interact with them, and how they can be programmed at a low level using the C language.

Course structure:

1. An introduction to the ARM architecture. Working with registers, GPIO

- 1.1. Introduction to ARM architecture
- 1.2. Basic principles of working with microcontroller registers
- 1.3. I/O ports. GPIO registers, setting

2. Reset and clock control

- 2.1. Flash microcontroller memory
- 2.2. Controller reset system
- 2.3. Microcontroller clocks adjustment system. RCC registers

3. Universal synchronous asynchronous receiver transmitter USART. Interrupts and events

- 3.1. How USART works
- 3.2. USART registers
- 3.3. USART setup
- 3.4. Microcontroller interrupt controller - NVIC
- 3.5. Enabling and Handling Interrupts

4. Timers, simple examples. Direct memory access

- 4.1. How DMA Works
- 4.2. DMA registers
- 4.3. Setting up DMA streams
- 4.4. How timers work
- 4.5. Timer modes
- 4.6. Timer basic setting

4.7. Timer registers

4.8. Transferring data to Matlab

5. Timers, DC motor control

5.1. Timer operation in PWM signal generation mode

5.2. Timer operation with encoder

5.3. Creation of a closed system

6. ADC. closed-loop system with PID

6.1. How different ADCs work

6.2. Microcontroller ADC registers

6.3. ADC setup
