

182.694 Microcontroller VU

FAKULTÄT FÜR **INFORMATIK**

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SS 2017

Featuring Today:
Recitation for first Exam

Weekly Training Objective

- Already done
 - 2.2.2 Input with floating pins *
 - 2.2.4 Monoflop buttons
 - 2.2.5 Digital I/O
 - 2.4.1 precompiled LCD *
- Until Exam (Friday!)
 - 2.2.3 LED Rain *
 - 2.2.9 LED curtain *
 - 2.4.2 Calling conventions I
 - 2.4.3 Calling conventions II
- Next week
 - 3.1.1 C demo program †
 - 3.3.2 Interrupts †
 - 3.4.3 Generating periodic signals †
 - 3.8.1 Switches †

Important

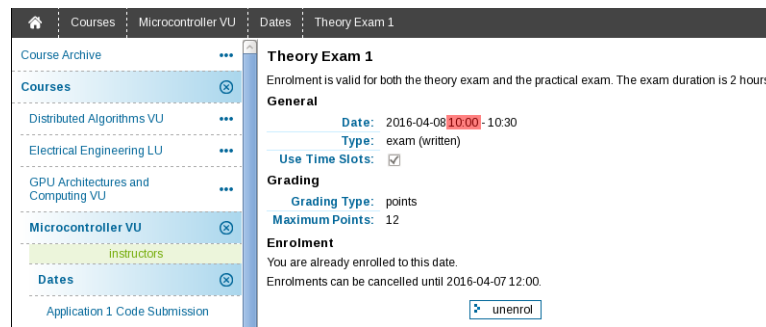
Registration for the Exam

- Do not forget to register for the exam, until Thursday 12:00, in myTI!
- You only need to register for the theory exam, the registration for the practical exam will be done automatically by us.
- The whole exam will last 2 hours.

There are enough slots for everyone, . . .

. . . but myTI will keep the number of slots as small as possible:
A new slot will only open when the previous one is full.

Important



The screenshot shows a web interface for a course named 'Microcontroller VU'. The left sidebar lists various course components, including 'Theory Exam 1'. The main content area displays the details for 'Theory Exam 1', including the date '2016-04-08 10:00 - 10:30', the type 'exam (written)', and the maximum points '12'. A red box highlights the start time '10:00'.

Figure: Your Exam start-time.

Exam Flow

- 1 Be at the glass door in front of the lab **before** your timeslot starts!
- 2 Keep your student-ID ready. We will check it multiple times!
- 3 A supervisor will fetch you there and bring you to the theory exam.
- 4 You will have approx. 25 minutes for the theory exam.
- 5 After that, a supervisor will bring you to the seminar room. There you will receive the exam paper with the task descriptions and have approx. 25 minutes of preparation time for the practical exam.
- 6 Then a supervisor will bring you back to the lab for the practical exam (approx. 50 minutes working time, there will be a clock on the big screens in the lab). The supervisor will assign you to a PC!
- 7 After you finished the practical exam you are only allowed to leave the room iff the supervisor **allows it!**

Attention

Cheating will not be tolerated!

- Usage of mobile phones/smart watches is forbidden until you leave the lab, i.e., throughout the entire exam!
- Talking to your colleague is **not allowed**.
- You are **not allowed** to use your own notes, paper, calculator, ... during the exam.
 - Everything you need is provided by us.
 - You can, of course, use your own pen and bring something to drink.
 - If you need a dictionary, you can use one.

Available Material

We will provide you with the following material during the . . .

- theory exam and the preparation time: everybody will have a printed version of
 - BigAVR6 Schematic,
 - AVR Instruction Set Manual,
 - Atmega1280 Manual,
 - avr-libc Reference Manual, and
 - a simple calculator.
- practical exam: you have to share the printed version of the above manuals with a colleague, but the digital versions are available to you.
- There will be **no** oscilloscope available during the test! But you can still use LEDs to debug your program.

Theory Exam

- The questions are in English only!
- 8 questions/statements with 3 answers/statements each.
- Every answer can be checked either true or false.
 - If you checked correctly, you get 0.5 point.
 - If you checked incorrectly, you get -0.5 point.
 - You may also not check true or false (provide no answer), then you get 0 points.
- The grading is done cumulative, i.e., you can get between -1.5 and 1.5 points for a questions.
- Positive and negative points will be considered for the total points. But we will cap a negative total to 0 points.

Practical Exam

- The task descriptions are in English only!
- The environment used for the exam is the default/plain setting of the lab; without any customizations you did, e.g., editor configuration!
- Obviously, there is no internet access.
- If you have a problem or something is unclear, ask a supervisor.
They will try to give you *hints*, if they have the time for it.
- When you are done with a task: knock
A supervisor will come to check if your solution is correct. If it is, the supervisor will mark it as solved on the exam paper.
- You must deliver your tasks **before** the time is over!
⇒ do not wait for the last minutes to deliver your tasks!

Practical Exam

Provided Code

- You will be provided with a program skeleton. The same that you have on the task description.
- Take a look at the example test on the course homepage for more details.
- You will also have access to a binary version of a solution.

Remember

The grading for the programming tasks is binary:
Do not spend all of your time trying to get one task running

Viewing (Einsichtnahme)

- Viewing for the theory exam is by appointment (email).
- Viewing for the practical exam is by email only:
 - Within a week after the exam write us an email in which of your task you are interested in.
 - We will evaluate them and send you an explanation of your mistakes per email.
 - Depending on our workload our response time may vary between a day and 1-2 weeks.

What will be asked in the Exams?

Theory Part

We will ask you questions about the microcontroller, its instruction set, and about our lab environment.

We also expect that you can convert between binary, decimal and, hexadecimal, and have knowledge about representation of binary numbers in a computer.

What will be asked in the Exams?

Practical Part

- The first task will cover digital I/O. E.g., reading a value from a port, performing operations on the value, and writing it to some port.
- The second task will involve an interrupt and acting upon it.
There will be something to write on the LCD. We provide a library for that, where you have to push the parameter to the stack before the call (and remove it after the call).

Remember

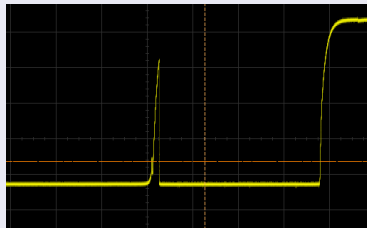
There are **no Makefiles** provided by us!

You must write them yourself during the test \Rightarrow you must know the toolchain (and/or how to use the help/man pages)!

What will be asked in the Exams?

Button Debouncing

The buttons on the board can bounce.



During the test the boards will be equipped with hardware debouncers.

Take a look at exercise 3.8.2 if you want to know how this can be done in software.

Exam Hints

- The printed material provided during the theory exam is printed on both sides (duplex), with 2 pages on one side
- The manual is version 2549A-03/05, as provided on the homepage.
Changes compared to the most current version are mostly cosmetic \rightarrow save trees.
- If you think there is a typo in a questions, which has relevance to the outcome:
Ask a tutor!

Assembler Programming Hints

- Do not use backjumps in the code (except for loops). Keep the program flow “downward”.
 - Certainly not the most efficient code,
 - but easier to debug!
- Play compiler!
Implement and learn skeletons for simple program structures (if, if-else, ...).
These structures appear often in code. Take a look at the slides from last time, there are two examples.

Pitfalls and Hints

Flash Verify

Verify that the flash was written successfully!

Linking

Do not forget to link your program!

Check the hardware

The supervisors may not have the time to check if every boards is set to the default settings!
Check the jumpers and switches!

Pitfalls and Hints

Infinite loop

Do not remove the infinite loop at the end of the main routine.

Interrupt Addresses

Do not forget that the interrupt addresses are word and not byte addresses!

Port as input with internal pull-up

The internal pull-up on an input port is weak. Thus if you enable the LEDs on the board for that port, you will not detect any change when a button is pressed.

Pitfalls and Hints

Port Access

Ports H, J, K, and L are not accessible via IN/OUT.

Register Alias

Pay attention to not use the same register twice, e.g.:

```
.equ first_temp, 0x16  
.equ second_temp, 0x16
```

Used Registers

Not all instructions work on all registers!

Feedback

- We are interested in your feedback!
- There will be a generic course evaluation in TISS.
- You can also write us an E-Mail or send a (anonymous) feedback over TISS at any time!
- We will handout a custom evaluation form during the first exam!

Questions?