System-Level Programming

2 Organization of the Lecture

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Lehrstuhl für Informatik 4
Systemsoftware

Friedrich-Alexander-Universität
Erlangen-Nürnberg

Summer Term 2024

http://sys.cs.fau.de/lehre/ss24
Content and topics

- Basic concepts of system-level programming
- Introduction to the programming language C
  - differences compared to Python/Java
  - modular concept
  - pointers and pointer arithmetic
- “Bare-metal” software development directly on hardware (ATmega $\mu$C)
  - mapping of storage ↔ language constructs
  - interrupts & concurrency
- Software development on operating system (Linux)
  - operating system as a runtime environment for programs
  - abstractions and services of an operating system
Lecture

36 sections
- slides on the web server syc.cs.fau.de
- dates: see semester overview
- → requirement for successful handling of the exercises

Questions on the lecture
- ideally ask immediately
- in following lecture

Q&A at the end of the term

Lecture does not replace the tutorials and hands-on exercises!
Exercises

Tutorial and hands-on exercise

- Tutorial (Tafelübung)
  - distribution of and additional information for the programming assignments
  - joined development of an outline for the solution
  - discussion of the solution the week after

Hands-on exercise (Rechnerübung)

- independent programming
- working with development tools
- support from an exercise supervisor

Appointments: choice of 8 + 1 groups

registration via Waffel from Thursday 04/18/2024, 6pm (refer to website)

Valid login for the Linux-CIP required for participation in exercises!
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- Appointments: choice of 8 + 1 groups
  - registration via Waffel from Thursday 04/18/2024, 6pm (refer to website)
  - separate group only for SLP

Valid login for the Linux-CIP required for participation in exercises!
WARNING!

There will be **no tutorials & exercises** during the winter term for students who failed the exam.

**WARNING!**
Practically apply lecture contents
- **eight programming assignments**
- including assignments in groups

Solutions must be submitted in the SPiC-IDE
- your solution is validated with the help of scripts
- we correct the assignments give points and provide feedback
- a solution will be presented by a student in one of the following tutorials
  
  **requires attendance!**
Programming Assignments

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however you can earn up to 10% extra points for the exam!
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  - **eight programming assignments**
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  - your solution is validated with the help of scripts
  - we correct the assignments, give points, and provide feedback
  - a solution will be presented by a student in one of the following tutorials

- Requires attendance!

Participation in the programming assignments is **NOT mandatory**; however, you can earn up to **10% extra points** for the exam! Plagiarising will lead to losing **ALL extra points**.

Nonetheless, the participation in the assignments is **highly recommended**!
Passing Rate of the Exam (SPiC)

By activity of the participants in the programming assignments.

- **ST23**: 48% (with ∅ 3,4) submitted none or less than half of the assignments, 83% (with ∅ 2,3) submitted at least half of the assignments
- **ST22**: 33% (with ∅ 3,5) submitted none or less than half of the assignments, 69% (with ∅ 2,7) submitted at least half of the assignments
- **ST21**: 38% (with ∅ 3,3) submitted none or less than half of the assignments, 87% (with ∅ 2,4) submitted at least half of the assignments
- **ST20**: 25% (with ∅ 3,6) submitted none or less than half of the assignments, 91% (with ∅ 2,5) submitted at least half of the assignments
- **ST19**: 51% (with ∅ 3,2) submitted none or less than half of the assignments, 84% (with ∅ 2,5) submitted at least half of the assignments
Exercise Platform: the SPiCboard

- ATmega328-μC
- USB port
- 8 LEDs
- 2 7-segment elements
- 2 buttons
- 1 potentiometer
- 1 photo sensor
  - optional:
- OLED display

- can be borrowed during hands-on exercises
- better option: → solder one by yourself!
- alternatively: development in simulator, which is integrated into the IDE
The FSI EEI, FSI ME and the FabLab offer a “soldering night” for the participants of the SLP lecture.
- participation is not mandatory
- you can gain (first) soldering experience while building your own SPiCboard
- there will be likely 4 appointments (in KW 18/19)

Registration via Waffel **necessary**, since the participation is limited: from Thursday 04/18/2024 at 6 PM (refer to website)

Participation is free of charge for SLP students (materials are funded from tuition fees)

**The date you choose to register is binding!**
Exam and Final Grade

- Exam (written test)
  - date: expected in early August
  - length: 90 min (SLP)
  - contents: questions on the lecture + programming exercise

- Exam grade $\mapsto$ final grade
  - (Usually) 50% of the exam’s maximum possible points (EP) are necessary to pass.
  - Only if you passed, your grade can be improved by your bonus points from the programming exercises.
    - minimum: 20% of possible bonus points (BP)
    - bonus points get divided in equal parts to match the interval [50%;80%] of possible BP
    - having 80%-100% of possible BP $\mapsto$ +10% of the maximum EP
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<td>Pointers and Arrays, Composite Data Types, µC-System Architecture – Preface, µC-System Architecture – Processor, µC-System Architecture – Periphery</td>
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Contributing Individuals, LS Informatik 4

Lecturer

Volkmar Sieh  Jürgen Kleinöder  Peter Wägemann

Organization of the tutorial and exercises

Maximilian Ott
Tutorial mentors

Jannik Hausladen
If there are Questions or Problems

- Take a look at the lecture or tutorial slides
- Consult the FAQ on our website
- Hands-on exercise
- Only if you still have no answer or in special cases, write an email to
  → all tutorial advisors i4spic@lists.cs.fau.de (content-related)
  → all academic staff (of this lecture) i4spic-orga@lists.cs.fau.de (organisational questions)