

# Theory of Computer Science

## A1. Organizational Matters

Gabriele Röger

University of Basel

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## A1.1 Organizational Matters

### A1.2 About this Course

## A1.1 Organizational Matters

## People

### Lecturer

Dr. Gabriele Röger

- ▶ email: [gabriele.roeger@unibas.ch](mailto:gabriele.roeger@unibas.ch)
- ▶ office: room 04.005, Spiegelgasse 1

## People

### Tutors

Patrick Ferber

- ▶ **email:** `patrick.ferber@unibas.ch`
- ▶ **office:** room 04.001, Spiegelgasse 5

Florian Pommerening

- ▶ **email:** `florian.pommerening@unibas.ch`
- ▶ **office:** room 04.005, Spiegelgasse 1

## Time & Place

### Lectures

- ▶ **Monday:** 13:15–16:00
- ▶ **Wednesday:** 16:15–18:00
- ▶ **Room 05.002, Spiegelgasse 5**

## Time & Place

### Exercise Sessions (starting March 2)

- ▶ **group 1 (Patrick Ferber; in German?)**
  - ▶ **time:** Monday 16:15–17:00
  - ▶ **place:** room 00.003, Spiegelgasse 1
- ▶ **group 2 (Florian Pommerening; in English)**
  - ▶ **time:** Monday 16:15–17:00
  - ▶ **place:** room U1.001, Spiegelgasse 1

**important:** please send me an email with your preferred language until **Wednesday 23:59** (February 19).

## Revised Course Format



*5 hours of lectures every week?!?*

- ▶ more hands-on experience during the lectures
- ▶ bring pen & paper or tablet
- ▶ no increase of content
- ▶ overall time unchanged (now 5+1, previously 4+2)

## Theory Course on the Web

### Course Homepage

- ▶ course information
- ▶ slides
- ▶ exercise sheets and additional material

### enrolment:

- ▶ <https://services.unibas.ch/>
- ▶ **deadline:** March 16
- ▶ better today, so that you get all relevant emails

## Course Material

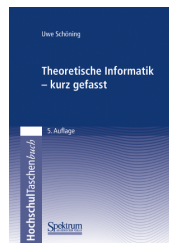
### course material:

- ▶ slides (online)
- ▶ textbooks (see next slides)
- ▶ additional material **on request**

## Course Material

### Textbooks (German)

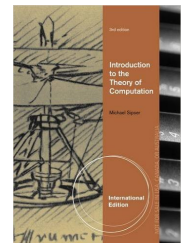
- ▶ Logik für Informatiker  
by Uwe Schöning (5th edition)
  - ▶ covers the **part on logic**,  
but also advanced topics  
beyond the scope of the course
- ▶ Theoretische Informatik – kurz gefasst  
by Uwe Schöning (5th edition)
  - ▶ covers **large parts** of the course,  
but not the part on logic



## Course Material

### Textbooks (English)

- ▶ Logic for Computer Scientists  
by Uwe Schöning (1st edition)
  - ▶ covers the **part on logic**,  
but also advanced topics  
beyond the scope of the course
- ▶ Introduction to the Theory of Computation  
by Michael Sipser (3rd edition)
  - ▶ covers **large parts** of the course,  
but not the part on logic



## Target Audience

### target audience:

- ▶ B.Sc. Computer Science, 4th semester
- ▶ B.A. Computer Science, 4th or 6th semester as an elective or if interested in M.Sc. Computer Science degree
- ▶ all other students welcome

### prerequisites:

- ▶ basic proof techniques (mathematical induction, proof by contradiction, ...)
- ▶ basic programming skills

## Exam

- ▶ **written exam**, 8 ECTS credits
- ▶ June 10, 14:00–16:00
- ▶ Vesalianum, large lecture hall (EO. 16)
- ▶ admission to exam: **no prerequisites**
- ▶ must **register** for exam during March 30 – April 14  
↪ see <https://philnat.unibas.ch/de/examen/>
- ▶ grade for course determined exclusively by the exam
- ▶ if you fail: **one** repeat attempt in FS 2021

## Exercises

### Exercise sheets (homework assignments):

- ▶ mostly theoretical exercises
- ▶ some programming exercises

### Exercise sessions:

- ▶ (live exercises)
- ▶ questions about exercise sheets
- ▶ questions about the course
- ▶ participation voluntary but recommended

## Exercises

- ▶ exercise sheets on course homepage every Wednesday
- ▶ may be solved in **groups of arbitrary size** (recommended: 2–3)
- ▶ due Wednesday the following week (upload to Adam at <https://adam.unibas.ch/>)
- ▶ scans must be legible (no photos, please)
- ▶ we appreciate  $\text{\LaTeX}$  submissions

## Questions on Organization



Questions?

## A1.2 About this Course

## Content: Theoretical foundations of computer science

- A. **background**
  - ▷ mathematical foundations and proof techniques
- B. **logic** (Logik)
  - ▷ How can knowledge be represented?
  - ▷ How can reasoning be automated?
- C. **automata theory and formal languages**  
(Automatentheorie und formale Sprachen)
  - ▷ What is a computation?
- D. **Turing computability** (Turing-Berechenbarkeit)
  - ▷ What can be computed at all?
- E. **complexity theory** (Komplexitätstheorie)
  - ▷ What can be computed efficiently?
- F. **more computability theory** (mehr Berechenbarkeitstheorie)
  - ▷ Other models of computability

## Learning Goals

- ▶ understanding the **capabilities and limitations** of computers
- ▶ working with **formal systems**
  - ▶ comprehending formal **definitions and theorems**
  - ▶ **precise formulation** of definitions, theorems and proofs
  - ▶ analyzing formal problems **precisely**
  - ▶ differentiating statements **within a system** from statements **about a system**

## Warning

“Wer’s nicht gewohnt ist,  
für den ist es ungewohnt.”  
(Prof. Dr. Th. Ottmann)  
[If you are not used to it,  
it may be unusual for you.]



What can you do?

- ▶ stay on the ball
- ▶ do the exercises
- ▶ pay attention to details
- ▶ ask questions!

## Questions about the Course



Questions?