Complexity Theory
VU 181.142, SS 2018

1. General Information

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Outline

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Classes

- **Language.** This lecture will probably be held in English.
- **Time.** Throughout the term: **Tuesdays, 11:00 – 13:00.**
- **Place.**
  - Classes will be held in the *Seminarraum 188/2* (Favoritenstraße 9-11, 4th floor).
  - The quiz at the beginning of the semester will be **in the main building, HS 11 Paul Ludwik.**
Prerequisites and Admission

- **Prerequisites.**
  - This course is designed for master’s students.
  - It is highly recommended to attend this course after the course *Formale Methoden der Informatik (185.291).*

- **Knowledge and skills required.**
  - basic knowledge in mathematical logic
  - introduction to complexity theory
  - in particular, the central concept of “problem reduction”

- **Admission.**
  - primarily for master’s students!
  - positive assessment in a quiz is required
  - each student has at most two attempts
Quiz

■ **Goal.**
- ensure that students have the required knowledge and skills
- basic knowledge in mathematical logic and complexity theory;
- in particular, the central concept of “problem reduction”.

■ **Organization.**
- **Student’s card required!!**
- **closed book** (no material allowed)
- Being able to solve all questions of the exercise sheet of block 1 (complexity theory part) of the course “Formale Methoden der Informatik” clearly suffices for the quiz.
- max. 10 credits; passed with \( \geq 5 \).

■ **Time and place.**
- Thursday, 8 March, 16:00 - 18:00: HS 11 Paul Ludwik
- Thursday, 15 March, 16:00 - 18:00: HS 11 Paul Ludwik
- 60 min actual working time
Communication

- (during, after) classes
- Course Homepage: http://www.dbai.tuwien.ac.at/staff/pichler/complexity
- TISS: please check your mail address in TISS
Course Overview

Further details on topics from “Formale Methoden”

- Logarithmic Space
- Boolean Logic, proof of the Cook-Levin Theorem
- More NP-Completeness

Further topics

- The polynomial hierarchy
- The class PSPACE
- Applications (Database Theory, Abduction, ...)
- Fixed-Parameter Tractability
References

- Further references (articles from journals, conferences, ...): see course homepage
References

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References
Assessment

Components

- Quiz: max. 10 credits
- Written Exam: max. 30 credits
- Oral Exam

Final Mark

- Quiz + written exam: mark ∈ {1, 2, 3, 4, 5}
- Mark after quiz + written exam (max. 40 credits):
  1 [35, 40], 2 [30, 35], 3 [25, 30], 4 [20, 25]
- Oral exam: change mark by {-1, 0, +1}
- Assessment of oral exam: good, medium, bad
- quiz passed
- interested in complexity

\[(\text{quiz} + \text{written_exam}) \in\]

- [0,20)
  - mark := 5

- [20,25)
  - mark := 4

- [25,30)
  - mark := 3

- [30,35)
  - mark := 2

- [35,40)
  - mark := 1

oral_exam =

- bad
  - mark := min(5, mark+1)

- medium
  - mark := max(1, mark-1)

- good
  - mark := max(1, mark-1)

end of term
ECTS Breakdown

3 ECTS corresponds to 75h of work for “standard students” fulfilling the prerequisites (i.e., VU Formale Methoden der Informatik - 185.291).

- quiz: 2h
- 12 classes (including preparation): 30h
- exam preparation: 40h
- exams: 3h

Total: 75h
Some Related Lectures

- **Complexity Analysis**
  184.215 – 2.0 VU – Komplexitätsanalyse
  Thomas Eiter

- **Database Theory**
  181.140 – 2.0 VU – Datenbanktheorie
  Tuesdays, 9:00 - 11:00, Seminarraum 188/2
  Reinhard Pichler