Complexity Theory
VU 181.142, SS 2017

1. General Information

Reinhard Pichler

Institut für Informationssysteme
Arbeitsbereich DBAI
Technische Universität Wien

07 March, 2017
1. General Information
1.1 Classes
1.2 Prerequisites and Admission
1.3 Quiz
1.4 Communication
1.5 Course Overview
1.6 Assessment
1.7 ECTS Breakdown
1.8 Related Lectures
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 following rooms:
    Thursday, 9 March: HS 11 Paul Ludwik, Main Building
    Thursday, 16 March: HS 11 Paul Ludwik, Main Building
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. 20 points; passed with $\geq 10$.

- **Time and place.**
  - Thursday, 9 March, 16:00 - 18:00: HS 11 Paul Ludwik
  - Thursday, 16 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

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

Components

- Quiz
- Homework and Reading assignments
- Exam

Final Mark

- Quiz, Homework, and reading assignments: 50%
- Written exam: 50%
- Requirements for positive assessment:
  - quiz + homework + reading: 40 (out of 80)
  - exam: 40 (out of 80)
- Marks 1–4:
  1 [140, 160], 2 [120, 140], 3 [100, 120], 4 [80, 100]
Homework and Reading Assignments

- 5 Homework assignments: max. 10 credits each
- 2 Reading assignments: max. 5 credits each
- maximum in total: **60** credits
  (normally, no excuses are accepted if a student misses a homework or a reading assignment).

**Submission**: per mail in electronic form
  (use of Latex is strongly encouraged)

**Submission deadline:**
- will be unambiguously stated on the problem sheet and/or on the course homepage (normally, 1–2 weeks are alloted for each homework and reading assignment)
- late submission: -2 credits per day of delay
Homework and Reading Assignments (cont’d)

- **good practice.**
  - discuss the problems with other students
  - team up to solve the problems
  - write down the solutions in your own words

- **bad practice.**
  - copy other students’ solutions
  - search for solutions on the web and copy them
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
reading assignments (2×): 8h
homework assignments (5×): 20h
exam preparation: 15h

-------------------------------
in 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 and
  Thursdays, 10:00 - 12:00, von Neumann Seminarraum.
  Reinhard Pichler

- **Further aspects of database theory (e.g. decompositions)**
  184.776 – 2.0 VU – Advanced Topics in Foundations of Databases and Artificial Intelligence (starts after the Easter holidays)
  Georg Gottlob