

Complexity Theory

VU 181.142, SS 2018

1. General Information

Reinhard Pichler

Institut für Informationssysteme
Arbeitsbereich DBAI
Technische Universität Wien

06 March, 2018



Outline

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 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 ≥ 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

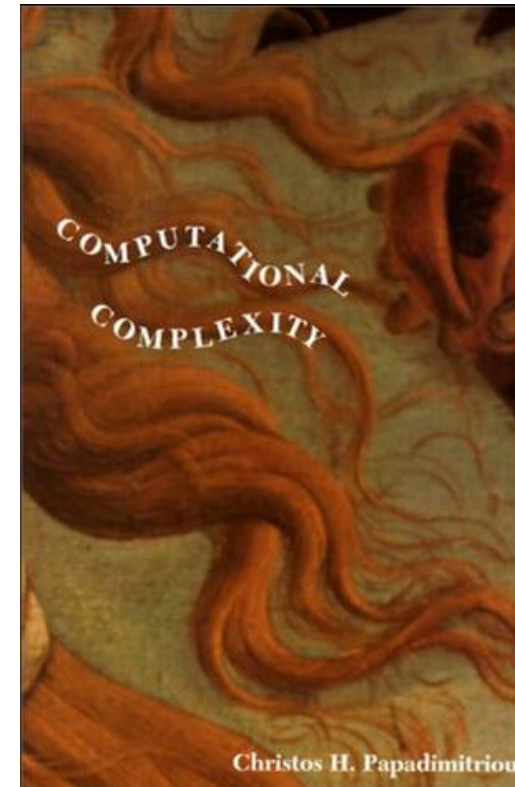
- The polynomial hierarchy
- The class PSPACE
- Applications (Database Theory, Abduction, ...)
- Fixed-Parameter Tractability

References

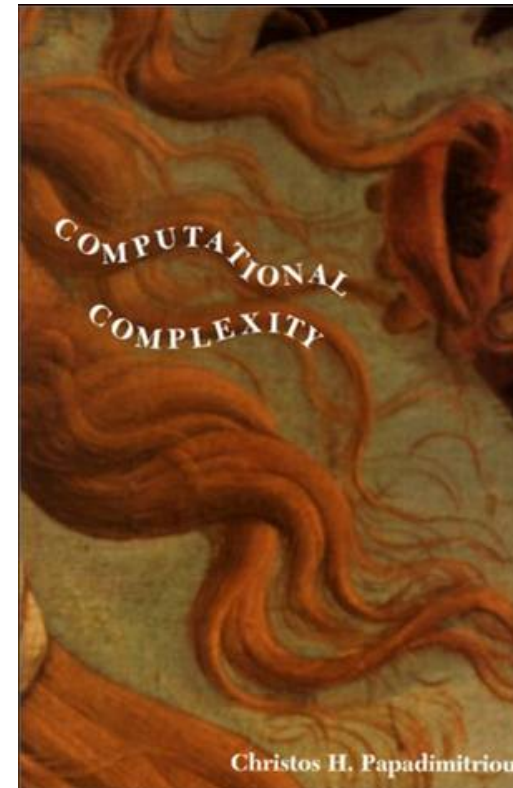
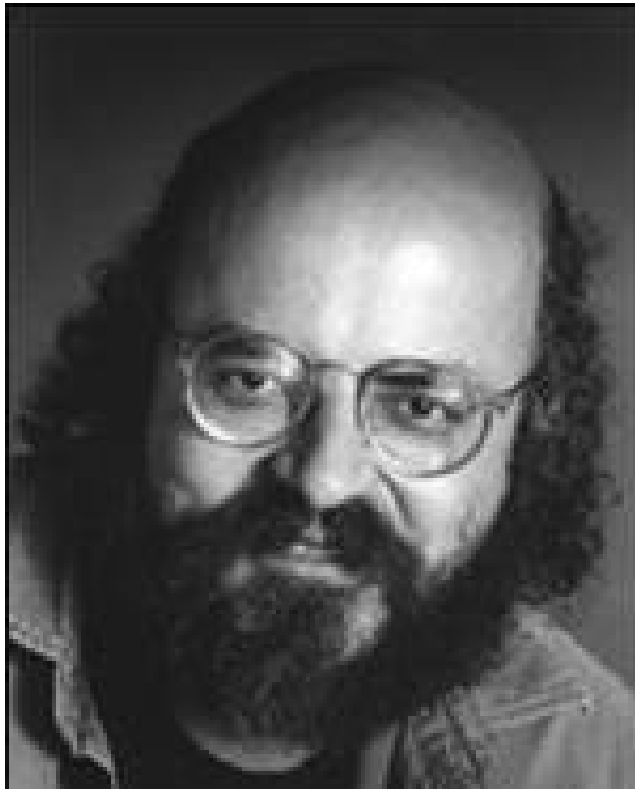
- Christos H. Papadimitriou:
Computational Complexity.
Addison Wesley, 1994.
- M. R. Garey, D. S. Johnson:
Computer and Intractability:
A Guide to NP-Completeness.
W. H. Freeman 1979.
- Further references (articles from
journals, conferences, ...): see
course homepage

References

- Christos H. Papadimitriou:
Computational Complexity.
Addison Wesley, 1994.
- M. R. Garey, D. S. Johnson:
Computer and Intractability:
A Guide to NP-Completeness.
W. H. Freeman 1979.
- Further references (articles from
journals, conferences, ...): see
course homepage



References



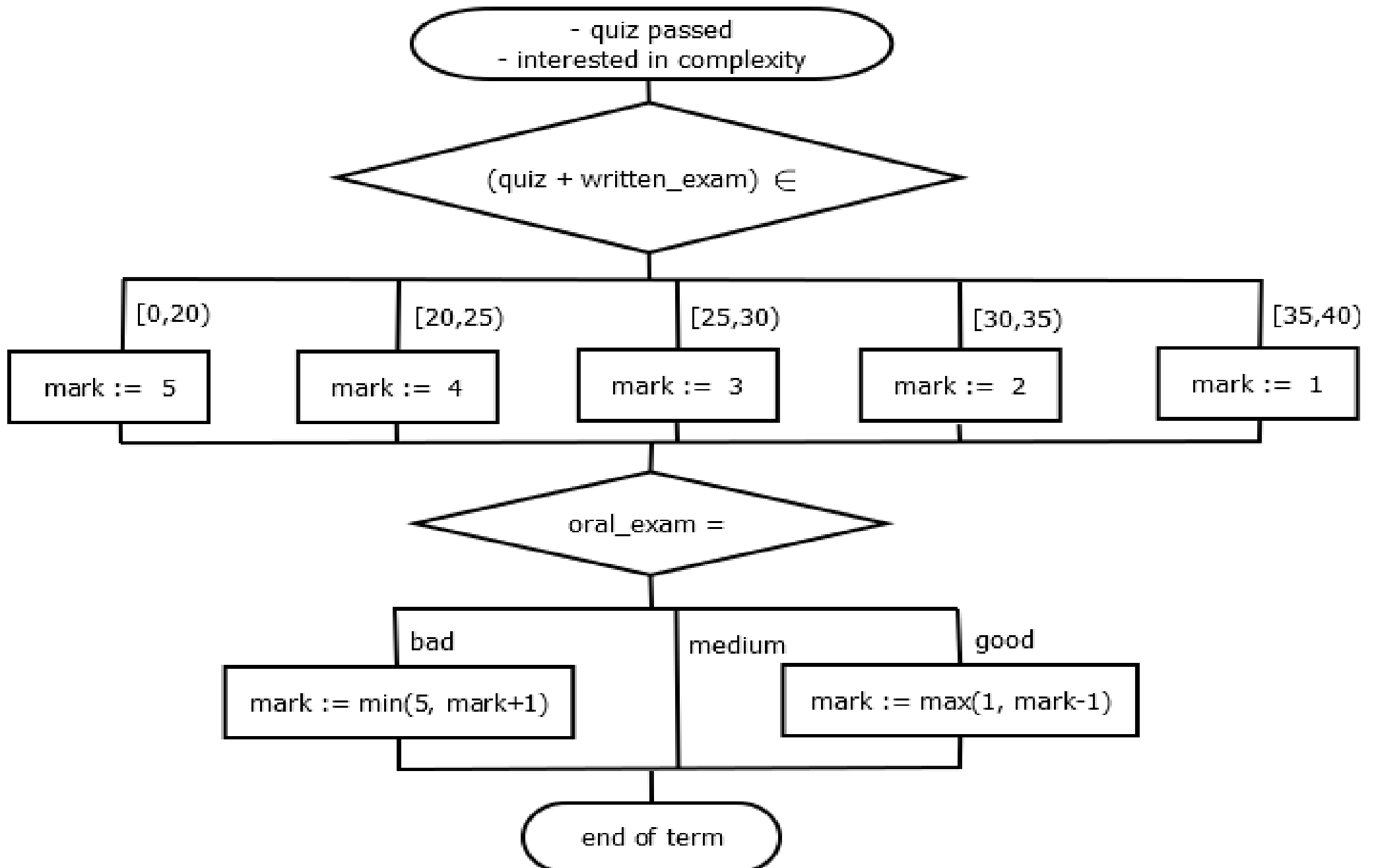
Assessment

Components

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

Final Mark

- Quiz + written exam: mark $\in \{1, 2, 3, 4, 5\}$
- 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



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
=====	
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
Reinhard Pichler