Computational Complexity, Summer 2009

Time

July 13 10:00 - 12:00, 16:30 - 18:30
July 14 10:00 - 12:00, 14:00 - 16:00
July 15 10:00 - 12:00, 14:00 - 16:00
July 16 10:00 - 12:00, 14:00 - 16:00
July 17 10:00 - 12:00, 16:30 - 18:30

Room

Rm 301, Zhulou Building

Lecturer

Martin Stigge
Matin Stigge is a PhD student of Division of Computer Systems, Department of Information Technology, Uppsala University, Sweden.

Course Takers

Teachers, PhD students, and Master students of College of Information Science and Engineering, Northeastern University, China

Course Page

http://www.it.uu.se/katalog/marst984/cc-st09
http://www.neu-rtes.org/courses/summer2009/ (local site for service)

Preliminary course outline

1st day (2009-07-13) - Introduction to Computability Theory

- Math preliminaries, Problems as languages, Landau Symbols
- Turing machines, decidability, non-determinism
- Turing reductions, halting problem

2nd day (2009-07-14) - Complexity classes

- Time and space complexity
- Reductions, hardness, completeness
- Non-determinism

3rd day (2009-07-15) - Polynomial Complexity

- Inside P
- NP, NP-complete
- SAT, NodeCover, Clique, KnapSack, MultiprocessorScheduling, ...

4th day (2009-07-16) - The P-vs-NP Problem

- The problems GI and PRIMES
- Oracles, Polynomial time hierarchy
- Relativization

5th day (2009-07-17) - Other complexity concepts

- Non-uniform complexity: Circuits
- Interactive Proof Systems
- Probabilistic complexity classes

In the end of every day, the students will be given a couple of small problems to solve, for deepening the understanding of the day's lectures.

Literature

Detailled lecture notes (suitable for printing out) will be provided on the course page before the beginning of the course.

Further Readings:

- **Introduction to the Theory of Complexity**, Daniel Pierre Bovet and Pierluigi Crescenzi, Prentice Hall
- **Computational Complexity**, Christos H. Papadimitriou, Addison Wesley

(Note that access to the above books is not a prerequisite.)

* Were there any change on lecture time and place, we will make announcements in class, via emails, or on the course web sites.