Discrete Mathematics II — Winter 2012/13

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Time: Lectures: Tuesdays, Wednesdays 8:30-10:00, Arnimalle 6 SR 032.
Exercises: Tuesdays 12:30-14:00, Arnimalle 6 SR 032.

Course webpage: http://discretemath.imp.fu-berlin.de/DMII-2012-13/

Topics of the course algorithmic combinatorics and its applications

- Graph Algorithms and Applications (asymptotic running time, P vs NP, Hamilton cycles, matchings, Hungarian Algorithm, connectivity, Menger's Theorem, flows, Ford-Fulkerson Algorithm, Baranyai's Theorem),

- Linear Programming (Linear Programs, Polytopes, Integer Programming and LP relaxations, Simplex Method, Duality, Applications of LP, Ellipsoid and Interior Point Methods, Randomized Simplex Algorithms in Abstract Models)

Prerequisite: basic graph theory, combinatorics, linear algebra, and calculus

Requirement for "active participation at the exercises". There will be 12 sheets of exercises. You should try to solve and write up all exercises for yourself, because you will face some of them on the final exam. Each week **submit solutions for two exercises**, those you would want to be corrected. For the signature on the exercises you must achieve **60% of the total score** (for each exercise the same score will be given).

You will usually have two weeks to think about each sheet, except the first one. The new exercise sheet will normally be placed on the web shortly after the end of the Wednesday lecture. You should submit your solutions until the end of the appropriate Tuesday lecture. It is not possible to submit the solutions later. However, an exercise is "alive" for submission until it is discussed at the exercises.

It is very beneficial to think about and discuss mathematics in small groups. You are absolutely encouraged to solve exercises together and submit

your solutions in pairs. However it is also crucial to practice writing up proofs independently. Hence every student is required to **write up solutions at least five times** (out of the twelve). At the beginning of each solution state the name of the person who wrote it up for the pair;

Furthermore, each student must **present a correct solution at the blackboard at least once.**

In conclusion, you need to fulfil each of the following:

- achieving at least 60% of the point value of $2 \times 12 = 24$ homework problems,
- writing up the solutions yourself at least five times (besides writing the name of the two authors, on each solution you should state who the scriber was),
- presenting at least once a correct solution at the blackboard.

Final. The grade for the course is based solely on the final exam,. The final takes place on February 20th (Wednesday) from 9:30AM to 12:30PM. The make-up final exam will be on the 20th of March (Wednesday) from 10AM to 12PM. The better of the two grades will count.
There will be three different type of exercises at the final:

- Definitions, statements and proofs of theorems.
  You should know all the material presented at the lecture.
- Problems from the exercise sheets.
  You should know how to solve all homework exercises.
- New problems
  You should be able to apply the encountered theorems and methods to solve exercises you have never seen.

Literature. There will be no separate lecture notes. Most of the material is taken from the following books, which are placed on the Handapparat in the mathematics library:

- J. Matoušek, B. Gärtner: Understanding and Using Linear Programming
- D. West: Introduction to Graph Theory

Further reading.
- V. Chvátal: Linear Programming
- R. Diestel: Graph Theory
- A. Schrijver: Theory of Linear and Integer Programming
- A. Schrijver: Combinatorial Optimization