Probabilistic Method— Summer 2016

Lecturer: Tibor Szabó
Phone: 838-75217
Office: 211, Arnimallee 3 211
Email: szabo@math.fu-berlin.de

Exercises: Tamás Mészáros
Phone: 838-75435
Office: 205, Arnimallee 3
Email: tamas.meszaros@fu-berlin.de

Time: Lectures: Tuesdays, 12:30-14:00, SR 031 Arnimalle 6
Exercises: Wednesdays, 12:30-14:00, SR 119 Arnimallee 3.

Course webpage: http://discretemath.imp.fu-berlin.de/DMIII-2016/

Topics of the course The probabilistic method and its applications in combinatorics, geometry and theoretical computer science. (Linearity of expectation, alterations, second moment method, Local Lemma, correlation inequalities, martingales, concentration inequalities, pseudorandomness, random graphs)

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

Requirement for "active participation at the exercises". There will be 12 sheets of exercises, some of which will also appear on the final exam. Each week **submit solutions for two exercises** that you would like corrected. If you want to **excel** in your craft, you are strongly encouraged to try to solve **all** exercises. Write them all up, they will be looked at, but only the two you signaled will be graded for credit.

The exercise sheets will usually be placed on the website of the course after the Tuesday lecture. Please submit your written solutions by 12:30PM on Wednesday of the following week in the mailbox of Tamás Mészáros. **Late solutions are not accepted.** For the signature on the exercises ("aktive Teilnehme") you must achieve **60% of the total score** (for each exercise the same score will be given).

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

your solutions in pairs. I also would like to encourage you to please feel free to approach us for discussion of your thoughts on particular exercises and ask for a hint about them. Nevertheless, I discourage you to search for the solutions on the internet. Most likely you *can* find one to most exercises, but copied solutions will never give you the deep understanding necessary to succeed on the final, so you cannot unfortunately spare the time you struggle on your own or with your study group while trying to solve exercises. Actually, *why* would you want to spare the struggle: that's exactly the creative and most fun part of the course!

It is also crucial to practice writing up proofs independently. Hence every student is required to **write up solutions to at least ten problems** (out of the twenty-four corrected). 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 to at least ten problems (on each solution you should clearly state who the scriber was (and of course the name of the coauthor)),
- presenting at least once a correct solution at the blackboard.

Final. The grade for the course is based solely on the final oral exam. The exams take place on the week of September 12 and and the week of October 10. The final is a closed-book/closed-notes exam, you must learn everything that was presented and be familiar with how to apply the learned methods. In order to succeed, it is absolutely necessary to actively follow the lecture throughout the semester, immediately revise the new material, and try to solve the exercises. There will be two different types of tasks on the final:

- Lexical knowledge: Definitions, statements and proofs of theorems
- Problem solving: applying the encountered theorems and methods to solve exercises (some of these will be from the homework sheets, some you have never seen before)

Literature.

- N. Alon, J. Spencer: The Probabilistic Method