Constructive Combinatorics — Summer 2018

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Course webpage http://discretemath.imp.fu-berlin.de/DMIII-2018/

Course contents In this course we will study extremal constructions for Turán- and Ramsey-type problems in combinatorics. These constructions shall make use of finite fields, projective planes, algebra, and probability. We will also study quasirandomness through graph eigenvalues, as well as applications of the discrete Fourier transform.

Prerequisites Basic extremal graph theory, combinatorics, algebra, probability, and calculus.

Lectures Lectures will take place on Mondays 10:30 to 12:00 (in Takustr 9, SR 051) and on Wednesdays 12:30 to 14:00 (in Arnimallee 3, SR 130).

Homework A new homework assignment will be posted every two weeks. You are asked to form a pair with a classmate. Solutions should be submitted in class, before the start (12:30pm) of the Wednesday exercise session every even week. Late homework will not accepted.

Aktive Teilnehme You are asked to form homework pairs and in fact strongly encouraged to think about/work on the problems in study groups with your classmates. When submitted, each solution should indicate who from the pair was the writer of the particular solution. For the active participation credit you need to be the scriber of at least 7 submitted exercises. You also need to receive at least 60% of the points and present the solutions of at least two exercises at the blackboard.

Final The grade for the course is based solely on the final exam. There will be oral exams, offered either in July directly after the end of the lectures, or in September/October. During the exam, you should expect to encounter three different types of exercises:

- Definitions, statements and proofs of theorems.
  You should know all the material presented in lectures.
- Homework exercises.
  You should be able to solve all the homework exercises.
- New exercises.
  You should be able to apply the theorems and methods from the course to solve exercises you have not seen before.

Literature Lecture notes will be provided as the course progresses. The following books also contain interesting material for further reading:

- N. Alon, J. Spencer: The Probabilistic Method
- R. Diestel: Graph Theory
- S. Jukna: Extremal Combinatorics
- D. West: Introduction to Graph Theory