

## Course Outline –595, Topics: Regularity Lemma and its applications;

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**TEXTBOOKS:** Most of the topics covered in the course appear in the book and the paper listed below: Other topics appear in recent papers.

Tao, Terence; Vu, Van *Additive combinatorics*. Cambridge Studies in Advanced Mathematics, 105. Cambridge University Press, Cambridge, 2006. xviii+512 pp.

- Gowers, W. T. Quasirandomness, counting and regularity for 3-uniform hypergraphs. *Combin. Probab. Comput.* 15 (2006), no. 1-2, 143–184.

### **COURSE OUTLINE:**

The course will focus on the Szemerédi Regularity Lemma, on its variants, and on numerous applications. It includes Roth and Szemerédi Theorem, on the existence of arithmetic progressions in dense subsets of integers. We try to look this theorem from several aspects, analytical, graph theoretical, and hypergraph theoretical point of view. In particular I plan to spend lots of time on the hypergraph regularity lemma, based on Gower's paper.

**REQUIREMENTS:** There will be some homework assignments, in order that the students could check their understanding of the material. For a full credit some homework should be submitted or a research paper should be presented in the class or an exam could be taken. Class attendance is strictly required.

**RESOURCES:** Electronic mail is a medium for announcements and questions.

**OFFICE HOURS:** By appointment.

**PREREQUISITES:** There are no official prerequisites, but students need the mathematical maturity and background for graduate-level mathematics. For example, basics of linear algebra, probability and graph theory are assumed to be known.