MINI COURSE

A quick introduction to Ergodic Theoretic and Analytic aspects of Additive Combinatorics

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SCHEDULE:	Lectures 1 & 2:	Tuesday, April 18, 2017, 9:30–12:30
	Lectures 3 & 4:	Thursday, April 20, 2017, 9:30–12:30
VENUE:	Lecture Hall 2, IPM Niavaran Bldg., Niavaran Square, Tehran	

ABSTRACT. In 1936, Erdös and Turán [ET] conjectured that every set of integers A with positive natural density contains a k-term arithmetic progression for every k. In 1953 [R] Roth proved Erdös-Turán's conjecture for $k = 3$. Later Szemerédi gave a proof first for $k = 4$ [Sz1] and then for general k [Sz2]. In 1977 Furstenberg [F] gave a proof by ergodic theoretic techniques and in 1998 Gowers [G] gave a proof for Szemerédi's Theorem using higher Fourier analysis.

In this course I will sketch ergodic, depending on the amount of time available I will review some of the history of the subject. I will also sketch the analytic proof of Szemerédi theorem as well as the ergodic proof and I will try to describe their connection.

References

[ET] P. Erdös and P. Turán, *On some sequences of integers.* Journal of the London Mathematical Society. **11** (4), (1936), 261–264.

[R] K. F. Roth, *On certain sets of integers.* Journal of the London Mathematical Society. **28** (1), (1953), 104–109.

[Sz1] E. Szemerédi, *On sets of integers containing no four elements in arithmetic progression*, Acta Math. Acad. Sci. Hung. **20**, (1969), 89–104.

[Sz2] E. Szemerédi, *On sets of integers containing no k elements in arithmetic progression,* Acta Arithmetica **27**, (1975), 199–245.

[F] H. Furstenberg, *Ergodic behavior of diagonal measures and a theorem of Szemerdi on arithmetic progressions*, J. D'Analyse Math. **31**, (1977), 204–256.

[G] T. Gowers, *A new proof of Szemerédi's theorem*, Geom. Funct. Anal. **11** (3), (2001), 465–588.