COURSE ANNOUNCEMENT

TOPICS IN COMBINATORICS

MATH 285N, WINTER 2016

MWF 12PM–12:50PM, MS 6201

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Description. This is a topics course in "tame" extremal combinatorics. We will develop the basics of the Vapnik-Chervonenkis theory and consider some applications (to questions in semialgebraic and convex geometric combinatorics, PAC learning, compression schemes). Besides, we will study various Helly-type phenomena: fractional Helly theorems, bounded transversals and piercing numbers (including the (p, q)-theorem for convex sets of Alon and Kleitman, the version for VC-families due to Matoušek, and an abstract version due to Alon, Kalai, Matoušek and Meshulam). Also, some related questions in semialgebraic incidence geometry and Ramsey theory will be considered.

References. I will follow my own notes. Some relevant references include:

- Matoušek, Jiří. Lectures on discrete geometry. Vol. 212. New York: Springer, 2002.
- Alon, Noga, and Daniel J. Kleitman. "Piercing convex sets and the Hadwiger-Debrunner (p, q)-problem." Advances in Mathematics 96.1 (1992): 103-112.
- Matousek, Jirí. "Bounded VC-dimension implies a fractional Helly theorem." Discrete & Computational Geometry 31.2 (2004): 251-255.
- N. Alon, G. Kalai, J. Matoušek, R. Meshulam. "Transversal numbers for hypergraphs arising in geometry." Advances in Applied Mathematics 29.1 (2002): 79-101.