18.316 Syllabus: Seminar in Combinatorics

Fall 2013

Instructor:	**Jacob Fox, fox@math.mit.edu, Room E17-316**
Time:	**Mondays, Wednesdays, Fridays 2:00-3:00**
Location:	**Room E17-129**
Office hours:	**Available by appointment**
Prerequisites:	**Permission by instructor**
Grades:	**No exams; grades will be determined by 3-4 presentations per student and class participation**
Objective:	**To learn and appreciate some cutting edge research in combinatorics, and practice presenting mathematics.**
Suggestions:	**Class participation and discussion are highly encouraged. Please feel free to ask appropriate questions before, during, or after class.**
Class website:	**http://math.mit.edu/~fox/18316/**

Suggested topics

1 class topics:

1. D.D. Cherkashin, A new randomized algorithm for the Erdos–Hajnal problem, preprint.

http://arxiv.org/pdf/1308.6696.pdf

2. J. Fox and P. Loh, On a problem of Erdos and Rothschild on edges in triangles, Combinatorica 32 (2012), 619-628.

3. D. Kral and O. Pikhurko, Quasirandom permutations are characterized by 4-point densities, Geometric and Functional Analysis 23 (2013), 570-579.

4. J. Solymosi, The (7,4)-conjecture in finite groups, preprint.

http://arxiv.org/pdf/1309.0133.pdf

5. J. Fox, C. Lee, and B. Sudakov, Chromatic number, clique subdivisions, and the conjectures of Hajos and Erdos-Fajtlowicz, Combinatorica (2013), 181-197.

6. H. A. Kierstead and A. V. Kostochka, A Short Proof of the Hajnal-Szemeredi Theorem on Equitable Coloring, Combin. Probab. Comput. 17 (2008), 265–270.

7. B. Sudakov, A conjecture of Erdos on graph Ramsey numbers, Advances in Mathematics 227 (2011), 601-609.

8. D. Conlon, J. Fox, and B. Sudakov, Large almost monochromatic subsets in hypergraphs, , Israel J. Math. 181 (2011), 423-432.

9. A. Marcus, G. Tardos, Excluded permutation matrices and the Stanley-Wilf conjecture, J. Combin. Theory Ser. A 107 (2004), no. 1, 153-160.

10. N. Alon, The Shannon capacity of a union, Combinatorica 18 (1998), 301-310.

2 class topics

1. N. Alon, A. Shpilka, and C. Umans, On sunflowers and matrix multiplication, Computational Complexity 22 (2013), 219-243.

2. H. Huang and B. Sudakov, A counterexample to the Alon-Saks-Seymour conjecture and related problems, Combinatorica 32 (2012), 205-219.

3. J. Pach and G. Tardos, Tight lower bounds for the size of epsilon-nets, Journal of the American Mathematical Society (2013), 645-658.

4. N. Alon A. Moitra and B. Sudakov, Nearly Complete Graphs Decomposable into Large Induced Matchings and their Applications, J. European Math. Soc. 15 (2003), 1575-1596.

5. N. Alon and A. V. Kostochka, Hypergraph list coloring and Euclidean Ramsey Theory, Random Structures and Algorithms 39 (2011), 377-390.

6. Shachar Lovett, An exposition of Sanders quasi-polynomial Freiman-Ruzsa theorem.

http://eccc.hpi-web.de/report/2012/029/

7. D. Conlon, A new upper bound for diagonal Ramsey numbers, Ann. of Math. 170 (2009), 941-960.

8. A. Dudek, T. Retter, and V. Rödl On Generalized Ramsey Numbers of Erdős and Rogers, submitted.

3 class topics

1. T. Bohman, The Triangle-Free Process, Advances in Mathematics , 221 (2009) 1653-1677.

2. J. Balogh, R. Morris and W. Samotij, Independent sets in hypergraphs

3. A. V. Kostochka and M. Yancey, Ore's Conjecture on color-critical graphs is almost true, submitted.

http://www.math.uiuc.edu/~kostochk/docs/accepted/1209.1050.pdf

4. N. Alon, O. Angel, I. Benjamini and E. Lubetzky, Sums and products along sparse graphs, Israel J. Math. 188 (2012), 353--384.