

M 584, Extremal Combinatorics, Spring 2019

Contact information

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Course description

One of the most typical questions in extremal combinatorics is the study of the maximum or minimum possible size of an object from some family of objects (e.g. graphs, sets) subject to some given constraints. For example, what is the maximum number of edges in an n -vertex graph without triangles? Another classic: what is the maximum size of a collection of subsets of an n -element set such that no subset contains another one? We will concentrate on questions of these types although extremal combinatorics also includes the important subjects of graph colorings and Ramsey theory. Extremal combinatorics is one of the most actively studied areas of combinatorics with many recent significant breakthroughs. Extremal problems often have important consequences in subjects such as computer science and number theory.

Topics

Forbidden subgraphs (e.g. Turán's theorem, Erdős-Stone-Simonovits theorems, forbidden bipartite subgraphs, forbidden subhypergraphs); Szemerédi's regularity lemma (e.g. triangle-removal lemma, Roth's theorem); Set systems (e.g. size of Sperner and intersecting systems, multiple proofs of Erdős-Ko-Rado theorem, Ahlswede-Khachatrian complete intersection theorem);

Textbook

There is no set textbook for this class. I will provide electronic notes with references. Some of the forbidden subgraph material can be found in the graph theory books of Bollobás (Modern Graph Theory, Extremal Graph Theory), Bondy and Murty (Graph Theory), Diestel (Graph Theory), or West (Combinatorial Mathematics). Diestel (Graph Theory) contains an excellent section on the regularity lemma. Set systems are covered well by the books of Bollobás (Combinatorics) and Anderson (Combinatorics of Finite Sets).

Class schedule

MWF: 1:00-1:50 PM in MATH 108

Grading

Grades are based on homework exercises. Letter grades and +/-s will be assigned according to the standard scale.

Accommodations

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommason Center 154 or 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

Academic honesty

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the [Student Conduct Code](http://life.umt.edu/vpsa/student_conduct.php) (http://life.umt.edu/vpsa/student_conduct.php).

Important dates

Full registration deadlines can be found online on the [registrar calendar](http://www.umt.edu/registrar/calendar.php) (<http://www.umt.edu/registrar/calendar.php>).