## M393C: Gibbs measures and random graphs Fall 2018 Section 54495

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**Course description**: This course is on random processes (such as random walks, percolation, uniform spanning trees, the Ising model) on graphs, usually Cayley graphs of groups. The emphasis is on how geometry (or geometric group theory) plays a role in the qualitative aspects of the process. For example, amenable Cayley graphs admit at most one infinite Bernoulli percolation cluster, but non-amenable Cayley graphs can admit infinitely many.

Part of the course will consist of student lectures. I will provide additional materials and coaching to help students with their lectures.

Useful online references. Links to the books below are on the class homepage.

- 1. Probability on Networks and Trees by Russ Lyons and Yuval Peres.
- 2. The random cluster model by Geoffrey Grimmett.
- 3. Probability on Graphs by Geoffrey Grimmett.
- 4. Probability and Geometry on Groups by Gabor Pete.
- 5. Gibbs measures and phase transitions on sparse random graphs by Amir Dembo and Andrea Montanari.

Lectures in the first few weeks will mostly follow the Lyons-Peres book.

Grading. There will be

- homework assignments (at a rate of approximately one a week),
- two midterms
- one research paper to read and present (from a list of proposed papers).

Your grade will be the best grade out of these three categories.

UT Honor Code. Information on the UT honor code can be found at

http://catalog.utexas.

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**Recommendations Regarding Emergency Evacuation**. Recommendations on emergency evacuation can be found at

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