

**MATH 608, TOPICS IN PROBABILITY:
2D STATISTICAL PHYSICS**

MWF 14–15pm, Mathematics building, room 202

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Office Hours: By appointment.

Prerequisites: Graduate probability (i.e., Math 544), undergraduate complex analysis.

Course Outline: We will review recent developments in 2D models of statistical physics:

- (a) Conformal invariance of critical percolation on the triangular lattice.
- (b) Conformal invariance of the planar FK-Ising model.
- (c) Random walks on infinite planar graphs and circle packing.

We will use some classical tools (which we will develop in class):

- (i) Basics of critical planar percolation: Russo-Seymour-Welsh and Harris-Kesten theorems, $p_c = 1/2$ and continuity of the percolation probability.
- (ii) Electric networks and random walks.
- (iii) Influence of bits on Boolean functions, Russo's formula, sharp thresholds.

Grading Scheme: Homework and presentation.