MATH 595, AN INTRODUCTION TO SLE

Instructor: Robert Bauer, rbauer13@illinois.edu
When: M-W-F 12, second half of semester.

This minicourse provides an introduction to the Stochastic Loewner Evolution (Schramm-Loewner Evolution, SLE). SLE and its variants describe a large class of random simple curves that arise as interphases in planar statistical mechanical models, such as the Ising model and percolation. In 1999, Oded Schramm combined an old idea of evolving slit mappings in planar domains (studied first by Karl Löwner in the 1920s) with two statistical properties for slit mappings describing interphases in models of statistical mechanics—the domain Markov property and conformal invariance. This combination meant that the tools of stochastic calculus could be brought to bear on questions regarding such interphases. We will briefly review underlying models and stochastic calculus and then see how one is naturally lead to the definition of SLE when describing planar interfaces. We will then study SLE using the tools of stochastic calculus.

Students interested in this course should be familiar with basic results in complex analysis (such as the Riemann mapping theorem) and Brownian motion. Grading will be based on homework assignments and/or a presentation.

We will use Greg Lawler’s book “Conformally invariant processes in the plane” as a reference.