2015 SPRING SEMESTER

BÁLINT TÓTH (BME & Rényi Inst.) PERCOLATION

Recommended for MSc and PhD students of mathematics and/or physics. Taught course of the Graduate Schools of Mathematics at BME and ELTE.

WHEN?THURSDAYS 10:15-12:00 AMWHERE?BME H-67first lecture:Thursday 12 february 2015

Lectures will be held in English or Hungarian, according to the composition of the audience.

Content:

- > Phenomenology, geometry of random graphs, phase transition.
- Elementary tools: Harris' inequality, Hammersley's theorem.
- > Unicity of percolation cluster: theorems of Aizenman&Kesten, and Burton&Keane.
- **Regularity above p**_c.
- Further tools: Russo's formula and van den Berg-Kesten (BK) inequality.
- > Sharpness of phase transition: theorems of Aizenman&Barsky, and Menshikov.
- Two-dimensions 1: topological duality, Sykes-Essam conj., Russo-Seymour-Welsh thm.
- > Two dimensions 2: the theorems of Kesten and Russo: $p_c+p_c^*=1$.
- > Two dimensions 3: critical conformal invariance, Cardy's formula, Smirnov's theorem.
- Stochastic Loewner Evolution (SLE): introduction, basics.
- **Outlook**.

Reading:

- o H. Kesten: Percolation for mathematicians. Birkhauser, 1982
- G. R. Grimmett: *Percolation*. Second Edition. Springer, 1999
- o B. Bollobás, O. Riordan: *Percolation*. Cambridge UP, 2006
- research *papers*
- o lecturer's handwritten lecture notes

Further information available here: http://www.math.bme.hu/~balint/oktatas/perkolacio/