

The Department of Mathematics

2019–20–A term

Course Name Percolation

Course Number 201.2.0101

Course web page

<https://www.math.bgu.ac.il/en/teaching/fall2020/courses/percolation>

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Office Hours <https://www.math.bgu.ac.il/en/teaching/hours>

Abstract

Requirements and grading¹

Course topics

This course concerns the physical notion of phase transition, specifically in the model known as “percolation”.

We will review the main mathematical results regarding percolation and its related counterparts the Ising model, Potts model and Fortuin-Kasteleyn cluster model, starting from works of Ising and Pierles in the beginning of the 20th century and culminating in modern work of Smirnov (for which he was awarded a Fields Medal).

The topics in the course are, time permitting:

1. Percolation on graphs. Definitions and basic properties.
2. Harris' inequality
3. van den Berg-Kesten inequality, Reimer's inequality
4. Russo's formula
5. Burton-Keane Theorem

¹Information may change during the first two weeks of the term. Please consult the webpage for updates



6. Exponential decay of correlations in sub-critical regime
7. Planar percolation: Russo-Seymour-Welsh theory
8. Planar percolation: the Harris-Kesten theorem.
9. Conformal invariance: Cardy-Smirnov formula on the triangular lattice
10. Percolation on groups
11. Critical percolation on non-amenable groups: BLPS