

## The Department of Mathematics

2023–24–B term

**Course Name** probabilistic methods in geometric group theory

**Course Number** 201.2.0601

**Course web page**

<https://www.math.bgu.ac.il/en/teaching/spring2024/courses/probabilistic-methods-in-geometric-group-theory>

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

### Abstract

### Requirements and grading<sup>1</sup>

### Course topics

in this course we will build methods from probability theory and apply them to study geometric questions regarding finitely generated groups. we will ultimately aim to provide a proof of Gromov's celebrated theorem: a finitely generated group is virtually nilpotent if and only if it has polynomial growth. we will also bring up open questions for further research.

#### Topics:

- .1 conditional expectation and martingales
- .2 random walk on groups
- .3 Cayley graphs
- .4 entropy
- .5 harmonic functions
- .6 unitary actions

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



- .7 nilpotent and solvable groups
- .8 Milnor-Wofl theorem
- .9 Gromov's theorem \*\* time permitting:
- .10 bounded harmonic functions
- .11 Choquet-Deny theorem
- .12 positive harmonic functions