

## The Department of Mathematics

2019–20–A term

**Course Name** Discrete Geometry

**Course Number** 201.2.0191

**Course web page**

<https://math.bgu.ac.il/en/teaching/fall2020/courses/discrete-geometry>

**Lecturer** Prof. Shakhar Smorodinsky, <shakhar@bgu.ac.il>, Office 208

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

### Abstract

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

### Course topics

- Fundamental theorems and basic definitions: Convex sets, separation, Helly's theorem, fractional Helly, Radon's theorem, Caratheodory's theorem, centerpoint theorem. Tverberg's theorem. Planar graphs. Koebe's Theorem.
- Geometric graphs: the crossing lemma. Application of crossing lemma to Erdos problems: Geometric Incidences, Repeated distance problem, distinct distances problem. Selection lemmas. Counting  $k$ -sets. An application of incidences to additive number theory.
- Coloring and hitting problems for geometric hypergraphs:  $VC$ -dimension, Transversals and Epsilon-nets. Weak eps-nets for convex sets.  $(p, q)$ -Theorem, Conflict-free colorings.
- Arrangements: Davenport Schinzel sequences and sub structures in arrangements.
- Geometric Ramsey and Turan type theorems: Application of Dilworth theorem, Erdos-Szekeres theorem for convex sets, quasi-planar graphs.

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