

MATH 309 Section 201
Topics in Geometry
2016 W Term 2 (January-April, 2017)

Instructor: Jozsef Solymosi, Professor, Department of Mathematics, UBC

Office: MATH 220

Office hours: Tuesdays 11:00-12:00 or by appointments (MATH 220)

Prerequisite: One of MATH 152, MATH 221, MATH 223 and one of MATH 220, MATH 226, CPSC 121. ***Specifically, it will be assumed that students are familiar with basic techniques of mathematical proof and reasoning such as induction and proof by contradiction.*** Students will be expected to write logically correct and mathematically coherent proofs as part of homework and examinations.

The course syllabus will be as follows:

Euler's formula. Convexity, Graphs, Trees, Convex Polyhedron, Planar Graphs.

Planar Graphs. Drawings, Colouring, Structure, Kuratowski's Theorem.

Geometric Graphs. Drawings, Intersections, Crossings.

Crossing Number. Basic Probability, Upper and Lower Bounds.

Point-Line incidences. Szemerédi-Trotter Theorem (bounds on incidences).

Metric problems in Discrete Geometry. The unit distances problem, distinct distances.

Combinatorics of point-sets. Erdős-Szekeres Theorem, Halving lines.

Circle Packing. Planar circle packing, Lattice Packing, Sphere Packing.

Geometry of Numbers. Pick's Theorem, Minkowski's Theorem, applications.

Course notes (relevant notes from the web) will be provided after lectures. There are two advanced books which cover most of the topics of the course:

Lectures on discrete geometry/ Jiri Matousek.

Combinatorial geometry [electronic resource via UBC Library] / János Pach, Pankaj K. Agarwal.

Evaluation: There will be two midterm exams and one final exam, as well as weekly homework assignments. Homework will be assigned on Thursdays, and due the following Thursday in class. Late homework will not be accepted.

The **Course Grade** will be computed as follows:

Final Exam: 50 percent

Midterm Exams: 20 percent x 2 = 40 percent

Homework: 10 percent

You are required to be present at all examinations. No makeup tests will be given. Non-attendance at an exam will result in a mark of zero being recorded.