

Spring 2023

CMU

**21-849 Special Topics: Analytic and Probabilistic Methods in Convex Geometry**

**Lecture:** MWF 8:00 am – 8:50 am, Wean Hall 8201

**Lecturer:** Tomasz Tkocz, Wean Hall 7206, [ttkocz@math.cmu.edu](mailto:ttkocz@math.cmu.edu)

**Office Hours:** Mon 10-11 and 2-3 or by email appointment

**Course website:** Canvas and/or <http://math.cmu.edu/~ttkocz>

**Course description:** This course will be a snapshot of several classical and modern topics in convex geometry and high dimensional probability (mainly nonasymptotic), where analytic methods play a prominent role. This course will be self-contained, but basic solid knowledge in linear algebra, measure theory and probability (mostly at the undergraduate-level) will be assumed.

**Prerequisites:** Linear algebra, measure theory, probability.

**Literature:** Most of the references will be provided as we go along. The most comprehensive monograph on the related topics is the following.

- Artstein-Avidan, Shiri; Giannopoulos, Apostolos; Milman, Vitali D.; Asymptotic geometric analysis, Part 1 & 2, Mathematical survey and monographs, AMS, 2015-21.

**Course content:** concentration of measure and isoperimetry, functional inequalities, log-concavity, Gaussian space

**Learning objectives:** Students should

- gain understanding of basic concepts such as convexity, concentration of measure, and their interactions
- advance their insight into the interplay between geometric, probabilistic and analytic ideas
- develop an improved ability and use the methods and results of modern high-dimensional probability and convex geometry

**Course format:** This is an in person class. You are expected to fully participate in class, viz. please ask and answer questions, initiate or participate in discussions.

Late submissions will not be accepted, but the lowest homework score will not count towards the final grade.

**Grades:** The grades will be based on students in-class presentations. A list of topics will be circulated as the semester progresses. Suggestions are more than welcome.