

COURSE CONTENT

- Academic Year : 2013/2014, Semester II.
- Course Code & Title : Discrete and Computational Geometry
- Undergraduate students register under:
MAS462/MTH472/MH4931 - Special Topics in Applied Maths
Graduate students register under:
MAS725 Topics in Discrete Mathematics II
- To apply : Please request and submit a form from the MAS general office.
- Prerequisites : Permission of the lecturer.
An informal list of prerequisites is MH2100, MH2200, MH3100.

Lecturer

Assoc Prof Sinai Robins

Track requirements

Undergraduate students of the pure and applied tracks can use this course to contribute to their track requirements. The division will view it as being on all lists for these two tracks.

This course is suggested for:

Any student interested in applications of Linear algebra and combinatorial methods to the study of polytopes and their interaction with lattices in the Euclidean space \mathbb{R}^d . Enumeration problems, such as the number of lattice points in a polytope, or the Frobenius coin exchange problem, turn out to be special cases of a more general 'Ehrhart' theory of polytopes, which we develop from first principles. Some of the topics may require a deeper knowledge of linear algebra and mathematical maturity.

Learning Objective:

To understand the mathematical tools used in the Ehrhart theory of integer point enumeration of polytopes, following the book "Computing the continuous discretely: integer point enumeration in polytopes", Springer, 2008, by M. Beck and S. Robins. This topic is essentially an interplay between the usual continuous volume of polytopes versus the discrete volume of a polytope. We will also use various sections from other books, such as Barvinok's book "A course in convexity", and some lecture notes by the instructor.

Content

Polytopes, Lattices, sublattices, convex analysis, discrete Fourier analysis, continuous Fourier analysis.

Textbooks/References

Lecture Notes by S. Robins, a book by S. Robins (joint with M. Beck), "Computing the continuous discretely: integer point enumeration in polytopes", Springer, 2008, 1-278, and various excerpts from other books and papers.