

MATH 125: GEOMETRY OF DISCRETE GROUPS SUMMER 2015

JOHN VOIGHT

COURSE INFO

- **Lectures:** Monday, Wednesday, Friday, 10A (10:00–11:05 a.m.)
- **x-period:** Thursday, 12:00 noon–12:50 p.m.
- **Dates:** 26 June 2015–26 August 2015
- **Room:** 004 Kemeny Hall
- **Instructor:** John Voight
- **Office:** 341 Kemeny Hall
- **E-mail:** jvoight@gmail.com
- **Instructor’s Office Hours:** MWF 11:30 a.m.–12:30 p.m., or just make an appointment!
- **Course Web Page:** <http://www.math.dartmouth.edu/~jvoight/~m125x15/>
- **Prerequisites:** Some advanced coursework and a healthy dose of curiosity!
- **Required Texts:** None (course notes on webpage).
- **Grading:** For undergraduates, grade will be based on weekly homework.

HOMEWORK

The homework assignments will be assigned on a varying basis and will be posted on the course webpage. Homework is required for undergraduates and optional but strongly encouraged for graduate students. In general, it is due in one week, but late homework will be accepted.

Cooperation on homework is permitted (and encouraged), but if you work together, do not take any paper away with you—in other words, you can share your thoughts (say on a blackboard), but you have to walk away with only your understanding. In particular, write the solution up on your own. Please write on your assignment the names of any other collaborators you worked with.

Plagiarism, collusion, or other violations of the Academic Honor Principle, after consultation, will be referred to the The Committee on Standards.

RELIGIOUS OBSERVANCES AND ACCOMMODATION

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the term to discuss appropriate accommodations.

I encourage students with disabilities, including “invisible” disabilities such as chronic diseases and learning disabilities, to discuss with me after class or during my office hours appropriate accommodations that might be helpful to you.

Students with disabilities enrolled in this course and who may need disability-related classroom accommodations are encouraged to make an appointment to see me before the end of the second week of the term. All discussions will remain confidential, although the Student Accessibility Services office may be consulted to discuss appropriate implementation of any accommodation requested.

TOPICS

This course will provide an introduction to the geometry of discrete groups. Specifically, we will study the action of discrete subgroups (lattices) inside groups of isometries of hyperbolic spaces, especially dimensions 2 and 3. An interesting class of such groups arises from arithmetic constructions, and the corresponding quotients give rise to orbifolds and manifolds of interest in number theory, geometry, spectral theory, combinatorics, and topology.

The plan is roughly as follows:

- Hyperbolic geometry, examples of $SL_2(\mathbb{Z})$ and $SL_2(\mathbb{Z}[i])$: 4 lectures
- Group actions, Fuchsian groups, and fundamental domains: 5 lectures
- Crash course on quaternion algebras: 1 or 2 lectures
- Arithmetic groups: 2 lectures
- Volume formula and applications: 6 lectures
- Further examples (triangle groups, etc.): 3 lectures
- Application to isospectrality: 2 lectures
- Application to Shimura curves: 2 lectures
- Other topics as time allows.

