

# Math 286X: Arithmetic Statistics

## Spring 2020

### Syllabus

**Location:** Science Center 310 (FAS)

**Course website:**

<http://math.harvard.edu/~gundlach/20-spring/286X/>

**Times:** Tuesdays and Thursdays 1:30–2:45pm

**Instructor**

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*Office hours:*

Tu/Th 3–4pm

in Science Center 233

## Prerequisites

This is a graduate topics course. Undergraduates are welcome.

Prerequisites are basic algebra and combinatorics (group actions, orbit-stabilizer theorem, ...), basic multivariable calculus, Galois theory, and algebraic number theory (number fields, local fields, geometry of numbers). We will use basic measure theory.

Some previous exposure to analytic number theory (in particular sieves, Dirichlet series) would be helpful, but isn't necessary.

## Tentative list of topics

Random primes, random polynomials, counting local fields, counting number fields (Malle's conjecture), random number fields (Cohen-Lenstra heuristics), sieves, lattice-point and orbit-counting methods. If time permits, we might also discuss random elliptic curves.

## References

There is no official textbook for this course, but here are some good references:

- *Problems in Analytic Number Theory* by M. RAM MURTY contains a nice introduction to Dirichlet series (chapters 1–3) and sieves (chapter 9).
- MELANIE MATCHETT WOOD's notes *Asymptotics for number fields and class groups* from the Arizona Winter School 2014: <http://swc.math.arizona.edu/aws/2014/index.html>

I'm not aware of a reference comprehensively treating the subjects of this course. There is a list of additional references for specific topics on the course website.

## Grading

There will be no graded homework and the final grade will be entirely based on a final paper (10–15 pages) on a topic related to the class material.

Please acknowledge collaborators and other sources.