

SYLLABUS

MATH 440 - Introduction to Algebraic Geometry

Fall 2018

Instructor: Kalina Mincheva

Lecture: TTh 11:35-12:45, DL 431

Office hours: DL 406, TBA

Course webpage: <http://users.math.yale.edu/~km995/alggeomF18.html>

Course description: We will develop the theory of algebraic varieties, which are zero sets of polynomial equations. We will start with some basic commutative algebra - define Gröbner basis, chain conditions and talk about the ideal membership problem. Then we will discuss varieties - affine, projective, quasi-projective. We will prove Hilbert's Nullstellensatz (one of the most important theorems of classical algebraic geometry). We will talk about different notion of dimension and how those relate. We will define maps between varieties - morphisms, rational and birational maps. The remaining topics are (but not limited to) singularity theory, normalization and blowups, elimination theory, resultants, divisors on algebraic varieties. We will try to also focus on some computational aspects of algebraic geometry.

Textbook: We will not follow a specific textbook, but here is a list of reference materials which can serve as a complement to the lecture notes.

- *Basic Algebraic Geometry 1: Varieties in Projective Space* by I.R. Shafarevich
- *Ideals, Varieties, and Algorithms: An Introduction to Computational Algebraic Geometry* by D. Cox, J. Little, D. O'Shea
- *Introduction to Algebraic Geometry* by B. Hassett
- *Introduction To Commutative Algebra* by M. Atiyah, G. MacDonal

Prerequisites: Math 350 Introduction to Abstract Algebra (or equivalent).

Grading: The final grade for the class will be formed by:

Homework: 65 %

Final Exam: 35 %

Exams: We will offer a take home final exam.

- Make-up for the exam will only be allowed with a deans excuse.

Homework: Assignments will be posted on the course webpage and on Canvas in advance.

- Homework will be due at the beginning of class. Exact dates TBA.
- Late homework will not be accepted unless accompanied by a dean's excuse.
- Homework should be *legibly written* otherwise we will not grade it.

Academic Honesty: At Yale, academic honesty is taken very seriously. You are welcome and encouraged to collaborate with other students, however writing the final draft should be your own individual effort.