

Math 214B

Introduction to Algebraic Geometry, second quarter

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Spring 2014, UCLA
MWF, 9 AM, MS 5118

This is a continuation of Prof. Rouquier's Math 214A from Winter 2014. The main book for the course is Hartshorne. Last quarter covered Chapter I and sections 1–3, 5, 7 of Chapter II.

This quarter will focus on coherent sheaf cohomology, the main technical tool in algebraic geometry. It gives invariants for algebraic varieties which are closely related to geometric problems. One application is the Riemann-Roch theorem for algebraic curves. Using that, we will classify algebraic curves of genus 0, 1, 2, 3, at least. We begin the birational classification of algebraic varieties of any dimension.

In terms of Hartshorne, here are the topics I plan to cover. The course can only include part of the material in each section.

- Chapter II, sections 4 (proper morphisms), 6 (divisors and line bundles), and 8 (the tangent bundle).
- Chapter III, sections 1–5 (coherent sheaf cohomology) and some topics from the later sections (Serre duality, flat morphisms, smooth morphisms);
- Chapter IV, sections 1–5 (algebraic curves: Riemann-Roch theorem, embeddings in projective space, elliptic curves, canonical embedding).
- Introduction to birational geometry in higher dimensions.

References

G. Kempf. *Algebraic Varieties*. Cambridge (1993).
R. Hartshorne. *Algebraic Geometry*. Springer (1977).
R. Vakil. *Foundations of Algebraic Geometry*, <http://math.stanford.edu/~vakil/216blog>

Grading

Grading will be based on three problem sets.

Office Hours: by appointment.

Web page: <http://www.math.ucla.edu/~totaro/214b.1.14s>