

Math 6130/Algebraic Geometry/Fall 2016 Syllabus

Course webpage: www.math.utah.edu/~bertram/6130

Class meets: MWF 11:50-12:40 in WEB L120

Instructor: Aaron Bertram Office: JWB 302

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Office Hours: MWF 3:30-4:20

Text: Course Notes and Hartshorne, *Algebraic Geometry*

Grading: Grades will be based on homework.

Homework: Assigned on Mondays, collected the following Monday. We will find an additional hour to meet and discuss the assignments.

The Course: Algebraic Geometry is concerned with loci of solutions to systems of polynomial equations in several variables and their completions to compact loci in projective space. When such a completed locus is “irreducible,” then it is called a **projective variety**, and when it is also smooth (or mildly singular) then it is a *geometric model* for its field of rational functions. A first example of this is the elliptic curve, which is a one-point completion of the locus of zeroes of:

$$y^2 = x^3 + ax + b$$

More generally, a finitely generated *module* over a polynomial ring may be completed to a graded module over a graded polynomial ring (in one more variable). Coherent sheaves on projective varieties allow us to interpret this geometrically as the passage from “local” to “global” objects. Coherent sheaves are analogous to vector bundles on compact manifolds, and indeed, differential forms and vector fields may be understood as sections of particular coherent sheaves. As with Hartshorne’s book, we will focus in the Fall on coherent sheaves and their properties (though we will be more example-based), and in the Spring we will focus on the (Cech) cohomology of coherent sheaves, allowing us to make computations of invariants of projective varieties that are crucial for the many applications of Algebraic Geometry.

ADA Statement: The Americans with Disabilities Act requires that reasonable accommodations be provided for each student with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss whether such accommodations are necessary.