YALE UNIVERSITY DEPARTMENT OF MATHEMATICS
MATH 608 INTRODUCTION TO ARITHMETIC GEOMETRY
FALL SEMESTER 2018

Instructor:	Asher Auel	**Lecture:**	LOM 201
Office:	LOM 210	**Time:**	Mon Wed 1:00 – 2:15 pm
Web-site:	http://users.math.yale.edu/~auel/courses/608f18/		

Introduction: This course will explore some of the major themes in arithmetic geometry. Topics will include Galois cohomology and descent, principal homogeneous spaces, quadratic forms and the Brauer group, Milnor K-theory, as well as the existence of rational points. Of particular interest will be varieties over finite fields, number fields, and functions fields.

Grading: The final grade is based on class participation, problem sets, and a final exam.

Prerequisites: Prior experience with algebra and Galois theory will be necessary. Some exposure to algebraic geometry will be useful, but may be taken in conjunction with a beginning algebraic geometry course.

Topics covered: Subject to change.

(1) Fields of interest (finite fields, p-adic fields, number fields, and function fields) and Galois theory.

(2) Projective space and the basics of affine and projective algebraic varieties. Rational points.

(3) Quaternion algebras and conics. Wedderburn's Theorem. Witt's Theorem. Quadratic reciprocity. Local-global principles for number fields and rational function fields.

(4) Galois cohomology. Hilbert Theorem 90. Torsors and nonabelian H^1. Linear algebraic groups.

(5) Central simple algebras. Artin–Wedderburn theory. The Brauer group.

(6) Milnor K-theory. Resultus of Merkurjev–Suslin. Milnor Conjecture and Block–Kato Conjecture.

(7) Tsen–Lang theory. C_i-fields. C_1-fields have trivial Brauer group. Chevalley's Theorem. Tsen's Theorem. Lang's Theorem. Applications to central simple algebras and quadratic forms.

(8) Descent obstruction and Brauer–Manin obstruction.

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