

## ALGERBRA II CLASS FALL 2010

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### FUNCTIONS FIELDS AND NUMBER FIELDS

We will study in parallel projective curves over a field  $k$  (finite or algebraically closed) and rings of algebraic integers in a finite extension of the field of rational numbers. The notions of discrete valuation ring, Dedekind rings, projective modules, locally free sheafs, class groups and Picard groups will be introduced. Arakelov theory of rings of integers will be studied in parallel with the classical theory of divisors on a projective curve (Riemann-Roch theorem, Riemann - Hurwitz exact sequence, Minkowski lattice point theorem, inverse different and sheaf of differential forms). The class can be use as a pretext to learn Algebraic Geometry and Algebraic Number Theory in a unified way.

Prerequisites: A good Algebra 1 class

#### Books:

Pierre Samuel : Algebraic Numbers (Springer)  
Eisenbud-Harris : Schemes the language of Algebraic Geometry  
Lucien Szpiro : Cours de Geometrie Arithmetique on my web site (in french)