Title: Toric Varieties

Prerequisites: Because of the elementary nature of these varieties, the prerequisite will be graduate algebra, although courses in commutative algebra and algebraic geometry will be helpful.

Course Description: Among the most accessible classes of algebraic varieties are toric varieties. This is fortunate for these are also among the most commonly encountered outside of algebraic geometry within mathematics and in the applications of algebraic geometry. Toric varieties in particular are currently widely studied in algebraic geometry and its applications.

This course would introduce the students to toric varieties, emphasizing their fundamental combinatorial nature while focusing on concrete examples and explaining some of their applications.

Here is an Outline:

- Toric ideals
  - Generation of toric ideals
  - Groebner bases
  - Computation
- Affine toric varieties
- Projective toric varieties
  - Orbit decomposition and Limiting behavior
- Lattice Polytopes
  - Algebraic-Combinatorial Geometric Dictionary
  - Normality of Sturmfellian Toric Varieties
- Real projective toric varieties
  - Irrational toric varieties
  - Algebraic moment map
- Geometric combinatorics, lattices and fans
- Abstract Construction of Toric Varieties
  - Arithmetic toric varieties
- Cox/Delzant quotient construction
  - Cox Coordinate Ring
- Line bundles on toric varieties
- Toric Degenerations

Avg Amount of Time Dedicated Per Week: