

Syllabus for Ma 765 - Selected Topics in Algebra (Schubert Varieties)

Updated information can be found on the web page of the course at
<http://www.ms.uky.edu/~uwenagel/SCHUBERT-s12/schub.html>.

Time and Place: 11:00 - 11:50 MWF, FB 213.

Instructor: Uwe Nagel, POT 763, 257-6793, uwe.nagel@uky.edu.

Office Hours: 1:00 - 1:50 pm MWF, or by appointment. You can also consult me by e-mail.

Textbook: *Combinatorial commutative algebra* by E. Miller and B. Sturmfels.

Material: The goal of the course is to discuss exciting recent developments at the intersection of Algebraic Geometry, Commutative Algebra, Combinatorics, and Topology. The main players will be Schubert varieties. These are sets of matrices whose submatrices satisfy certain rank conditions. A wealth of mathematics has been and is being developed to investigate these varieties. We will primarily use an algebraic approach focussing on ideals generated by determinants of matrices of indeterminates. The methods and concepts we will develop include Gröbner bases, SAGBI bases, Young tableaux, Gelfand-Tsetlin patterns, simplicial complexes, pipe dreams, Schubert and Schur polynomials, flag varieties, and Plücker coordinates. The focus will be on numerical invariants of Schubert varieties, their interpretations and computations.

The course will be as self-contained as possible. Familiarity with the ring-theoretic concepts of a first year graduate Algebra course will be assumed. Though helpful, no prior knowledge of Combinatorics is required. The basic reference for the course will be the book by E. Miller and B. Sturmfels.

LITERATURE

1. E. Miller, B. Sturmfels, "Combinatorial commutative algebra," Graduate Texts in Mathematics **227**, Springer, 2005.
2. W. Fulton, "Young tableaux," Cambridge University Press, 1999.
3. L. Manivel, "Symmetric functions, Schubert polynomials and degeneracy loci," SMF/AMS Texts and Monographs **6**, 2001.

Grades: The grade will be based on active participation in the course and an in-class presentation.