

MA 796: Schubert Calculus

Spring 2020

Location: TH 3:00–4:15, SAS Hall 1218

Instructor: Ricky Liu (riliu@ncsu.edu, SAS Hall 3264)

Prerequisites: Some familiarity with linear algebra and combinatorics

About the course:

Given four lines in 3-space, how many lines intersect all four? This question and others like it involving intersections of linear spaces lie in a branch of mathematics called *Schubert calculus*, which dates back to the nineteenth century and is the subject of Hilbert's fifteenth problem. Nowadays, such questions are typically phrased in terms of the cohomology rings of the Grassmannian and flag varieties. In this course, we will give a modern treatment of the subject from a combinatorial perspective. In particular, we will study in detail the relationship to combinatorial constructions such as Young tableaux, symmetric functions, and Schubert polynomials.

Some prior familiarity with algebraic geometry or algebraic topology may be helpful but is not required. Grades will be based on occasional homework and a final project.

Optional references:

Manivel, *Symmetric Functions, Schubert Polynomials, and Degeneracy Loci*
Fulton, *Young Tableaux*