

Discrete Mathematics – Math 60610
10:40-11:30 MWF Spring 2008
Andrew Sommese (Instructor)

Combinatoric methods, e.g., [1, 2], play a significant role in mathematics and its applications. This course will cover basic theory including enumeration techniques; generating functions; graphs and their colorings; special classes of polynomials; basic coding theory; Latin squares; games; the LLL and PSLQ algorithms and their consequences; . . .

The last part of the course will cover some applications of algebraic geometry to combinatorics: the necessary algebraic geometry will be explained (without proofs). Some topics we will cover:

1. Hirzebruch's association [3] of an algebraic surface to an arrangement of lines in the plane and the restrictions on line arrangements implied by the Miyaoka inequality;
2. Stanley's work [4] relating algebraic geometry/commutative algebra and the combinatorics of triangulations of spheres.

References

- [1] P. Cameron, *Combinatorics: Topics, Techniques, Algorithms*, Cambridge University Press (1995).
- [2] J.H. van Lint and R.M. Wilson, *A Course in Combinatorics*, Cambridge University Press (2001),
- [3] F. Hirzebruch, Arrangements of lines and algebraic surfaces, in *Arithmetic and geometry*, Vol. II, *Progress in Mathematics*, 36 (1983), 113–140, Birkhäuser Boston.
- [4] R. Stanley, *Combinatorics and commutative algebra*, Second edition. *Progress in Mathematics*, 41 (1996). Birkhäuser Boston.