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.