Mathematics 996, Fall 2013 (Section #26481)
Topics in Algebraic Combinatorics and Commutative Algebra (3 credits)

Instructor: Jeremy Martin (You can call me "Jeremy")
  E-mail: `jmartin@math.ku.edu`
  Office: 623 Snow Hall, (785) 864-7114
  Office hours: MTW 1–2 PM or by appointment

Meeting times: MWF 9:00 – 9:50 AM, 408 Snow Hall

Website: `http://www.math.ku.edu/∼jmartin/math996`

Course description: This course will focus on topics of current interest spanning combinatorics, commutative algebra, and algebraic geometry: simplicial complexes and Stanley-Reisner rings; Gröbner bases; lattice ideals, semigroup rings, and toric varieties; and multigraded Hilbert series. Other possible topics (depending on time and students' interest) may include: Coxeter groups; critical groups and sandpiles/chip-firing; and Grassmannians, flag varieties, and Schubert varieties.

Prerequisites: Math 791 or permission of the instructor. Essentially, you should be comfortable with groups, rings and fields. Some knowledge of commutative algebra and/or combinatorics is helpful but is not required.

Textbook: *Combinatorial Commutative Algebra* by Ezra Miller and Bernd Sturmfels (Springer, Graduate Texts in Mathematics #227, 2005). I am planning on covering at least chapters 1, 7, and 8. The full text of the book is available electronically from the KU Libraries website at `lib.ku.edu`. *Respect the publisher's copyright and do not redistribute the PDF or print out a copy on the department copier.* I may also post lecture notes on the website, as needed.

Other books that may be useful: (* = freely available online)

  (1) W. Bruns and J. Herzog, *Cohen-Macaulay Rings* (Cambridge, 1993)
  (2) D. Eisenbud, *Commutative Algebra with a View to Algebraic Geometry* (Springer, 1995)
  (3) W. Fulton, *Young Tableaux* (London Mathematical Society, 1997)
  (4) *A. Hatcher, *Algebraic Topology* (Cambridge, 2002)
  (5) *A. Schrijver, *A Course in Combinatorial Optimization*
  (6) R.P. Stanley, *Combinatorics and Commutative Algebra*, 2nd ed. (Birkhäuser, 1996)
  (7) *R.P. Stanley, *Enumerative Combinatorics*, volume 1, 2nd ed. (Cambridge, 2012)
  (8) R.P. Stanley, *Enumerative Combinatorics*, volume 2 (Cambridge, 1999)
  (9) *R.P. Stanley, *Hyperplane Arrangements*
  (10) B. Sturmfels, *Gröbner Bases and Convex Polytopes* (AMS, 1996)

Course requirements: Come to class every day and *participate*. One of the goals of a 996 class is to get you thinking about your future research and thesis topics.

Each student will carry out an individual project, consisting of reading a research article or the equivalent, giving a brief expository talk to the class, and providing written feedback on another student's talk. I will work with each student individually to choose an appropriate article.

There will be no official homework or exams.

Blatant shill: Please also attend the Combinatorics Seminar, which meets Fridays, 3–4 PM, in 408 Snow.

Dropping the course: Through September 16, you may drop a course and have it removed from your record. From September 17 through November 20, you may withdraw from a course (a grade of W will appear on your transcript). After November 20, dropping is not permitted. For complete details, consult the KU Registrar's office (151 Strong Hall; 785-864-4423; `http://www.registrar.ku.edu`).

Academic honesty and collaboration: You are required to abide by all KU policies on academic integrity: see `http://documents.ku.edu/policies/governance/USRR.htm#art2sect6`. Cheating, plagiarism or other academic misconduct will result in a failing grade on the assignment in question, and usually further disciplinary sanctions, possibly including a failing grade in the course.

You are encouraged to collaborate with other students on the homework assignments. However, intellectual honesty requires that each student write up his or her own solutions and acknowledge all collaborators. It is a violation of academic integrity to copy another student's homework, or to let someone else copy yours.

Students with disabilities: The KU Office of Disability Resources (22 Strong Hall; 785-864-2620 (V/TTY); `http://www.disability.ku.edu`) coordinates accommodations and services for all students who are eligible. If you have a disability for which you wish to request accommodations, please contact Disability Resources as soon as possible. Please also contact Prof. Martin privately in regard to your needs in this course.

Religious holidays: If you plan to observe a religious holiday which conflicts in any way with the course schedule or requirements, contact Prof. Martin at the beginning of the semester to discuss alternative accommodations.

Intellectual property: Course materials prepared by the instructor, together with the content of all lectures and review sessions, are the intellectual property of the instructor and are solely for use by students enrolled in the course. Redistributing course materials in any form without the consent of the instructor is prohibited. Likewise, video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Upon reasonable request, the instructor will usually grant permission to record lectures, on the condition that such recording is used only as a study aid by the student making the recording, and is not modified or distributed in any way.