MATH 552 ALGEBRAIC GEOMETRY I

İzzet Coşkun, MWF 12:00-12:50 p.m.
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Welcome to Math 552! This course serves as an introduction to Algebraic Geometry. Algebraic Geometry is a central subject in modern mathematics, with close connections with number theory, combinatorics, representation theory, differential and symplectic geometry. We will study basic properties of projective algebraic varieties such as dimension, degree and singularities. At the same time, we will develop a large body of examples that motivate the study of the subject. Depending on time, we will develop the classical theory of curves and surfaces. This course should be enough preparation for a course on the theory of schemes.

Course webpage: http://www.math.uic.edu/~coskun/math552.html

Venue and time: Lincoln Hall 201, MWF 12-12:50

Drop-in hours: MW 1-2

Credit Hours: 4

Text: There are three recommended texts for this course.

- (FC) Joe Harris, Algebraic Geometry: a first course, Springer 1992.
- (BAG) Igor Shafarevich, Basic Algebraic Geometry I, Varieties in Projective Space, Springer-Verlag 1994.
- David Mumford, Algebraic Geometry I, Complex Projective Varieties, Springer 1995.

Prerequisites: A solid background in commutative algebra, especially in the theory of rings and modules at the level of a first year graduate class. Some familiarity with complex analysis, algebraic topology and differential geometry useful, but not required.

Requirements: There will be weekly homework. Homework is a very important component of this course. It will count for 100 % of your grade. No late homework will be accepted. You may collaborate on the homework problems, but you must write your own solutions and properly acknowledge any help you receive from others.

Attendance Policy: Registered students are expected to attend and participate in all of the lectures and should notify me before any planned absence.

Topics: The following is a tentative list of topics that will be covered in the course. Please read the subject in the recommended texts before class.

Aug 21	Affine varieties	BAG p. 22-32
Aug 23	Examples: Plane curves	BAG p.1-21
Aug 25	Rational Functions	BAG p. 32-40
Aug 28	Projective varieties	BAG p. 41-53
Aug 30	Examples	FC p. 1-16
Sep 1	Products	BAG p. 54-60
Sep 4	No class: Labor day	
Sep 6	Maps of projective varieties	FC p. 17-31
Sep 8	Examples; Finite maps	BAG p. 61-66
Sep 11	Dimension	BAG p. 67-76
Sep 13	Dimension	FC p. 133-150
Sep 15	Dimension of Fibers	BAG p. 76-82
Sep 18	Examples: Grassmannians	FC p. 63-71
Sep 20	Applications	FC p. 151-162
Sep 22	Hilbert Polynomials	FC p. 163-173
Sep 25	Degree of projective varieties	FC p. 88-97
Sep 27	Degree	FC p. 224-238
Sep 29	Examples	FC p. 239-250
Oct 2	Tangent spaces	BAG p. 83-97
Oct 4	Examples	FC p. 174-185
Oct 6	Gauss maps, dual varieties	FC p. 186-199
Oct 9	Power series rings	BAG p. 98-113
Oct 11	Blow-ups	BAG p. 114-124
Oct 13	Blow-ups	FC p. 72-87
Oct 16	Normal varieties	BAG p. 125-131
Oct 18	Curve singularities	BAG p. 131-138
Oct 20	Divisors	BAG p. 151-159
Oct 23	Divisors	BAG p. 159-166
Oct 25	Divisors on curves	BAG p. 168-174
Oct 27	Rational curves	
Oct 30	Elliptic curves	BAG p. 175-187
Nov 1	The group law on elliptic curves	
Nov 3	Abelian varieties	BAG p. 188-194
Nov 6	Differential forms	BAG p. 195-204
Nov 8	Differential forms	BAG p. 204-210
Nov 10	The canonical class	BAG p. 210-215
Nov 13	The Riemann-Roch Theorem for curves	BAG p. 215-222
Nov 15	Applications	
Nov 17	Intersection numbers	BAG p. 223-232
Nov 20	Intersection numbers	BAG p. 232-236
Nov 22	Bezout's theorem	BAG p. 236-241
Nov 24	No class: Thanksgiving	
Nov 27	Surfaces	BAG p. 241-245
Nov 29	Birational maps between surfaces	BAG p. 251-261
Dec 1	Cubic surfaces	BAG p. 246-251

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Procedures". Information on these policies and procedures is available on the University web pages of the Office of Access and Equity: http://oae.uic.edu/.

Student Evaluation of Teaching Program (Course Evaluations) Student evaluations of teaching play a fundamental role in improving course content, format, and delivery (teaching) at UIC. Students are invited to share feedback on the course with the instructor throughout the semester, and should complete to the online course evaluation form emailed to them at the end of the semester before 12am on the first day of finals.

Academic Integrity Policy For written assignments in the course (both homework and daily recap summaries), students are encouraged to work together. However, the final write-up must be done individually. As an academic community, UIC is committed to providing an environment in which research, learning, and scholarship can flourish and in which all endeavors are guided by academic and professional integrity. All members of the campus community–students, staff, faculty, and administrators–share the responsibility of insuring that these standards are upheld so that such an environment exists. Instances of academic misconduct by students will be handled pursuant to the Student Disciplinary Policy: http://dos.uic.edu/docs/Student%20Disciplinary%20Policy.pdf

Religoius Holidays Students who wish to observe their religious holidays shall notify the faculty member by the tenth day of the semester of the date when they will be absent unless the religious holiday is observed on or before the tenth day of the semester. In such cases, the student shall notify the faculty member at least five days in advance of the date when he/she will be absent. The faculty member shall make every reasonable effort to honor the request, not penalize the student for missing the class, and if an examination or project is due during the absence, give the student an exam or assignment equivalent to the one completed by those students in attendance. If the student feels aggrieved, he/she may request remedy through the campus grievance procedure. http://oae.uic.edu/docs/ReligiousHolidaysFY20152017.pdf

Disability Accomodation UIC is committed to full inclusion and participation of people with disabilities in all aspects of university life. Students who face or anticipate disability-related barriers while at UIC should connect with the Disability Resource Center (DRC) at drc.uic.edu, or at (312) 413-2183 to create a plan for reasonable accommodations. In order to receive accommodations, students must disclose disability to the DRC, complete an interactive registration process with the DRC, and provide their course instructor with a Letter of Accommodation (LOA). Course instructors in receipt of an LOA will work with the student and the DRC to implement approved accommodations.