

Math 797 - Introduction to Algebraic Geometry - Spring 2021

Tuesdays and Thursdays 11:30 → 12:45 AM via Zoom

Instructor: Eyal Markman

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Course Web page: See our Moodle page.

Lectures: The course runs as synchronous – optional, as we have students in different times zones. However, students residing in USA time zones are strongly encouraged to participate in every live Zoom lecture.

Office hours: Will be held via Zoom on Tuesday 1:30 am → 2:30 pm, Thursday 2:30 → 3:30 PM, and by appointment.

Prerequisites: Commutative algebra (rings and modules) as covered in 611-612. Some prior experience of manifolds would be useful (but not essential).

Course Plan:

1. Introduction: Algebraic sets, Zariski Topology, Nullstellensatz, Hilbert basis theorem.
2. Affine varieties, projective varieties, morphisms, birational maps, dimension, non-singularity.
3. Curves: Valuation rings, completions, integral closure, discrete valuation rings. Extending maps of nonsingular curves to projective varieties.
4. Divisors, line bundles, linear systems, and morphisms to projective space. Picard group. Class group. Degree. Differential forms.
5. Riemann-Roch for projective algebraic curves and applications.

References:

1. Shafarevich: *Basic Algebraic Geometry I: Varieties in projective space*. Second Edition. This would probably be the main reference.
2. *Algebraic Geometry*, by R. Hartshorne. A very useful standard textbook. Invaluable also as a reference for every researcher in algebraic geometry! It is rather dense.
3. David Mumford: *Red Book on Varieties and Schemes*. Springer Lecture Notes in Math. Volume 1358.

Homework: Will be assigned biweekly and graded. To be scanned and submitted online via Gradescope. Group work is encouraged, but individual papers should be submitted.

Grades: Will be determined by each student's individual progress as manifested in the homework.

Accommodation: The University of Massachusetts Amherst is committed to making reasonable, effective and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you have a disability and require accommodations, please register with Disability Services (161 Whitmore Administration building; phone 413-545-0892) to have an accommodation letter sent to your faculty. Information on services and materials for registering are also available on their website www.umass.edu/disability.

Academic honesty: Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent (http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).