

PMATH 464/764 Introduction to Algebraic Geometry, Spring 2019

Lectures: MWF 9:30-10:20 in MC 4041.

Instructor: Stephen New, office MC 5419, extension 35554, office hours MW 1:30-3:00

Text: There is no required text. Several good introductory texts include: Algebraic Curves, by Fulton, Basic Algebraic Geometry, by Shafarevich, and Algebraic Geometry, by Gathmann. A few more texts at a higher level include Algebraic Geometry, by Hartshorne, Principles of Algebraic Geometry, by Griffiths and Harris, and Foundations of Algebraic Geometry, by Vakil.

Course Outline: We will try to cover the following topics. Affine varieties and ideals in polynomial rings. The Zariski topology. Irreducible varieties and prime ideals. Points and maximal ideals. Integral ring extensions and the Lying Over Theorem. Field extensions, transcendence bases and Noether's Normalization Lemma. Radical ideals. and Hilbert's Nullstellensatz. Regular maps, the coordinate ring of a variety, and isomorphic varieties. Rational maps, the function field of a variety, and birational isomorphism. Projection from a point and the blow-up at a point. Dimension and singular points. The local ring at a point and the Zariski tangent space. Projective space, homogeneous polynomials, and projective varieties. Rational and regular maps between projective varieties. The multiplicity of a point on a curve. The multiplicity of a point of intersection of two curves. Bézout's Theorem. Elliptic curves and the group law on the cubic.

Assignments: There will be an assignment due every week or two, to be handed in during class. Students may receive help from any source as long as the help is acknowledged. Your solutions must be written in your own words (not copied) and they must reflect your own understanding. No late assignments will be accepted. Each student's lowest assignment mark will be dropped. Any assignments which remain uncollected by the end of September will be shredded.

Tests: There will be 4 term tests, each held on a Monday during the lecture period from 9:30-10:20 in MC 4041. The tests will be held on May 27, June 17, July 8 and July 29. No calculators will be allowed on the tests. Each student's lowest test mark will be dropped. Note that there will be no final exam.

Course Mark: For undergraduate students, the final course grade G will be given by the maximum of the two marking schemes

$$G = 40\%A + 60\%T \qquad G = 25\%A + 75\%T$$

where A is the average of the assignment marks, and T is the average of the test marks. Graduate students will also be required to submit a written project.

Persons with Disabilities: AccessAbility Services located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AccessAbility Services at the beginning of each academic term.

Website: The course website can be found at <http://www.math.uwaterloo.ca/~snew/>

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. (Check www.uwaterloo.ca/academicintegrity/ for more information.)

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, <http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>.
When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing academic offenses and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the undergraduate associate dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline, <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>.
For typical penalties check Guidelines for the Assessment of Penalties, <http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm>.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals, <http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>.