

Math 511 - Introduction to Algebraic Geometry
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
Spring 2021

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Lecture:	MWF 1:00-1:50 pm (CST)
Grader:	TBD
Instructor Office Hours:	by appointment

Learning Goals:

- develop an intuition with the classical objects that algebraic geometry study;
- become familiar with the always present dictionary between algebraic and geometric concepts that lies at the core of algebraic geometry;
- develop a set of skills in an elementary formulation of algebraic geometry that allows one to start (or complement) the study of other areas of mathematics, e.g. number theory, algebraic topology, differential manifolds, etc.

Objectives: The main goal of this course is to learn the elementary, i.e. pre-Grothendieck (schemes and functor of points), formulation of algebraic geometry and treat many examples. Even the non-schematic formulation of algebraic geometry relies on a lot of background: point-set topology, commutative algebra, some abstract algebra. Thus, **this is a rather hard graduate class and you will need to put in a lot of work**. A rough description of topics divided following the chapters of Shafarevich that we will cover (Chapter 1-3) is:

- 1) affine and projective varieties, regular and rational functions;
- 2) singular and smooth points, birational maps, blow up in projective space;
- 3) divisors, class group, differential forms and Riemann–Roch Theorem.

Structure: This is an online class with synchronous Zoom meetings (accessible via [Moodle](#)) at MWF 1:00 pm to 1:50 pm (CST). The meetings will be a mix of traditional lectures (roughly 2/3 of the time) and discussion sections (roughly 1/3 of the time). The schedule and all course material will be available on [Moodle](#).

The discussion sections will work as follows: at least three days before the meeting I will provide a list of topics and exercises from the book for the students. Before the class you should answer a poll to let me know which topics/exercises they understand clearly or are confused by. I will use the results of the poll to plan what we will talk about in the discussion sections.

Recording of lectures: to accommodate students that miss the meeting, I will record the lectures (but not the discussion sections). At the beginning of the lecture I will remind you before I start recording, but in case I forget you should assume that this is the case for the lectures.

Textbook: *Basic algebraic geometry. 1*, by Igor R. Shafarevich. You can get a copy from the library [here](#).

Platforms:

- [Moodle](#) will be used to access the Zoom sections and see your grades.
- [Perusall](#) will be used as platform to read the textbook together and have discussions about it.
- [Gradescope](#) will be used to submit your assignments (Homework and Exams).
- [Campuswire](#) will be used to communicate about the material.

Participation:

As this is an online course, and we are all trying to make it through a worldwide pandemic, we might struggle to bridge the physical distance between us all. Nevertheless, let us attempt to build personal connections and try to create a sense of community in our course. One way that we will try to do this is by using [Campuswire](#) to communicate.

My intention is for you to use this to ask questions related to the material, answer polls, and use chat-rooms to discuss the material and study together. One feature to notice is that you can create private chat-rooms and invite only certain people, so it works to form study groups.

Disclaimer: This is my first time using this platform, hopefully it will be more useful than a hindrance.

Assessments:

- **Homework. (50 %)** *Every two weeks.* These should be neatly written and turned in on time. For every 24-hour period that the homework is late you will lose 5 % of the grade and after 5 days the homework won't be accepted. The first 24-hours after the deadline are a grace period, but turning it after 24-hours will take 10 % off your homework. I will drop your worst grade from all the homework assignments.
- **Midterm. (20 %)** *There is a single "take-home" exam.* You will have a 36-hour window to access and complete the test, during the exam you can consult with me or the textbook (Shafarevich) but no other source, i.e. other books or the internet.
Mark your calendar: **Mar. 8.**
- **Final. (30 %)** *This is a three-hour exam, which covers the material of the whole course.* You will have a 24-hour window to access the final exam and once you log in you will have three hours to solve it.
Mark your calendar: **May. 7.**

No make-up exams. Rubrics for the specific assignments will be presented later.

Class Policy:

- Zoom etiquette is important when you attend discussion sections, meetings and office hours. Please be respectful of everyone present. Muting your audio when not talking can be a good way to minimize

noise, when a lot of people are in the meeting. We understand that you might have privacy concerns regarding video on Zoom, so we encourage you to explore Zoom backgrounds and/or profile pictures for your account. This helps your instructor, TAs and fellow classmates a bit, as it can be very hard conversing with empty squares on a screen.

- If you require accommodations, please don't hesitate and reach out as soon as possible, so we can make sure the course works for everyone from day one! For more information see the University Policy below.
- Communication is key. The world has been feeling overwhelming and scary lately, and we understand it. If you are struggling, please communicate with me.

University Policy:

- This class is subject to all the rules specified in the university policy and in particular to the Mathematics department policies. You can find the relevant information in the following link: <https://math.illinois.edu/resources/department-resources/teaching-policies>.
- Students that need special accommodations need to have a letter from the Disabilities Resources and Educational Services. For more information see the website: <http://www.disability.illinois.edu>.
- Students are required to abide by the University of Illinois's academic integrity policy, which can be found at: <http://studentcode.illinois.edu/>. Suspected violations of academic integrity will be reported to the Dean's Office and will likely result in a failing grade in the class and a note in your academic record.
- As any other university obligation this class does not take precedent over the students well-being and health. The university has great resources for anyone in need, more information can be found on: <http://odos.illinois.edu/community-of-care/>.