

MATH 483, Fall 2020

Algebraic Geometry

Instructor: Paul Goerss

Email: pgoerss@math.northwestern.edu

Office hours: By appointment.

Course Time: MWF Harris Hall 107 at 4.10PM (Tentative. But see below.)

Text: Hartshorne, *Algebraic Geometry*.

This is an industry-standard text available from many sources, although it is possible to argue that every professional mathematician should own a copy. In the fall we will focus on Chapter 2.

Overview: This is the first quarter of a two-quarter sequence on schemes and their coherent cohomology, following Hartshorne, with added material to raise the emphasis on the modern “functors of points” point of view. The fall quarter will develop schemes, quasi-coherent sheaves, divisors, maps to projective space, and differentials. Topics that require cohomology, such as Serre duality and Reimann-Roch will be left of the spring quarter.

Read this: As of September 14, this class is scheduled to be taught in a hybrid format, meaning there will be in-person class meetings. Learning and teaching are highly interactive and if we can hold meetings it will add considerably to the experience. This on many factors beyond the control of the instructor or even the mathematics department, including by not limited to the success of the University’s opening plans. Further note:

1. **Remote learning is possible, and even on-campus students should not attend a class if they are not well or not comfortable.**
2. In the first week of the quarter, all classes are only on-line.
3. All classes will be synchronously on-line, will be recorded, and will be available for later review.

What this course is: This is course in schemes, their properties, and their uses in modern algebraic geometry. Topics will include

1. Sheaves of rings, sheaves of modules, quasi-coherent sheaves
2. Affine and projective schemes
3. Hypotheses that make schemes workable: separated, proper, integral, and varieties
4. Constructing new schemes from old: closed immersions, and blow-ups
5. Line bundles and divisors; maps to projective space
6. Schemes as sheaves; functors of points
7. Differentials and (co-) tangent bundles

The Evaluation Component – Grades: This is a second year grad class, and will be graded by departmental norms. **But Note:** much of the important material in Hartshorne is in the exercises, so we will run this class in a partially flipped manner. Students will be expected to do some reading and preparation in advance of the class, and to make periodic presentations of selected questions.

University Statements and Policies

Recording

This class or portions of this class will be recorded by the instructor for educational purposes. These recordings will be shared only with students enrolled in the course and will be deleted at the end of the Fall Quarter 2020. Your instructor will communicate how you can access the recordings.

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact AccessibleNU. Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University’s Copyright Policy, faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or

distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

Accessibility

Any student requesting accommodations related to a disability or other condition must register with AccessibleNU and provide the instructor with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. All information will remain confidential. For more information, visit AccessibleNU, or call (847) 467-5530.

Discrimination and Sexual Harassment

Northwestern University's Policies on Discrimination, Harassment, and Sexual Harassment apply to all members of the University community, including students, staff, and faculty. Any student, staff, or faculty member who believes that he or she has been discriminated against or harassed on the basis of his or her race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, parental status, marital status, age, disability, citizenship, veteran status, genetic information or any other classification protected by law, should contact the Office of Equal Opportunity and Access at (847) 491-7458 or the Sexual Harassment Prevention Office at (847) 467-6571. Additional information about the University's discrimination and harassment policies, including the campus resources available to assist individuals with discrimination or harassment concerns, is available online on the Human Resources Equal Opportunity and Access website.

Sexual Misconduct and Reporting

Northwestern University is committed to fostering an environment where students are safe and free from sexual misconduct. Confidential resources are available to those who have experienced sexual misconduct. Faculty and instructors are not confidential resources and are required to report incidents of sexual misconduct, whether discussed in your assignments or in person, to the Title IX Coordinator, who can provide information about resources and options. Students who have experienced sexual misconduct are strongly encouraged to talk with someone to get support. For more information, including how to request interim protective measures and academic accommodations or file a complaint, see the Get Help page.

Academic Integrity

Academic integrity is taken very seriously at Northwestern. Students are responsible for reading and understanding Northwestern's academic integrity policies. **All suspected violations of academic integrity will be reported to The Graduate School.** These include: cheating, plagiarism, fabrication, unfair advantage, unauthorized collaboration, and aiding and abetting of academic dishonesty. Students found in violation of academic integrity may receive a zero on the assignment or a failing grade for the course, **and** may be suspended or permanently expelled from the University. See the WCAS website on academic integrity and Academic Integrity: A Basic Guide for more information.

Resources

Students can find useful resources for safety and security, academic support, and mental and physical health and well-being at the NUhelp website and app.