

# Math 763, Introduction to Algebraic Geometry Number of Credits: 3 credits Canvas Course URL: Not taught through Canvas, use www.math.wisc.edu/~andreic/teaching/763/index.html instead

Course Designation or Attributes: None

Meeting Time and Location: TR 9:30-11:00 online, via zoom

**Instructional Mode:** Face to face (synchronous online)

**Credit hours:** This class meets for two 75-minute class periods each week over the semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 3 hours out of classroom for every class period. The syllabus includes more information about meeting times and expectations for student work.

#### **INSTRUCTOR:**

Andrei Caldararu Office hours and location: Tuesdays 1:30-2:30pm and/or by appointment, via zoom

Email: andreic@math.wisc.edu

# **OFFICIAL COURSE DESCRIPTION**

Math is a graduate level introduction to algebraic geometry. It introduces the students to the basic concepts of algebraic geometry: varieties, morphisms, rational maps, dimension, smoothness.

### Requisites

Math 742 or equivalent.

# LEARNING OUTCOMES

At the end of this course students should be able to:

- Give definitions of algebraic objects related to varieties and morphisms between them.
- Recognize the appearance of these objects in examples and confirm this rigorously using the definitions.
- Operate with the objects and use their properties to solve problems.
- Express themselves in a mathematically rigorous way.

# TEXTBOOK

Algebraic Geometry, Robin Hartshorne.

# GRADING

Homework Assignments 100%

## EXAMS

None.

### HOMEWORK ASSIGNMENTS

Homework is assigned weekly, and due in class, usually on Thursday. Feel free to discuss the assignment with me, other students, or anyone else, however, you should write your own work, representing your understanding. Calculators/computer algebra systems (such as SAGE) are allowed for homework. The lowest homework grade is dropped, which means you can skip one homework.

### **HONORS OPTION**

N/A

# COURSE OUTLINE

This is a first course in algebraic geometry. While there are no formal prerequisites beyond a knowledge of the material covered in the first-year algebra and geometry sequence, familiarity with some basic commutative algebra will be helpful. I will follow roughly the first chapter of Hartshorne's book, but at some point we'll move on to the study of divisors, linear equivalence, Riemann-Roch, and related topics.

The rough list of topics includes (with ? marking some topics that may be partly omitted):

- Affine and projective varieties.
- Morphisms and rational maps.
- Local properties: smoothness and dimension. Tangent space.
- Degree of projective varieties and Bezout's Theorem.
- Divisors.
- Low-dimensional varieties: curves and surfaces. Blow-ups.
- The Riemann-Roch Theorem (?).

# **RULES, RIGHTS & RESPONSIBILITIES**

• See the Guide's to Rules, Rights and Responsibilities.

### ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and

helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to <a href="https://conduct.students.wisc.edu/academic-integrity/">https://conduct.students.wisc.edu/academic-integrity/</a>.

# ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

**McBurney Disability Resource Center syllabus statement:** "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

# **DIVERSITY & INCLUSION**

**Institutional statement on diversity:** "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." <u>https://diversity.wisc.edu/</u>