

Course Information

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| Course Number: | MATH 635 |
| Course Title: | Algebraic Geometry II |
| Section: | TBA |
| Time: | TBA |
| Location: | TBA |
| Credit Hours: | 3 |

Instructor Details

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| Instructor: | TBA |
| Office: | TBA |
| Phone: | TBA |
| E-Mail: | TBA |
| Office Hours: | TBA |

Course Description

This is a continuation of algebraic geometry I, which gives an introduction to the basic tools of algebraic geometry in preparation for more specialized topics. Topics to be covered: review of divisors and line bundles, the Riemann-Roch Theorem, Intersection Numbers, the smooth cubic surface, sheaves and sheaf cohomology. The remainder of the semester will cover a more advanced topic such as: schemes and the Hilbert scheme, Hodge theory and complex geometry, moduli spaces, or Invariant Theory.

Course Prerequisites

MATH 620 (Algebraic Geometry I), or approval of instructor.

Course Learning Outcomes

Upon successful conclusion of this course, students should be able to:

- Identify and know how to apply basic tools of algebraic geometry
- Define Hilbert schemes and apply them to various algebraic geometry proofs and problems
- Describe Hodge theory and apply it to the study of differential forms and topology
- Define and construct moduli spaces
- Identify the basics of the Invariant Theory and its applications

Textbook and/or Resource Materials

Primary Textbook:

Shafarevich, Basic Algebraic Geometry I,II (Springer, 3rd edition)

Additional Texts:

Mumford: Algebraic Geometry I: Complex Projective varieties (Springer Classics in Mathematics), Voisin: Hodge Theory and Complex algebraic geometry I (Cambridge Studies in Advanced Math 76)

Mukai: In introduction to invariants and moduli (Cambridge Studies in Advanced Math 81) Hartshorne: Algebraic Geometry (Springer GTM 52)

Griffiths and Harris: Principles of Algebraic Geometry (Wiley)

Grading Policy

Grades will be based on ten written homework assignments (70%) and on in-class presentations (30%). Homework problems will primarily come from the textbook (Shafarevich), with additional problems from other sources. The problems will largely consist of proofs and computations of examples. Homework assignments will be due approximately every 10 days. In-class presentations will be due every four to five weeks. They will primarily consist of explaining solutions of the assigned homework to the rest of the class. There will also be an option for the student to present supplementary material to the class in consultation with the instructor.

A: 90% - 100%

B: 80% - 89%

C: 70% - 79%

D: 60% - 69%

F: 0% - 59%

Late Work Policy

The acceptance of late work will be left up to the discretion of the instructor for the course.

Work submitted by a student as makeup work for an excused absence is not considered late work and is exempted from the late work policy ([Student Rule 7](#)).

Course Schedule

- Week 1: Review of Divisors and Line Bundles
- Week 2-3: The Riemann-Roch Theorem
- Week 4-5: Intersection Numbers
- Week 6: The Smooth Cubic Surface
- Week 7-8: Sheaves and Sheaf Cohomology
- Week 9-10: Schemes and the Hilbert Scheme
- Week 11-12: Hodge Theory and Complex Geometry
- Week 13-14: Moduli Spaces
- Week 15: Invariant Theory

University Policies

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to [Student Rule 7](#) in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to [Student Rule 7](#) in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" ([Student Rule 7, Section 7.4.1](#)).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" ([Student Rule 7, Section 7.4.2](#)).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See [Student Rule 24](#).)

Academic Integrity Statement and Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do."

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" ([Section 20.1.2.3, Student Rule 20](#)).

Texas A&M at College Station

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at aggiehonor.tamu.edu.

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact the Disability Resources office on your campus (resources listed below)

Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Texas A&M at College Station

Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit disability.tamu.edu.

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

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Students wishing to discuss concerns related to mental and/or physical health in a confidential setting are encouraged to make an appointment with [University Health Services](#) or download the [TELUS Health Student Support app](#) for 24/7 access to professional counseling in multiple languages. Walk-in services for urgent, non-emergency needs are available during normal business hours at University Health Services locations; call 979.458.4584 for details.

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors influencing a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-

care practices by utilizing the resources and services available through [University Health Services](#). Students needing a listening ear can call the Texas A&M Helpline (979.845.2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends for mental health peer support while classes are in session. The [TELUS Health Student Support app](#) provides access to professional counseling in multiple languages anytime, anywhere by phone or chat, and the 988 Suicide & Crisis Lifeline offers 24-hour emergency support at 988 or [988lifeline.org](#).

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