

PRACTICAL INFORMATION

Class hours: TR 2:00–3:20 pm

Class room: MA 010

Instructor: Lars Winther Christensen

Office: MA 251

Office hours: W 2:30–4:30 pm and F 3:00–3:50 pm, or by appointment

E-mail: lars.w.christensen@ttu.edu

Course homepage: www.math.ttu.edu/~lchriste/teaching5399142.html

COURSE DESCRIPTION

The developments in computer algebra software have, over the last couple of decades, had a profound influence on research in commutative algebra and algebraic geometry. They have made it a routine matter to compute examples in quantities and of complexities that are way beyond the reach of pencil and paper. This course is focused on using the computer algebra software MACAULAY 2 to perform computations of objects and invariants that occur in commutative algebra and algebraic geometry.

Text: *Computational Algebraic Geometry* by Hal Schenck, London Mathematical Society Student Texts 58.

Prerequisites: Math 5327, possibly concurrent.

Student learning outcomes: After completion of the course, the students will be familiar with a host of invariants from commutative algebra and algebraic geometry, and they will know how to compute them using the computer algebra system MACAULAY 2. The focus of the class is on computations rather than proofs. Topics covered include:

- Zariski Topology
- Hilbert's Nullstellensatz
- Projective Space
- Graded free resolutions
- Gröbner bases
- Stanley–Reisner rings
- Sheaves
- Global sections
- Divisors

LEARNING ASSESSMENT

Graded assessment is done through homework, presentations, and projects. Other assessment techniques will also be used; these include direct questioning, problems to be solved in class, and discussions during office hours. Additionally, problems will be assigned for student self-assessment.

COURSE ORGANIZATION

The plan is to cover as much of Schenck's book as possible; at minimum the first 8 chapters. Exact reading assignments are posted on the course homepage, which is updated after every class.

Exams: A take-home exam is due on 27 Mar. and the final project is due on 12 May.

Other important dates:

Last day to drop a course without penalty	31 Jan.
Spring Break	15–23 Mar.
Last day to drop a course	26 Mar.
Last day to withdraw	1 May

ASSIGNMENTS, GRADES, AND GRADING

One take-home exam is given during the semester. Homework will be assigned 13 times during the semester and is due on Fridays.

Grading policy: On exams and written homework, partial credit for correct steps will be awarded even if the final answer is wrong. Full credit will be given only if the final answer and all intermediate steps are correct. A correct final answer does not *per se* guarantee any credit.

Deadlines and make ups: Homework is not accepted after the deadline.

Final grade: Homework (10 assignments), the exam, and the final project are counted towards the final grade with weights as follows: Homework 50% (5% ea.), exam 25%, and final project 25%.

GENERAL POLICIES

Academic integrity: It is the aim of the faculty of TTU to foster a spirit of complete honesty and a high standard of integrity. Any attempt of students to present as their own any work that they have not honestly performed is regarded by faculty and administration as a serious offense and renders the offenders liable to serious consequences, possibly suspension. Please see more information on-line at www.depts.ttu.edu/studentjudicialprograms/academicinteg.php.

Civility in the classroom: You are expected to be courteous to me and your fellow students. This means that your cell-phone should be turned off during the class; you shall not chat with your friends during class, eat meals or snacks, or cause a distraction in any other way.

Officially approved trips: Students are allowed to miss class for trips officially sanctioned by TTU. The student must notify the instructor of upcoming trips and present written authorization.

Religious holy days: You are allowed to take the time to travel and observe a religious holy day. Prior notice should be given at least one week before the absence.

Students with disabilities: Any student who, because of a disability, may require special arrangements in order to meet course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's hours. Please note instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.