Introduction to Commutative Algebra and Algebraic Geometry
Math 8240 Section 002, CRN-92670, Fall 2023

Instructor: Florian Enescu

Classroom: Sparks Hall 426   **Class timings:** M W 2:00 – 3:15pm

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Office Hours: Tuesdays 1-2pm Wednesday 10-11am and by appointment.

Recommended notes:

F. Enescu, Lecture notes on commutative algebra, at `https://math.gsu.edu/fenescu/currentclasses.html`

Other recommended texts:

M. Hochster, *Course notes*, at `https://dept.math.lsa.umich.edu/ hochster/614F13/614.html`

Cox, Little, O'Shea, *Ideals, Varieties and Algorithms*, 3rd ed, Springer

H. Schenck, *Computational Algebraic Geometry*, London Math Society, Student texts 58

C. Peskine, *An Algebraic Introduction to Complex Projective Geometry I. Commutative algebra,* Cambridge Univ Press

H. Matsumura, *Commutative ring theory,* Cambridge University Press

D. Eisenbud, *Commutative algebra with a view towards algebraic geometry*, Springer-Verlag

J. Milne, *Lecture notes on algebraic geometry*, at `http://www.jmilne.org/math/index.html`

Course content/outcome: The course offers a solid introduction in commutative algebra and algebraic geometry. The basic concepts will be rigorously introduced and emphasized through examples. Among the major tools developed, we mention Gröbner bases, primary decomposition for ideals and submodules, graded rings and modules, Zariski topology, irreducible varieties, integral extensions, Nullstellensatz.

This course will emphasize the understanding of the concepts, through examples and proof writing. The students passing the course will be able to present the proofs of the majors results as well as apply them in the solving of routine exercises. The class will offer a solid foundation to students planning to specialize in those areas of mathematics, as well as algebraic number theory, complex analysis, or complex geometry.

Prerequisites: MATH 8220 with a grade of C or higher.

Grading scheme for Math 8240:

Hwk:	60 %	
Exam 1:	20 %	Monday, October 9
Final exam:	20 %	Wednesday, December 6

Homework: There will be weekly homework assignments that will be graded. No late homework will be accepted. You can discuss the problems among yourselves, but the write-up of the solutions has to be done individually according to your own understanding. Identical assignments will not be graded.

Exams: There will be one midterm exams and one final exam. The final exam is comprehensive and required.

Using the above weights, letter grades will be assigned (roughly) as follows:

97–100 = A+, 93–96 = A, 90–92 = A-, 87–89 = B+, 83–86 = B, 82–80= B-, 77–79 =C+, 70–76 = C 60–69= D

less than 60 = F.

Attendance: You are expected to attend regularly for the entire period of the class. That is, you are expected to arrive on time and stay for the duration of the class. After four or more absences a student can be dropped from this class. In case of an absence, the student is responsible for knowing all the material covered.

Important dates: Last day to drop a class: August 25, on GoSolar. A student that does not attend the first two weeks can be dropped by the instructor.

Last day to withdraw from term length classes and possibly receive a W: October 10, 2023.

Disruptive behavior: Any disruptive behavior will be handled according to the University's policy on disruptive behavior. This includes the possibility of withdrawing the student from the class.

Academic honesty: Academic honesty is expected from any student. Cheating will not be tolerated and will be handled according to the University's policy on academic honesty (http://www.codeofconduct.gsu.edu) which includes academic as well as disciplinary penalties. A zero will be given for any work in which cheating occurred. The Dean of Students will be notified. Subsequent violations will result in a grade of F.

The selling, sharing, publishing, presenting, or distributing of instructor-prepared course lecture notes, videos, audio recordings, or any other instructor-produced materials from any course for any commercial purpose is strictly prohibited unless explicit written permission is granted in advance by the course instructor. This includes posting any materials on websites such as Chegg, Course Hero, OneClass, Stuvia, StuDocu and other similar sites. Unauthorized sale or commercial distribution of such material is a violation of the instructor's intellectual property and the privacy rights of students attending the class, and is prohibited. Failure to abide by these limitations constitutes a violation of the Policy on Academic Honesty and will be treated accordingly.

Student evaluations: Your constructive assessment of this course plays an indispensable role in shaping education at Georgia State. Upon completing the course, please take time to fill out the online course evaluation.

Special accommodations: Students who wish to request accommodation for a disability may do so by registering with the Office of Disability Services. Students may only be accommodated upon issuance by the Office of Disability Services of a signed Accommodation Plan and are responsible for providing a copy of that plan to instructors of all classes in which accommodations are sought.

Diversity Statement: At Georgia State University, the Department of Mathematics and Statistics value diversity and is committed to fostering and maintaining an educational environment which appreciates individual differences in all areas of operation including classroom instruction, texts, and materials. To this end, any actions, practices, or processes by any faculty, staff person, or student that discriminates against or is prejudicial toward any person or group based on race, sex, age, religion, ethnicity, nationality, disability, sexual orientation, or socioeconomic status will not be tolerated.

Changes: Any changes to the above syllabus will be announced in class. The course syllabus provides a general plan for the course; deviations might be necessary.