

**Mathematics 423/502. Algebra II**  
TTh 11:00-12:30, January - April 2021, on zoom.

**Instructor:** Zinovy Reichstein

**Textbook:** Atiyah and Macdonald, Introduction to commutative algebra.

**Course description:** This is a course in commutative algebra, with some homological algebra mixed in. This material is of interest in its own right; it is also important for advanced work in algebraic geometry, algebraic topology and algebraic number theory. Specific topics include:

- Preliminaries on rings and ideals.
- Nilradical and Jacobson radical.
- Local rings and localization.
- Modules: tensor product, extension and restriction of scalars.
- Noetherian and Artinian rings.
- Hilbert basis theorem.
- Gröbner bases.
- Hilbert's Nullstellensatz, Noether normalization theorem, and an introduction to affine algebraic geometry.
- Time permitting, we may explore further topics, such as primary decomposition of ideals in Noetherian rings, Krull dimension, valuations, or finite generation of rings of invariants.

**Prerequisites:** High comfort level with linear algebra and some familiarity with rings and modules.

**Homework:** Several problem sets will be assigned throughout the term. Interaction and collaboration on homework is encouraged, but the work you turn in should be your own, written in your own words.

**Evaluation:** Course marks will be based on the homework and two midterm exams. The midterms will be given on line during class hours Thursday, February 25 and Thursday, March 25. There will be no final exam in this class.

**Further information** will be provided on Canvas.