Mathematics 423/502. Algebra II

TTh 11:00-12:30, January - April 2025
in CEME (Civil and Mechanical Engineering Building), room 1206.

Instructor: Zinovy Reichstein

Textbook: Atiyah and Macdonald, Introduction to commutative algebra.
Available on line through UBC library.

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. The main topics will be:

- Rings, ideals, nilradicals.
- Local rings and localization.
- Modules: tensor product, exact sequences, extension and restriction of scalars.
- Noetherian and Artinian rings.
- Hilbert basis theorem.
- Hilbert's Nullstellensatz, Noether normalization theorem, and an introduction to affine algebraic geometry.
- Gröbner bases.
- Time permitting, we may explore further related topics, such as finite generaion of the ring of invariants (Hilbert's 14th problem).

The textbook by Atiyah and Macdonald is a classic. Each chapter conveys a vast amount of information in just a few pages. My plan is to follow the book quite closely in the first half of the course, then deviate from it with increasing frequency in the second half. In particular, Gröbner bases are not covered in Atiyah-Macdonald. I will be posting lecture notes throughout the term.

Homework: I plan to assign a problem set every 2-3 weeks. 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 (50%) and a final exam (50%).

Further information will be provided on Canvas.