

**Syllabus.**  
**G311 Commutative Algebra , Fall 2007.**

**Instructor: Jerzy Weyman, 530 NI, ext. 5513, j.weyman@neu.edu.**

**Office hours: by appointment.**

**Time: Monday, 3:00-4:30, Thu, 1:30-3, 509 Lake.**

**Text: H. Matsumura, Commutative Ring Theory,**  
Cambridge Studies in Advanced Mathematics, 8.

**Supplementary reading:**

M. Atiyah, I. MacDonald, Commutative Algebra,  
D. Eisenbud, Commutative Algebra with a view toward Algebraic Geometry,  
H. Schenck, Computational Algebraic Geometry, London Mathematical Society student texts, no.58.

**Computer Algebra Programs.**

Macaulay 2, <http://www.math.uiuc.edu/Macaulay2>  
Singular, <http://www.singular.uni-kl.de>.  
CoCoa, <http://cocoa.dima.unige.it>.

We will study the basic notions of commutative ring theory. The notions covered by the course will include.

1. Dimension Theory, prime and primary ideals,
2. Localization,
3. Height and Depth of ideals in commutative rings,
4. Regular Local Rings and their characterizations,
5. Cohen-Macaulay and Gorenstein Rings,
6. Koszul complexes,
7. Minimal Free Resolutions.

Aside from explaining the theoretical part we will try to get some hands on experience working with Computer Algebra Systems listed above (mainly Macaulay 2). The examples of ideals studied in this way will be:

ideals generated by monomials, defining ideals of toric varieties, determinantal ideals.

The grading will be based on homework assignments.