

**Commutative algebra II**  
**MATH 629, section 002, Fall 2013**  
**Tues 5:55 - 8:35 PM, room TBA,**  
**<http://math.gmu.edu/~nepstei2/629f13>**

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**Instructor:** Dr. Neil Epstein, Exploratory Hall 4457, Office Phone: (703) 993-1473

**Office Hours:** TBA

**Textbook:** Winfried Bruns and Jürgen Herzog, *Cohen-Macaulay Rings* (revised ed.), 1997.

**Prerequisites:** Graduate-level experience with the field of commutative algebra, ideally in the form of a course or two in that field.

**Course Content:** By the end of this course, students will have a solid understanding of commutative Noetherian rings, especially in the local case.

We will start with some preliminaries (including the Krull height theorem and flatness) for a week or two. Then we will spend several weeks on completion and complete rings (including power series rings, inverse limits, Hensel's lemma, and the Artin-Rees lemma), culminating in the Cohen Structure Theorems.

All of the above will be culled from various sources. For the second approximately half of the course, we will delve into the book by Bruns and Herzog, covering chapters 1 through 3. In doing so, we will explore the topics of regular sequences, acyclicity criteria, graded rings, Koszul complexes, and the following four main classes of rings: Cohen-Macaulay rings, Gorenstein rings, Complete Intersection rings and Regular rings. We will explore how these rings arise, how they are related to one another, and criteria for determining what sort of ring one has, among other topics. We will also touch on some homological topics, including (hopefully) an introduction to local cohomology.

**Expectations:**

- Pay attention in class and do all readings!
- You will do all assigned homework problems.  
As you know by now, math is best learned by doing.
- If you have any questions, ideas, or comments, you will speak up!
- You may be required occasionally to present proofs or ideas for the class.

**Attendance and Class Participation:** Students are expected to attend classes regularly and participate. Please let me know ahead of time if you plan to be absent and why.