

Math 200c Spring 2012: Graduate Algebra III.

MWF 2-2:50pm, 5402 AP&M

Professor D. Rogalski

1. CONTACT INFORMATION

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2. BASIC COURSE INFORMATION

- **Course description** This is a rigorous third course in graduate level algebra. Math 200a-b is the prerequisite, or permission of the instructor.

- **Qualifying exam** The qualifying exam in algebra will be given in May of 2012. It will cover only the basic group, ring, module, and field theory covered in 200a-b. However, the material of 200c will build on the ring and module theory we have studied and help develop your intuition for commutative rings further; so the material of this quarter will still be useful in preparation for the exam.

The qualifying exam will be given again in September 2012 with the same syllabus.

- **Qualifying exam practice problems** Old qualifying exams can be found on the math department website as part of the "Graduate student Handbook." Kimberly Eaton on the seventh floor should be able to help you out with more information, or to provide paper copies. She is also the person to contact once it comes time to sign up officially for the qualifying exam.

- **Textbook** We will loosely follow Atiyah and Macdonald, "Introduction to commutative algebra." It has the advantage of being a standard reference for the commutative algebra which appears in a follow-up course in algebraic geometry, say out of Hartshorne's book. It is much terser than Dummit and Foote, and more is left for the reader to fill in; but it is a good experience to read a text of this sort. Actually, we have covered the majority of the material in Chapters 1 and 2 (and also bits and pieces of some later chapters) already. Reading Chapters 1 and 2 may be a nice way to review some of the basic material on rings and modules.

The main topics I hope to cover, time permitting, are the following: prime ideals; correspondence between ideals of polynomial rings and algebraic sets in affine space; localization and contractions and extensions of

ideals; primary decomposition; integral extensions and the Nullstellensatz; Artinian rings; Dedekind domains and discrete valuation rings; and dimension theory.

- **Homework** Homework will be assigned only every two weeks, and due on Fridays at 5pm in the homework box in the basement of AP&M. The assigned problems will be posted on the class website. Only selected problems will be graded, but you are responsible for completing and understanding all problems. You are free to discuss the homework problems in general with the professor, the TA, or each other, but your final write-up of the problems must be your work alone.

The reduced homework schedule is meant partly to give you time to prepare for the qual exam by reviewing the material of Math 200a-b and working problems from old qualifying exams.

- **Exams** There will be no exams except the qualifying exam in May.

- **Grading** Your grade will be based on your performance on the homework and on the qualifying exam, roughly based on Homework 50%, Qualifying exam 50%. However, you are not required to take the qualifying exam. If you choose not to, your grade will be based on homework only. Also, you do not have to take Math 200c to take the qualifying exam. However, the commutative algebra we will study this quarter is basic background for further work in algebraic geometry, noncommutative algebra, algebraic number theory, representation theory, or algebraic combinatorics.