Mathematics 632: Theory of Modern Algebra II
Fall 2007

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Office Hours: M, W 10:30 – 12, and by appointment

Web page: http://www.dms.uaf.edu/~jrhodes/M632.html

Prerequisites: Ideally, Math 631. However, the material in this course will not explicitly build on the group theory that is the primary focus of 631. A solid undergraduate abstract algebra background, combined with a willingness to fill in gaps in your background outside of class will be sufficient.

Credit Hours: 3.0

Texts: A Singular Introduction to Commutative Algebra, by G.-M. Greuel and G. Pfister; Springer
Ideals, Varieties, and Algorithms, 3rd ed., by D. Cox, J. Little, and D. O'Shea; Springer

Software: You will be expected to use two pieces of software for computational algebra, Singular (freeware for PC, Linux, Mac) and Maple (licensed to the department, available in the Chapman computer lab)

Class Meetings: M W F 9:15-10:15 in Gruening 309

Exams: Midterm, Final (see schedule)

Course overview and goals:
This course has three main goals:

1. to provide a solid graduate-level background in commutative algebra,
2. to provide an introduction to the field of algebraic geometry, as one of the leading areas in which commutative algebra is used,
3. to provide a hands-on introduction to the computational tools whose recent development has profoundly affected both theory and applications of commutative algebra.

This is an ambitious (and experimental) plan, and may not be fully achievable. In order for it to be successful, you and your classmates will need to work productively with one another outside of class meetings. You will have to learn to independently pinpoint gaps in your understanding, and be willing to find ways to fill those gaps through outside reading and discussion with your fellow students and professor.

Mechanics of the course:

In a typical week, I plan to lecture (on the material in the Greuel text) during two of the three class meetings. In the third meeting, we will more informally discuss material you will have read in the Cox text. Once the semester is underway, I'll assign two students per week to lead the discussion.

Although I have 'official' office hours, I hope to keep an open door for students in this course. If you have questions that aren't answered in class, or need advice on how to fill some gap in your background, you should stop in.

Homework I'm likely to assign some homework each day, and collect it weekly. You are encouraged to work with others on the homework, though your written presentation of it should be your own. You are expected to read and assimilate assigned sections of the textbooks. Readings may sometimes include material dealt with only cursorily, or not at all, in lectures.

Homework problems and due dates will be posted on the course web page as they are assigned.

You will be expected to use computational software for this course. Singular is free, Maple requires a license. How to access these will be discussed in class.

Examinations Both the midterm and final examinations will have an open-book, open-note component which you will have a number of days to complete. There *may* also be a closed-book in-class part that has more routine problems, and asks for definitions, examples, etc..

Any form of cheating on these exams will be dealt with harshly. At a minimum, the examination will receive a score of zero, so a passing course grade will require extraordinarily strong performance on all other work. I may also request a University Disciplinary and Honor Code Committee hearing which could result in suspension or expulsion.

For missed examinations that are not approved in advance, no make-up exams will be given except in case of emergencies.

Project Each student will complete an individual project, which can be tailored to particular interests. Possibilities include learning some of the material that we do not cover in one of the texts, following up more deeply in other sources on something we do cover, or pursuing a related topic entirely from other sources. You may focus on theory, an application, or interesting computational examples. Midway through the course, you will submit for approval a brief description of the project you would like to undertake. The final presentation of the project will be in written (or electronic) form.

Grades Your performance will be evaluated based on 25% homework, 5% class participation, 25% midterm exam , 30% final exam, 15% project. Course grades will be determined according to the following cutoffs:

$$A \geq 90\%, \quad B \geq 80\%, \quad C \geq 70\%, \quad D \geq 60\%.$$

I reserve the right to move the cutoff points downward if particular exams turn out to be unexpectedly difficult. Note that you are not in competition with your peers – everyone in the class may get an A, or everyone may get an F.

Warning I expect to be off-campus for the entire month of December (for research purposes). To accommodate this, I may try to call a few extra classes earlier in the semester so that we are able to adequately cover the material outlined in the syllabus. During the time I'm away, you will work on your project, and the final exam, both of which will be submitted to me electronically.

University and Department Policies Your work in this course is governed by the UAF Honor Code. The Department of Mathematics and Statistics has specific policies on incompletes, late withdrawals, and early final exams which can be found at

`http://www.dms.uaf.edu/dms/Policies.html`.

If you have any disabilities that I should know about, you should bring them to my attention soon so that we can work with the Office of Disability Services to set up any necessary accommodations.

Tentative Schedule

G=Greuel & Pfister
C=Cox, Little, & O'Shea

Week 0-1	Sept. 7 – Sept. 14	G 1.1, C 1
Week 2	Sept. 17 – Sept. 21	G 1.3, C 1
Week 3	Sept. 24 – Sept. 28	G 1.4, C 2
Week 4	Oct. 1 – Oct. 5	G 2.1, C 2
Week 5	Oct. 8 – Oct. 12	G 2.2, C 3
Week 6	Oct. 15 – Oct. 19	G 2.4, C 3
Week 7	Oct. 22 – Oct. 26	G 2.7, C 4, MIDTERM
Week 8	Oct. 29 – Nov. 2	G 3.1, C 4
Week 9	Nov. 5 – Nov. 9	G 3.2, C 5
Week 10	Nov. 12 – Nov. 16	G 3.3, C 5
Week 11	Nov. 19 – Nov. 21	G 3.5, C 8, THANKSGIVING
Week 12	Nov. 26 – Nov. 30	G 4.1, C 8
Week 13	Dec. 3 – Dec. 7	Project, FINAL
Week 14	Dec. 10 – Dec. 14	Project, FINAL