

ABSTRACT ALGEBRA I
22m:120, Fall 2005

Instructor: Fred Goodman
Office: 325G McLean Hall
Phone: 335-0791
Office Hours: To be arranged.

Course goals:

The goals of this course will be for you to develop a systematic knowledge of the elements of modern algebra; to develop your skills and strategies for mathematical investigation and problem solving; and to improve your mathematical writing, and your ability to engage in mathematical discussion.

Textbook:

Required: Frederick M. Goodman, *Algebra: Abstract and Concrete*, 2nd edition, Prentice Hall, with additional notes by the author.

Recommended: I.N. Herstein, *Topics in Algebra*, 2nd edition.

Course plan:

The department of mathematics adopted the following list of topics for the sequence 22M:120-121:

Preliminary Notions (done rapidly): sets, mappings; integers including induction, division algorithm and elementary number theory, integers mod n

Group Theory: groups, subgroups, normal subgroups, quotient groups and homomorphism theorems, permutation groups, group actions, finite p -groups, Sylow theorems, solvable groups

Ring Theory: rings, ideals and quotient rings, field of fractions of a domain, Euclidean rings, PIDs, UFDs, polynomial rings, irreducibility criteria

Vector Spaces and Modules: vector spaces and linear transformations, dual spaces, inner product spaces, modules, finitely generated modules over a PID

Fields: finite field extensions, roots of polynomials, finite fields, Galois theory in characteristic 0 including solvability by radicals and insolvability of general quintic, compass and straight edge constructions

Matrix Theory: linear transformations and matrices, Cayley-Hamilton Theorem, modules over $k[X]$, canonical forms, other topics as time permits.

Homework:

There will be about ten homework assignments which will require *lots* of time. You may collaborate on homework (discussing mathematics with your peers is an important skill), but you must write your own solutions. In general your

homework solutions should be literate; the point is to explain your method, not just to obtain an answer. A good criterion for an adequate explanation is the following: a person who knows about as much as you do, but who has not thought about the problem should be able to understand the solution by looking at your paper. That is, the person should be able to understand, without looking elsewhere, what is the problem, what is the idea behind your approach, and what are the details of your solution.

Exams and grading:

There will be two midterm exams on dates to be arranged. There will be a comprehensive final exam. Grades will take into account both homework and exams. I will weigh most heavily what you do best, but the homework will receive substantial weight.

Course information will be regularly posted on my web page at www.math.uiowa.edu/~goodman.

Attendances and absences:

Regular attendance will be expected. However, if you must miss class, you will still be responsible for the material discussed in class. You are responsible for announcements made in class, which may concern changes in the assignments, syllabus, exams, etc. Absence from exams will require a compelling reason, and must be arranged in advance.

Complaint procedure:

I hope and expect that you will have a good time, work a lot and learn a lot in this course. However, if you have concerns or complaints about any aspect of the course, you are welcome to discuss these with me. If we are not able to resolve the difficulty, please contact the Chair of the Department of Mathematics, 14 Maclean Hall.

Accommodations for students with special needs:

Students with disabilities are entitled to special arrangements; please contact me in order to arrange appropriate accommodations. (Requests for modifications of class requirements or testing must be made through the Student Disability Services office, 3100 Burge Hall.)

Notice about cross college enrollments:

This course is given in the College of Liberal Arts and Sciences. This means that class policies on matters such as requirements, grading, and sanctions for academic dishonesty are governed by the College of Liberal Arts and Sciences. Students wishing to add or drop this course after the official deadline must receive the approval of the Dean of the College of Liberal Arts and Sciences.