

**MATH 512 – 16480**  
**Introduction to Modern Algebra**

FALL 2005

MON, WED, FRI, CW122, 9:30–10:20

**Instructor:** Prof. Chris Pinner

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**Probable Office Hours:** MWF 10:30–11:30, U 3:30–4:30, or by appt.

**Course Home-Page:** <http://www.math.ksu.edu/~pinner/math512/>

**Text:** *A First Course in Abstract Algebra*, John Fraleigh, 7th edition, Addison-Wesley.

**Prerequisites:** MATH 222 recommended but all that is required is a sound knowledge of College Algebra and some mathematical maturity.

**Course Outline:** We should cover much of Fraleigh. In particular groups & subgroups, cosets, homomorphisms and isomorphisms, factor groups, rings, integral domains, fields, ideals and other topics as time permits.

**Grading Scheme**

Weekly assignments worth 150 points,

Three mid-terms worth 100 points each.

Tentative dates: Wed Sep 21, Wed Oct 19, Wed Nov 16.

Final Exam worth 150 points, Fri Dec 16, 11:50–1:40.

**Assignments:** Problems will be assigned weekly, due in class on Friday of the following week. You will generally have about a week to complete the assignment. Don't leave your homework to the last minute (many of the questions will involve proofs or may require extended thought). Show all your work. Include your name and Math 512 on the front. The lowest homework score will be dropped.

**General Information:** If you have any condition such as a physical or learning disability, which will make it difficult to carry out the work as I have outlined it or which will require academic accommodations, please notify me in the first two weeks of class. There will be no late homework or make-up exams. If you have to miss a test for a valid reason then your course grade will be determined from your remaining work (notify me as soon as possible).

## ROUGH COURSE OUTLINE

### **Ch 0. Sets & Relations**

### **Ch I. Groups & Subgroups**

1. Introduction & examples
2. Binary operations
3. Isomorphic binary structures
4. Groups
5. Subgroups
6. Cyclic groups

### **Ch II. Permutations, Cosets and Direct Products**

8. Groups of permutatioons
9. Orbits, cycles and the alternating group
10. Cosets and Lagrange's theorem
11. Direct products & finitely generated abelian groups

### **Ch III. Homomorphisms & Factor Groups**

13. Homomorphisms
14. Factor groups
15. Factor group computations & simple groups

### **Ch IV. Rings & Fields**

18. Rings & fields
19. Integral domains
20. Fermat's & Euler's theorem
21. The field of quotients of an integral domain
22. Rings of polynomials
23. Factorization of polynomials over a field
24. Quaternions

### **Ch V. Ideals & Factor Rings**

26. Homomorphisms & factor rings
27. Prime & maximal ideals

If time permits we may cover some sections out of:

### **Ch VI. Extension Fields**

29. Introduction to extension fields
30. Vector spaces
31. Algebraic extensions
32. Geometric constructions
33. Finite fields

### **Ch IX. Factorization**

45. Unique factorization domains
46. Euclidean domains
47. Gaussian integers & multiplicative norms