

David Hill

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1. MATH 113: INTRODUCTION TO ABSTRACT ALGEBRA

1.1. General Information. The text for this class is *Beachy/Blair*, Abstract Algebra, 3rd ed. The course Math 54 is a prerequisite, and a working understanding of Linear Algebra is expected.

This is a proof course. As such, solutions to all problems should be written clearly and using proper grammar. Each word (including mathematical notation!) should be part of a sentence and each sentence should be part of a paragraph. If you perform a computation, tell the reader why. At times, it will be useful to use diagrams. All notation used in diagrams must also be defined in the text. Refer to *Suggestions for Writing Mathematics*, by Jon Erdmann.

1.2. Homework. Homework will be assigned every week. Late homework will not be accepted.

In general I assign more problems than other instructors. Of the problems assigned, 5 will be collected (indicated with an asterisk). Of the 5 problems collected, 2-3 will be graded.

Note that exam problems will come from the homework.

1.3. Midterms. There will be two one hour exams given in class on the scheduled dates. Make up exams will not be given except in the case of a documented emergency.

I will not provide review sheets. Exam problems come from homework, and the material covered comes from the book.

1.4. Final Exam. There will be a three hour final exam on **Monday, 12/13, 8-11am**. The classroom will be posted at a later date.

I will not provide review sheets. Exam problems come from homework, and the material covered comes from the book.

1.5. Attendance. All information on this syllabus is subject to change, including exam dates. You are responsible to be in class to learn of any changes. Absences will not be an excuse for any problems that arise.

1.6. Weighting of Final Grade. Grades will be determined based on the following breakdown:

Midterm 1	20%
Midterm 2	20%
Final Exam	30%
Homework	30%

2. (ROUGH) SCHEDULE

- **Week 1** Introductory Topics.
 Overview of notation. Groups, Rings and how they are related. Examples.
- **Week 2** Integers, Functions, and the Symmetric group.
- **Week 3-7:** Groups.
 Definition of a group, examples (dihedral groups, symmetric groups, etc.), abstract groups, isomorphisms, cyclic groups, classification and properties, subgroups, cosets, Lagrange's theorem, permutation groups, group actions, normal subgroups, factor groups, homomorphism and isomorphism theorems, etc.
- **Week 8-11:** Ring theory and polynomials.
 Definitions of rings and fields, integral domains and quotient fields. Euclidian algorithm over a field, irreducible polynomials. More general coefficients, Gauss' Lemma. Eisenstein's criterion, examples. Units, ideals, congruences, quotient rings. Principal ideals; prime and maximal ideals.
- **Week 12-15:** Elements of Field Theory.
 Review of basic linear algebra—vector spaces over an arbitrary field, linear independence, basis theorem, dimension, etc.. Prime subfields, algebraic and finite extensions, degrees of an extension, transitivity of extensions. Algebraically closed fields and algebraic closure. Fundamental Theorem of Algebra. Cubic and quartic equations over \mathbb{C} ; polynomials over \mathbb{Q} . Construction and properties of finite fields.

3. IMPORTANT DATES

- Labor Day (no class): 9/1
- **Midterm 1:** 10/3
- **Midterm 2:** 11/7
- Wife's Due-Date: 11/10 . . .
- Administrative Holiday: 11/11 (Tuesday)
- Thanksgiving Holiday (no class): 11/27-11/28
- Last Day of Class: 12/10
- **Final Exam:** Monday, 12/13, 8-11am.