

Math 421
Modern Algebra
Spring 2005

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Overview: This course will serve as an introduction to so -called Modern Algebra: the study of groups, rings, fields and modules. I plan to approach these from the modern point of view. This viewpoint, which stresses general structure over specific calculation ought to more quickly advance the mathematical maturity level of the student. She will thus find any other advanced mathematical courses easier to handle.

Text: The primary text for this course will be notes which I author. They will be available on line and will be presented in class. In addition, I will place the following books on reserve at E&H's library:

Algebra by Saunders MacLane and Garrett Birkhoff: A synthesis of the traditional and modern approach to Modern Algebra. MacLane is generally recognized as one of the two to discover category theory.

Contemporary Abstract Algebra by Gallian: A more traditional approach to undergraduate level abstract algebra. Lots of good graphics and fun historical notes.

Introduction to Abstract Algebra by Moore: Like Gallian. A little more hard-nosed I'd say, though.

Categories for the Working Mathematician by Saunders MacLane: The classic. I would say more mathematicians learned category theory on their own from this text than any other. Does assume that you are a working mathematician and not one in training though. Also gives a thorough, yet accessible (a relative term) treatment of foundational issues.

Categories by Blyth: Just for a different treatment than MacLane's.

These books may be taken out of the library for one day.

Course Objectives: The successful student will, by the end of the semester, know the basic definitions used in category theory and modern algebra. This student should be able to use these definitions to prove simple statements about those topics. In addition, this student will know the statements of some of the important basic theorems in those subjects: The three isomorphism theorems for rings, groups, and modules; the Galois correspondence between fields and groups, the fundamental theorem of finitely generated Abelian groups, and all others presented in class.

Grade: The course grade will be determined by your performance in three areas:

1. Daily, or near daily quizzes on definitions and statements of theorems
2. Homework
3. Final Presentation

In addition, points may be earned by correcting any mistakes in my notes. I will say more about this as the course goes along.

Each quiz will consist of one question and be worth one point.

Each homework problem will be worth 2 points and may be resubmitted as many times as the student wishes until 2 points are earned.

The final presentation will be worth 10 points.

Your final grade will be determined according to the following:

A:>95 points

A-:90-95 points

B+: 87-89 points

B: 83-86 points

B-: 80-82 points

C+: 77-79 points

C:73-76 points

C-:70-72 points

D+: 67-69 points

D: 63-66 points

D-:60-62 points

F:<59 points

Quizzes: The quizzes will be based on assigned reading. This reading will be posted on the web and consist of notes for the next class. The quizzes will ask you to correctly state a definition or theorem which we will be using or proving in class that day.

Homework: The homework problems will be sprinkled throughout the text of my notes. I anticipate that there will be well over 100 problems to choose from. Problems may be resubmitted until a "2" is earned. The credit you earn for any given problem you attempt will be the maximum number of points earned on that problem by the end of the semester.

Presentation: This will be on one of the homework problems you turn in for credit. I will choose which. More details will be forthcoming.

I view this course as an opportunity for both of us. For you I hope that you will learn modern algebra. I also hope that this course will prepare you for other advanced math courses, and, that you emerge from this course with a better idea of how the whole discipline is really a single entity. For myself, I look forward to your assistance and forbearance as I write the text for the course.