Math 411: Introduction to Algebra (Algebra I)

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Fall 2025

1 Course Information

Section	Time	Location

Requests for special arrangements require **advanced approval** and **at least two weeks of notice**. Contact me if you have further questions, and pay attention to the Make-up Exams Policy!

2 Course Description

Math 411 is the first part of a two-semester undergraduate abstract algebra course. The focus of the course will be on studying *groups*. These are algebraic structures that capture the notion of symmetry. Groups are ubiquitous in all areas of mathematics (and the world around us). If you commit to this class, you will master the essential concepts of group theory by the end of the course.

2.1 Prerequisites

MATH 235 and either **CMPSCI 250** or **MATH 300**. In other words, we will need some important concepts from linear algebra, and there will be an emphasis on proofs and development of careful mathematical reasoning and writing.

2.2 Main goals

- Survey the basic results and techniques in group theory.

- Explore key concrete examples and applications.
- Develop proof skills.

There will be three mid-term exams plus a final exam. Regular problem sets will cover the theoretical part of the course.

My job as your instructor is to provide a framework and guide you in learning the concepts and methods that comprise the material of the course. Most learning will take place outside the classroom. Read the textbook carefully and slowly before the lectures, working through examples and filling in omitted steps. This is a challenging course with many new concepts and techniques.

2.3 Learning objectives

1. To learn the fundamental examples of groups: finitely generated abelian groups, dihedral groups, symmetric and alternating groups, and matrix groups.
2. To learn the axiomatic definition of a group and how to use it to prove basic properties.
3. To learn the concepts of subgroups, cosets, quotients, and how to combine these to derive Lagrange's theorem.
4. To learn the concepts of homomorphisms and isomorphisms and Noether's isomorphism theorems.
5. To understand the structure theorem of finitely generated abelian groups in terms of the Smith normal form of a matrix with integer coefficients.
6. To learn what it means for a group to act on a set as well as the natural actions of each of the fundamental examples.

2.4 Textbook

- **Algebra: Abstract and Concrete** by *Frederick M. Goodman*. The book is freely available for download at the author's web-site.
- As a complement of the textbook, we will use some of Keith Conrad's blurbs on group theory.

3 Contact Information

- Office: Lederle Graduate Research Tower, Room 1238
- Email: sarangopiner@umass.edu

4 Grading Policy

- Midterm #1: Thu Oct 5, 7–8:30pm, Room TBA
- Midterm #2: Thu Nov 9, 7–8:30pm, Room TBA
- Final Exam: Fri Dec 15, 10:30am–12:30pm, LGRT 204
- Homework: 30% of grade
  - Lowest exam score counts 20%
  - Other two exams count 25% each

4.1 Grading scale (no rounding)

Grade	Range
A	[86,100]
A-	[83,86)
B+	[78,83)
B	[74,78)
B-	[69,74)
C+	[65,69)
C	[61,65)
C-	[56,61)
D+	[52,56)
D	[48,52)
F	[0,48)

5 Homework Policy

- Due Wednesdays at 10am via Gradescope
- No late homework
- Lowest two homework grades dropped

- Collaboration allowed, but write-ups must be individual
- Using online solutions (Chegg, ChatGPT, etc.) is cheating
- Homework is for practice; exams may contain different problems

6 Administrative Details

- Add/drop only via SPIRE
- No waiting list
- Final exams kept by Math Dept; copies available upon request

7 Class Etiquette

- No texting/calls during lectures except in emergencies
- Arrive on time; if late, take the nearest seat
- Laptops/tablets allowed if not disruptive; not allowed during exams

8 Religious Observance

Notify in writing within first two weeks if you will miss class or an exam for religious reasons.

9 Drops, Withdrawals, and Incompletes

- Last day to drop with no record: Mon Sept 11
- Last day to drop with W: Tue Oct 31
- Incompletes only for compelling reasons, passing work, and likely completion

10 Make-up Exam Procedure

See: `http://people.math.umass.edu/~siman/makeup.html`

11 Accommodation Statement

UMass Amherst provides equal opportunity for all students. Contact Disability Services and notify instructor within first two weeks if accommodations are needed.

12 Academic Honesty

Academic honesty is required. Dishonesty includes cheating, fabrication, plagiarism, and facilitation. Sanctions may be imposed. Ignorance is not an excuse.