

Math 361 – Abstract Algebra II
MWF 11:00 a.m.–11:50 a.m., W-1-64

Spring 2022

Instructor: Steven Jackson
Office hours: MWF 12:00 p.m.–12:50 p.m.
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Course Description

Math 361 is a continuation of Math 360. We will study the basic structures of modern algebra (groups, rings, and fields) in greater depth, culminating with the systematic study of symmetry groups of extension fields and its implications for solvability of polynomial equations by radicals (Galois theory).

Prerequisites

Admission to the course is contingent upon successful completion of MA360.

Textbook

There is one required text for the course: *A First Course in Abstract Algebra*, Seventh Edition, by John Fraleigh.

Grading

Course grades are based on weekly quizzes (20%), two in-class tests (20% each), and a cumulative final exam (40%).

Course wiki

This course makes use of a wiki, similar to Wikipedia, to disseminate homework assignments and to ease communication among students. The course wiki page can be found here:

http://cartan.math.umb.edu/wiki/index.php/Math.361,_Spring.2022

Any registered student can edit this page or any of its sub-pages. You might find this useful for collaborative note-taking, or to ask one another questions about homework problems. The wiki supports L^AT_EX (see below), so it is relatively painless to write mathematical symbols and formulas.

To edit, you will first need to sign in. Your username is your UMB e-mail address. On first login, use the password reset link, and a random password will be e-mailed to you. After using this, you may change the password to something of your own choosing.

Reading and class preparation

There is a reading assignment associated with each class period. Although it is not generally possible to discuss every topic in class, students are responsible for the entire content of the reading assignment. *Test and exam questions may cover reading material not discussed explicitly in class.* Consequently it is very important to complete the reading assignments on time and to come to class prepared with questions.

Make-up tests

Tests may be rescheduled only in cases of serious illness, bereavement, or other circumstances of similar gravity. Whenever possible, arrangements for make-up tests must be made *in advance* of the regularly scheduled testing time.

Student conduct

Students are required to adhere to the University Policy on Academic Standards and Cheating, to the University Statement on Plagiarism and the Documentation of Written Work, and to the Code of Student Conduct. The section of the Code pertaining to academic honesty is available online at the following URL:

https://www.umb.edu/editor_uploads/images/life_on_campus/FINALUMBCode9-5-18-Appendix_B_V2.pdf

Violation of these policies will result in disciplinary action, as described in section B.II of the Code.

Travel during the final exam period

This course has a final exam during the period **May 16–20, 2022**. The exact time of the final is determined by the Registrar's Office, and will be posted on WISER around the middle of the semester. Students must not make travel arrangements which might conflict with their responsibility to take the final exam at the appointed time. In particular, **a purchased airline ticket does not constitute a valid excuse to miss the final, and no makeup exam will be granted under these circumstances.**

Conflict finals

University policy specifies that any student who has two final exams scheduled at the same time, or who has three or more final exams scheduled on the same day, is eligible to reschedule one of the exams. Under these circumstances, students who wish to reschedule their final exam in this class must notify the instructor in writing **no later than Monday, May 9, 2022**. You must include the course number, your name, and your student ID number in this notification. Department staff will then verify your eligibility to reschedule, and assign you to an alternate testing time if appropriate.

Accomodations for students with disabilities

Section 504 of the Americans with Disabilities Act of 1990 offers guidelines for curriculum modifications and adaptations for students with documented disabilities. If applicable, students may obtain adaptation recommendations from the [Ross Center for Disability Services](#), CC-UL-211, (617-287-7430). The student must present these recommendations and discuss them with each professor within a reasonable period, preferably by the end of the Drop/Add period.

Schedule of topics

- Week 1:** Introduction. Normal subgroups and quotient groups.
- Week 2:** The fundamental theorem of homomorphisms. Quotient group computations.
- Week 3:** Rings and fields. Integral domains.
- Week 4:** Direct products and the Chinese Remainder Theorem. Theorems of Fermat and Euler.
- Week 5:** RSA encryption. Ring homomorphisms and ideals.
- Week 6:** First midterm (Wednesday, March 2; covers assignments 1–4). Field of fractions of an integral domain.
- Week 7:** Rings of polynomials. Factorization of polynomials over a field.
- Week 8:** Prime ideals and maximal ideals. Extension fields.
- Week 9:** Vector spaces. Algebraic extensions.
- Week 10:** Unique factorization domains. Euclidean domains.
- Week 11:** Second midterm (Wednesday, April 13; covers assignments 5–9). Gaussian integers and multiplicative norms.
- Week 12:** Splitting field of a polynomial. Uniqueness of the splitting field.
- Week 13:** Finite fields. Irreducible polynomials and the Sieve of Eratosthenes.
- Week 14:** Euclidean construction.
- Week 15:** The Galois group and the Galois correspondence.