Math 4281: Introduction to Modern Algebra

Course Syllabus

Instructor: Gregg Musiker, Office in Vincent Hall 251,

Telephone (with voice-mail): 624-7073, E-mail: musiker@math.umn.edu

Meeting time: You are responsible for attending the section for which you are registered.
Section 1 will meet on Mondays, Wednesdays, and Fridays from 9:05 AM - 9:55 AM in Vincent Hall 113.
Section 2 will meet on Mondays, Wednesdays, and Fridays from 11:15 AM - 12:05 PM in Vincent Hall 6.

Office hours: Monday 10:10-11:00, Wednesday 10:10-11:00, Wednesday 2:30-3:20, or by appointment.

Course Webpage: http://www.math.umn.edu/∼musiker/4281/

Course Content: The course will be a basic introduction to fundamental algebraic structures known as groups, rings, and fields. Beginning with familiar structures, such as integers, polynomials, and vector spaces, we will develop the underlying theory that connects these various concepts which will allow us to introduce more exotic examples. We will end this course with a study of symmetries which will illustrate how these different algebraic stuctures are all interconnected.

Along the way, we will establish a few of the fundamental properties satisfied by these algebraic objects and illustrate their importance by looking at applications that follow from their properties. Algebra has a very different feel from calculus and geometry. One starts with a list of allowable axioms that define the algebraic structures and all properties and results flow from these axioms. The material often comes off as abstract; be prepared to put in extra time if this is not your natural inclination. After working with these structues for a while, things become more familiar and natural.

Prerequisites:

Math 2283, 3283 or their equivalent. In particular, students will be expected to know some calculus and linear algebra, and have familiarity with proof techniques, such as mathematical induction.

Required Text (on reserve in the math library):

Abstract Algebra: A Geometric Approach, by Theodore Shifrin (1996, Prentice-Hall).

The plan is to cover the majority of chapters 1-7 of the textbook. The lecture schedule on the course website will include suggested readings to accompany the lecture material. It will be **expected** that you will read or at least look through these sections prior to the appropriate lecture.

Other useful texts available online:

Abstract Algebra: Theory & Applications, by Thomas Judson.
`http://abstract.ups.edu/index.html`

Algebra: Abstract and Concrete, by Frederick M. Goodman.
`http://homepage.math.uiowa.edu/ goodman/algebrabook.dir/algebrabook.html`

Homework (40%): There will be **11** homework assignments, **due on Friday of most weeks**. The first homework assignment is due on **January 27th**. I encourage **collaboration** on the homework, as long as each person understands the solutions, writes them up in their own words, and indicates on the homework page their collaborators. **Late homework will not be accepted**. Early homework is fine, and can be left in my mailbox on the 1st floor. Homework solutions should be well-explained – the grader is told not to give credit for an unsupported answer. Complaints about the grading should be brought to me. The score on the **lowest homework assignment will be dropped**.

Exams: There will be **3 in-class exams**, on Friday **March 3rd (15%)**, Wednesday **April 5th (20%)**, and Friday **May 5th (25%)**.

Each of these will be **closed book and closed notes**. Since the material will focus on abstract concepts rather than computations, **calculators will not be allowed nor necessary**. The course material builds on itself which is why later exams are worth more than earlier ones. Missing an exam is permitted only for the most compelling reasons. You are responsible for obtaining my permission in advance if you must miss an exam. **Otherwise you will be given a 0**. If you are excused from taking an exam, your other exam scores will be prorated.

Class Participation: Participation in class is encouraged. **Please feel free to stop me and ask questions during lecture.** Otherwise, I might stop and ask you questions instead. Additionally, some course material will be taught by having the students work together in **small groups cooperatively**.

University Policy Statements: The University Senate statements regarding academic dishonesty, credit, and workload expectations, and grading standards are at

`http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html` and

`http://policy.umn.edu/Policies/Education/Education/STUDENTWORK.html`.

Scholastic Misconduct: You must do your own work on all portions of the exams. Academic dishonesty in any portion of the academic work for this course is grounds for receiving an "F" for the entire course.

Workload: One credit is defined as equivalent to an average of three hours of learning effort per week (over a full semester) necessary for an average student to achieve an average grade in the course. This course is a 4 credit course that meets 3 hours per week. Therefore, you should expect to spend an additional 9 hours per week on coursework outside the classroom.