

## MA 361 - Elementary Modern Algebra - Fall 2018

- Instructor: Nathan Fieldsteel
- E-mail: nathan.fieldsteel@uky.edu
- Time & Place: MWF, CB 335, 10:00 - 10:50am
- Office: 767 Patterson Office Tower
- Office Hours: MWF 11:00 - 11:50am or by appointment.

**Course Summary:** Abstract Algebra is the study of mathematical structures, which are sets with operations obeying certain rules. As a few examples, the set of all integers together with the addition operation, the set of all invertible  $2 \times 2$  matrices of real numbers together with the matrix multiplication operation, or the set of all bijective functions  $f : \{1, 2, \dots, n\} \rightarrow \{1, 2, \dots, n\}$  together with the function composition operation.

In this course, we will become familiar with abstract concepts such as groups, rings, and fields, which generalize these algebraic structures and allow us to prove statements about all such structures simultaneously. In addition to being an essential building block of many mathematical disciplines (algebraic topology, algebraic geometry, algebraic number theory to name a few), abstract algebra is also widely applicable in cryptography and coding theory, and also finds some applications in physics and chemistry.

**Course Goals:** In addition to learning some topics in abstract algebra, this course will aim to develop your skills in:

- reasoning and thinking critically, especially about abstract mathematical concepts.
- Communicating mathematical ideas, especially in writing.
- Exploring a new abstract subject by posing and rigorously answering questions.

**Website:** The course schedule, homework, announcements, this syllabus, and more will be posted on Canvas.

**Textbook:** We will be using the 7<sup>th</sup> edition of “A First Course in Abstract Algebra”, by John B. Fraleigh (ISBN: 0201763907).

**Homework:** There will be homework, assigned every week and collected the following week. The best (maybe only) way to become fluent in abstract mathematical ideas is to work with the definitions, theorems and concepts in the context of challenging problems, and this activity is what the homework will be designed to support. The homework problems will be more difficult than quiz or exam questions. You are free to work in study groups and discuss the homework with other students, but you must write up and hand in your own solutions. It is your job to take your ideas, notes, proof sketches and discussions and turn them into a polished proof to be handed in; you should not be reading or copying other students’ finished proofs.

**One opportunity for extra credit:** Some homework assignments will have optional bonus problems.

**Another opportunity for extra credit:** There is a typesetting language called L<sup>A</sup>T<sub>E</sub>X (pronounced “lay-tek” or “lah-tek” or sometimes just “tek”) which is used to produce high-quality pdf documents in the mathematical sciences. If you expect to continue in mathematics, fluency with L<sup>A</sup>T<sub>E</sub>X will be an essential skill that you will need to pick up at some point. Even

if you don't expect to continue in mathematics, some skill with L<sup>A</sup>T<sub>E</sub>X can serve you in your professional life.

If you write a homework assignment using L<sup>A</sup>T<sub>E</sub>X, you will earn extra credit on that assignment. The amount of extra credit will be such that if you write *every* homework assignment in L<sup>A</sup>T<sub>E</sub>X you will earn 2 points on your final grade. An instructional guide and some template files will be posted on Canvas to help you get started.

**Quizzes:** We will regularly have 10-minute quizzes at the end of class, approximately once per week. They will be announced in class ahead of time.

**Exams:** There will be two in-class midterm exams and a final exam, at the following times:

- **Midterm 1:** In Class, Wednesday September 26.
- **Midterm 2:** In Class, Wednesday October 31.
- **Final Exam:** Thursday, December 13th at 8:00am

**Grading:** Your grade (from 0 – 100) will be calculated as follows:

| Assignment Type: | Weight: |
|------------------|---------|
| Quizzes          | 10%     |
| Homework         | 20%     |
| Midterm 1        | 20%     |
| Midterm 2        | 20%     |
| Final Exam       | 30%     |

Letter grades will be assigned to percentages in the usual way:

| Final Grade ( $G$ ) | Letter Grade: |
|---------------------|---------------|
| $90 \leq G$         | A             |
| $80 \leq G < 90$    | B             |
| $70 \leq G < 80$    | C             |
| $60 \leq G < 70$    | D             |
| $G < 60$            | E             |

### Policies and Expectations:

- Cheating and other academic integrity violations are serious offenses that will have serious consequences. You are expected to know and understand university policy on this matter (University Senate Rules, §6.3).
- Work Load: You should expect to spend 2-3 hours studying and working outside of class for every class meeting. This means a weekly homework assignment might take you between 6 and 9 hours to finish (so don't wait until the last minute to start!)
- : If you fall behind in a 300 level math course it can be extremely difficult to catch back up. The Mathskeller and The Study typically do not provide tutoring services for Math 361. This is why I have office hours 3 times each week. Email me or talk to me in office hours as soon as you feel you are struggling in the course.

- Accommodations due to disability: If you have a documented disability that requires academic accommodations, please get in touch with me as soon as possible. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at [drc@uky.edu](mailto:drc@uky.edu). Their web address is <http://www.uky.edu/DisabilityResourceCenter>.
- Syllabus Changes: If changes are made to this syllabus during the semester, they will be announced and explained in class in a reasonable timeframe.