Instructor: Nathan Pflueger (pronounced "fleeger")
  email: npflueger@amherst.edu
  office: SMUD 401

Times and locations: Mon, Wed, Fri   2:00-2:50   SMUD 204

Course webpage `http://npflueger.github.io/410/`   (I rarely use Moodle)

How to reach me   Come to office hours! No appointment is needed. Besides that, I generally reply to email within 24 hours. However, **I may not read or reply to email on weekends, outside business hours, or on Thursdays**, which is the day I devote primarily to research.

Course content

Galois theory revolves around *field extensions*, which are a sweeping generalization of the idea of extending the real numbers to the complex numbers by adjoining $\sqrt{-1}$. Our main objective is to understand the **Galois correspondence**, which is a beautiful identification between field extensions and certain symmetry groups, running through the heart of much of modern mathematics. Specific topics will include

- The origins of Galois theory: the effort to extend the quadratic formula to higher-degree polynomials; the role of permutation groups in this story.
- Three classic impossibility results: the impossibility of trisecting an angle, doubling the cube, squaring the circle.
- The study of these problems via classification of algebraic subfields of the complex numbers.
- Field extensions and the Galois correspondence.
- Finite fields and their applications.

We will begin our study focusing, as Galois did, on the field of complex numbers, and subfields thereof. After thoroughly understanding the Galois correspondence in this setting, we will transition to the more abstract, and modern, viewpoint encompassing all fields.

Prerequisites   Math 350, or equivalent background in abstract algebra.

Textbook   *Galois Theory, **Fifth Edition***, by Ian Stewart. We will also make use of Emil Artin's classic little book, also called *Galois Theory,* to reinforce the material. This book is a classic, and is quite concise, providing a counterbalance to our primary book.

Course structure

Grading: Grades are based on the following categories. The exact cutoffs for each letter grade are not set in advance; I calibrate them at the end based the difficulty and score distribution of the exams.

Participation and effort	5%	
Weekly homework	45%	
Midterm	20%	(take-home)
Final exam	30%	(take-home)

The take-home midterm will probably be distributed in early November; I will announce details closer to the date. The take-home final exam will be due during the final exam period.

Expectations   You should expect to spend at least eight hours studying and working on problem sets outside of class each week. Of that time, I recommend that you spend at least two hours reviewing your notes, the textbook, and previous assignments. Distributing your practice and review throughout the semester will be much more effective than concentrating your review and studying right before exams or due dates. You are expected to attend class every day, arrive on time, and be respectful. You are expected to know about any announcement I make in class or by email.

I encourage you to **stop me to ask questions**. Active participation helps but your brain in the mode that will make new connections and learn well. If you are feeling lost, there is almost certainly someone else feeling the same thing; asking a question may help many of your classmates as well!

Course policies

Dropped assignments   To compensate for illness and other emergencies, your **lowest two homework scores will be dropped**. If you cannot make a due date due to an emergency, my advice is to skip the assignment, but study and understand the problems when you have time, and focus on keeping up with the new material in the course. You do not need to apologize or provide any reasons for skipping an assignment or turning it in unfinished; please choose what is best for your time, health, and well-being. Remember that **the primary purpose of the homework is not evaluation, but to help you learn the material and guide your studying**, so you should still work through all problems on any assignment your drop, and ask me about them as needed.

Homework deadlines and late policy   Homework will be **due at 10pm**, typically on Wednesdays, via Gradescope. To allow for technical difficulties or other last-minute issues, Gradescope will allow you to submit homework after the deadline, however your score will be reduced by 2% **per hour** after the deadline (scaled continuously, e.g. being fifteen minutes late results in a 0.5% deduction). Please try to turn in your work by the due time (I don't want to be responsible for lost sleep!), but don't worry about short delays. **I generally do not grant extensions**, but instead drop two assignments (see above).

Accommodations   I strive to make this course welcoming to all students. If you would like to discuss your learning needs with me, please schedule a meeting so that we can work together to support your academic success. Anyone who may require an accommodation based on the impact of a disability should contact me to make arrangements. I rely on Accessibility Services for assistance in verifying the need for accommodations and developing accommodation strategies, so you should contact them at `accessibility@amherst.edu` or 413-542-2337. If you require accommodations on exams, please arrange this with me at least one week in advance.

Intellectual responsibility

- **Homework:** Mathematics is a collaborative subject; open and generous communication is one of its core values. Therefore you are strongly encouraged to work with other students, ask many questions, and learn from as many people as possible. However, you must write up

the solution yourself. **All your submitted work must be your work, written in your own words**. Copying solutions from other students, solutions manuals, online databases, or generative AI is plagiarism; such copying will result in a 0 on the assignment and will be reported to Community Standards. You are also expected to **list each person your worked with** on the front of your homework assignment.

- **Take-home exams:** absolutely no collaboration or communication with other students, or use of online forums or generative AI, is allowed on exams. You will not be permitted to discuss the exam problems with anyone apart from me before the exam due date. Any collaboration on exams is considered cheating and is a violation of the Honor Code.

For homework and exams, I reserve the right to give no credit for any work that appears suspicious.

Tips and resources

Come to office hours!   I am happy to answer your questions and also talk about the course in general. Even if you don't have specific questions, you can come to review material, listen to other students' questions, or just to chat. There is a desk in my office and several just outside where you are welcome to work, chat, and listen in. Office hours are the best way I have to learn about you and how you're doing in the course and the college, so please visit!

Focus on practice and improvement.   Every homework problem, or example and class or the book is an opportunity to practice. Take these opportunities, and make the most of them!

Distribute your practice.   Study a bit every day, not just before exams. Treat every homework problem as a chance to practice and study.

Actively seek opportunities to practice.   Ask me questions, ask classmates questions, read examples in the book, and try problems that haven't been assigned.