Math 250 – Number Theory – Syllabus

Spring 2023

- **Instructor**: Chris Elliott (pronouns: he/him)
  You can reach me by e-mail at `celliott@amherst.edu`. Please feel free to call me Chris.
  Office Hours: Monday 2:30–4:30, Wednesday 10:30–11:30, Friday 9:30–10:30 in Science Center E206.
- **Math Fellow**: William DeGroot
  Office Hours: Tuesday 5:00–6:30, Thursday 5:00–6:30 in SMUD 205. These office hours will start on Tuesday February 7th.

What We'll Cover

In this course you will learn the foundations of number theory. Topics we will cover include:

- Factorization of integers and prime numbers.
- Modular arithmetic and the idea of congruences.
- Simultaneous linear congruences.
- The theorems of Fermat and Euler.
- Quadratic residues.

The course will involve proofs! You don't need to have prior experience with writing proofs in order to succeed in this class. In fact, learning how to write a proof will be an important part of the course. You will see lots of examples during class time, and have lots of practice as part of your homework.

Schedule

We will meet three times a week for classes:

Monday, Wednesday and Friday at 12pm in **Seeley Mudd 204**.

There will be two midterm exams and a final. The exams will be held on the following days.

- **Midterm 1:** Friday March 3rd (during class)

- **Midterm 2:** Friday April 7th (during class)
- **Final:** TBD (During the period May 15th to 19th)

The exams will be in person, and will be closed book. Calculators will not be allowed.

Makeup Exams

If you cannot make one of the exam times, please let me know as long as possible in advance and **at least two weeks beforehand**. I can arrange make-up exams for legitimate conflicts (e.g. for academic commitments, religious observances) but two weeks advance notice is necessary.

Textbook

We will use the textbook *Elementary Number Theory* by G. Jones and J. Jones. You can access this textbook for free through Amherst College Library (call number QA241.J664 1998eb E-Book). You can use the direct link `http://ebookcentral.proquest.com/lib/amherst/detail.action?docID=3074593` to access the book, and log in using your Amherst College ID. You can also find used paper copies for under $30.

We will be focussing on chapters 1–7, with chapter 6 only summarized briefly, not gone through in full. In some places the textbook uses the language of groups from abstract algebra, however you will *not* need to know anything about abstract algebra for this class, I will always cover the material without assuming any of this knowledge. However, this will be useful context for those of you interested in continuing to take Math 350 in the future!

Other useful references for the course that you may wish to take a look at for another perspective are *An Introduction to the Theory of Numbers* by Hardy and Wright (a classic!), and *The Higher Arithmetic* by Davenport. There is no need to buy these books, they have been reserved in Amherst College library.

Homework

Homework will be assigned each week and due on **Fridays at 5pm**. There will not be homework due during weeks with a midterm exam. The first homework will be due on Friday February 10th.

Homeworks will consist of 5-10 problems on the material we learned in the past week. Some problems that are particularly challenging may be marked with a $(*)$. These problems are **optional**; you can earn 100% on the homework without attempting these, but good solutions will be worth extra credit!

You are encouraged to work on the homework in groups; this is often one of the best ways of learning. However, your final solution **must** be your own work; you should write up your answers on your own, without anyone else's work present (in other words, do not copy!). On the first page of your homework submission, please list the people that you worked with.

You will submit your homework online through **Gradescope** (`https://www.gradescope.com`). You should sign up for a free account using your Amherst College email address. Once you've created an account you should join the section using the following course code:

Gradescope course code: **G2JEZG**.

Homework Extensions

I know that sometimes things come up that make it difficult to complete homework on time. As such, I will grant up to two homework extensions per person during the semester (you don't need to give a reason, just ask). If you want an extension on one of the homeworks, please e-mail me no later than the **day before** the homework is due.

Assessment Structure

Your grade will be calculated as follows.

- Homeworks: 35% (lowest score dropped)
- Midterm exams:
  - Higher midterm score: 20 %
  - Lower midterm score: 15 %
- Final exam: 30%

Accessibility

As the instructor of this course, I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, let's connect to discuss ways to best support your access. If you have disability-related circumstances and are seeking academic accommodations (e.g. extra-time testing, reduced distraction test area, short breaks as needed, note taking assistance, etc.), Accessibility Services is eager to assist with identifying reasonable accommodations for the course. They can be contacted at `accessibility@amherst.edu`.

Honor Code

The Amherst College honor code applies to this course. All the work you submit, both for the exams and the homework, must be entirely your own. In particular, although discussing the homework in groups is encouraged, when you write down your solutions you should not be looking at anyone else's work. Copying somebody else's work is a violation of the honor code.

If you feel stuck or lost in the course, please get in touch with me or one of the Math Fellows assigned to Math 250 either by e-mail or in office hours as early as possible. We will be happy to help you!