

# Math 1231-10: Calculus 1

Fall 2020

Instructor: Jay Daigle  
Email: [jaydaigle@gwu.edu](mailto:jaydaigle@gwu.edu)  
Office hours: TW 3-4, R 2-3, on Discord  
Lecture: TR 11:10 am - 12:25 pm US Eastern time  
Course Web Page: <https://jaydaigle.net/cryptography/>  
All lectures and recitations will be available through Blackboard:  
<https://blackboard.gwu.edu>

## Textbook

The semi-official textbook for Math 4981 this term is *An Introduction to Mathematical Cryptography* by Hoffstein, Pipher, and Silverman. It should be available as a free PDF with your GWU login.

## Course content

Cryptography is the study of sending secret messages over insecure communication channels. Cryptographic capabilities are important to politics and foreign affairs, and underlie the functioning of a great deal of the modern economy.

Unlike many math courses, this course will be oriented around a problem we're trying to solve, rather than around a set of techniques. We'll draw on basic ideas from fields including combinatorics, information theory, probability theory, number theory, geometry, and algebra to encrypt messages so they can't be intercepted, and to break encryption schemes and interpret those secret messages sent by others.

In this course we will:

- Understand the mathematical underpinnings of cryptographic systems and be able to analyze their security.
- See how a problem-centric approach brings many different ideas and fields of math together to solve problems.
- Practice communicating mathematical ideas in writing and in oral communication, and translating technical mathematical ideas for a lay audience.
- Relate your mathematical knowledge of cryptographic systems to newsworthy events and policy issues.

## Prerequisites

The only prerequisites for the course are linear algebra and multivariable calculus; intro to mathematical reasoning is also recommended but not required. This course will in many ways be a tour of a large number of mathematical topics, but with no expectation that you have seen any of them before.

## Technological requirements; recordings

Lectures and recitations will be **delivered synchronously through Blackboard, and recorded**. Participation and discussion with me and each other are highly encouraged, and you will greatly benefit from the ability to engage with a microphone and a camera. Please contact the instructor *immediately* if you believe you will have a technical obstruction to participation. Please contact Student Support or Disability Support Services if you have questions or need assistance in accessing electronic course materials.

**Under no circumstances may you post or share recordings of lecture or recitation** (to YouTube, etc.) without the explicit permission of the instructor and everyone else who appears in the recording. Students who impermissibly share any electronic course materials are subject to discipline under the Student Code of Conduct.

Please contact the instructor if you have questions regarding what constitutes permissible or impermissible use of electronic course materials and/or recorded class sessions.

I have set up a Discord server at <https://discord.gg/HD3dvYC> to facilitate low-key discussions of class material. This is totally optional, but you can go there to talk about the class with each other or with me; I'll be keeping an eye on it most of the time and it's usually the easiest and fastest way to get in touch with me.

## Learning outcomes

By the end of the course, students will acquire the following skills and knowledge:

## Expected amount of work

There are just over 3 hours of class time each week. In addition, we expect a typical students to spend a minimum of 5 hours each week on independent work (primarily, homework assignments).

## Course Structure

This semester will probably be difficult for all of us. I will endeavor to make things as painless as I can manage. Please let me know if you are facing difficulties and I can do anything to help—or if you just need to talk.

I would like to focus our time together in lectures and recitations on actual interactions with each other. In the spring I found that online lectures tended to be very one-sided, so I will try to minimize the use of direct lecture.

For each class, I will assign some reading and some videos to watch before class. Some of these readings and videos will be produced by me; others will be from the textbook or from other (free) online content sources. Please familiarize yourself with at least some of them.

I intend to focus most of our lecture time on working problems. You should expect to work on problems in small groups with each other, and then discuss them with the entire class. I hope this will give you all a chance to meet and interact with your fellow students, which is an important part of the college experience. Attendance will not be monitored or enforced, but will be extremely helpful to progressing in your understanding of calculus.

There will be regular homework assignments, weekly quizzes, and a midterm and a comprehensive final exam.

## Homework

Homework is by far the most important component of this course. Math is a skill that can only be learned by practice, and it's very difficult to understand the material until you have worked through applying it.

Homework will be assigned weekly. Please begin the homework early, and discuss it with your classmates and with me.

The most challenging and interesting problems of the course will be on the homework. This is where you get to really engage with the material.

## Project

Towards the end of the term you will submit a somewhat larger-scale project bringing together some of the ideas in the course. Some of the details will be worked out between us to make sure the project is a productive experience for everyone involved.

## Midterm and Final

There will be a midterm around the end of February, and a final exam. Both should be relatively straightforward if you've been following the class appropriately.

## Computation of final grades

- Homework: 50%
- Project: 20%
- Midterm: 15%
- Final Exam: 15%

Minimum scores for each letter grade are as follows: A, 94%; A-, 90%; B+, 87%; B, 84%; B-, 80%; C+, 77%; C, 74%; C-, 70%; D+, 67%; D, 64%; D-, 60%.

## Support and Mental Health

In addition, the University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. For additional information, see <https://counselingcenter.gwu.edu/> or call 202-994-5300.

## Academic integrity Code

Students are responsible for the honesty and integrity of their own academic work. In particular, it is unacceptable to present the work or ideas of others as if they were your own. The course staff take this *extremely seriously*, and you should as well. The best way to avoid problems is to clearly indicate on your work what sources/individuals/etc. you consulted. Failure to abide by rules for individual assignments is subject to sanction, including possibly failure of the class. If you have any questions, please do not hesitate to contact the instructor. The complete university code is at <https://studentconduct.gwu.edu/code-academic-integrity>

## Religious holidays and other excused absences

If you will be unable to complete or submit an assignment, notify your TA or instructor *in advance* to discuss your options. Unexcused missing work will be assigned a score of 0. In accordance with University policy, students should notify faculty *during the first week of the semester* of their intention to be absent from class on their day(s) of religious observance. For details and policy, see "Religious Holidays" at <https://provost.gwu.edu/policies-procedures-and-guidelines>

## Students with disabilities

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information, see <https://disabilitysupport.gwu.edu/>

## Safety and Security

1. In an emergency: call GWPD 202-994-6111 or 911
2. For situation-specific actions: review the Emergency Response Handbook at [safety.gwu.edu/emergency-response-handbook](https://safety.gwu.edu/emergency-response-handbook)
3. In an active violence situation: Get Out, Hide Out, or Take Out. See [go.gwu.edu/shooterpret](https://go.gwu.edu/shooterpret)
4. Stay informed: [safety.gwu.edu/stay-informed](https://safety.gwu.edu/stay-informed)

## Final disclaimer

The course staff reserves the right to change course policies in light of unforeseen events; in this case, announcements will be posted to Blackboard explaining the change.