

Course Syllabus

Math 110 (Introduction to Number Theory)

Winter 2023 • MWF 4:00 PM – 5:05 PM

Instructor Xu Gao (xgao26@ucsc.edu), McHenry Library 1292

Lectures The lectures will be **in-person** and will take place at **Engineer 2 194** every Monday, Wednesday, and Friday 4:00 PM – 5:05 PM.

Office Hours Monday and Wednesday 2:30 – 3:30 PM, or by appointment.
(This is when you come and talk to me if you have any questions. Do not hesitate to make appointments with me if regular office hours don't work for you!)

Teaching Assistant Changan Zou (czou3@ucsc.edu)

Discussion Sections (A): F 9:20 AM – 10:25 AM (B): Tu 1:20 PM – 2:25 PM

Textbook We will follow *An Illustrated Theory of Numbers* by Martin H Weissman, focusing on Chapters 1 – 8. See [the book page](#) for more information on this book.

Course Schedule The following is a tentative course schedule.

Week	Topic	Textbook
Week 1	Linear Diophantine Equations	Chapter 0 – 1
Week 2	Prime Numbers	Chapter 2
Week 3		
Week 4	Rational and Algebraic Numbers	Chapter 3
Week 5	The modular worlds and Modular dynamics	Chapter 5 – 6
Week 6		
Week 7		
Week 8	Assembling Modular Worlds	Chapter 7
Week 9	Quadratic residues	Chapter 8
Week 10		

Learning Outcomes

- Familiarize ideas and problems in number theory that play essential roles in modern mathematics.
- Understand the roles of theorems, proofs, and counterexamples.
- Develop problem-solving skills.
- Practice clear, concise, and precise mathematical writing.

Grade The grade will be based on two parts:

- **Homework and Classwork (50%)**
 - **Attendance and quizzes (10%)**
there will be attendance forms and quizzes, the lowest **5** ones will be dropped.
 - **Glossary (10%)**
you are asked to keep a glossary and share it with us before **each** exam.
 - **Homework (30%)**
weekly homework (different from exercises, which will not be graded)
- **Exams (50%)**
 - **Midterm (20%)**
there will be **two** midterms, the lower one will be dropped.
 - **Final (30%)**

The final score will be **curved with a norm distribution** and then translated to letter grades using the following grading scheme.

Total scores	Grade
≥ 98	A+
90 – 97	A
88 – 89	A–
85 – 87	B+
78 – 84	B
75 – 77	B–
70 – 74	C+
60 – 69	C
55 – 59	C–
40 – 54	D
< 40	F
incomplete ¹	I

To pass the course, your letter grade should be at least C.

¹Need to discuss with the instructor before the end of the course.

Guidelines

■ Attendance and Quizzes

1. The lectures are **mandatory**, so there will be an attendance record.
2. At the **beginning** of a lecture, you will see a QR code. Scan it to complete the attendance form. This is also the place to submit your quiz answer (if there is a quiz). You can also use this form to give your feedback on this lecture. The QR code will appear again at the **end** of the lecture.
3. If you cannot attend, please **contact me before the lecture** to avoid losing attendance points.
4. There may or may not be a quiz during the lecture. Submit your answer **through the attendance form**.

■ Glossary

1. Throughout the course, you will maintain a glossary of terms and results that you find difficult to digest or wish to remember. Add **your thoughts** on them, and whenever possible, include examples as well.
2. The glossary can be typed or handwritten, long or short, but it **cannot be empty**. The point is it is about your learning experience.
3. You are asked to share your glossary every month (before the exams). To do this, navigate to the Glossary page and upload a **PDF** file to Gradescope. Be aware of the **due date**.
4. You can use the glossary as an **index** to resources you need to solve problems in the exams.

■ Homework

1. There will be homework every week. Please turn in the homework on the **due date**. (If you need an extension, please ask before the due date.)
2. You are encouraged to **discuss** the problems with your peers (for example, on ED Discuss). However, you must write the homework **by yourself** using your words and **acknowledge your collaborators**.
3. The homework is expected to be typed using **L^AT_EX**.
4. Pay close attention to the presentation and the clarity of your reasoning. This course is writing-intensive.
5. List the **references** you have used in your answer. You should avoid using resources that solve the problem immediately.
6. To submit the homework, navigate to the Homework page and upload the **compiled PDF** file (not the .tex file) to Gradescope.

■ Midterm

1. The Midterms will be given on **Monday, Jan. 30th** and **Monday, Feb. 27th** during the lecture times.
2. Please prepare draft papers before the exam.
3. You can use your glossary, notes, textbook, and homework during the exam. But you **cannot discuss** the problems with others. **No digital devices** are allowed during the exam.
4. The only results (theorems/lemmas) you're allowed to use are either provided during the lectures or in the exercises/homework.

■ Final

1. According to [the registrar](#), the Final will be given on **Thursday, March 23 12:00 – 3:00 PM**.
2. You can look up your glossary, notes, textbook, and homework during the exam. But you **cannot discuss** the problems with others. **No digital devices** are allowed during the exam.
3. The only results (theorems/lemmas) you're allowed to use are either provided during the lectures or in the exercises/homework.
4. If you have any questions, ask me or the TA.

■ Communication

1. You are welcome to ask me any questions during class and the office hours.
2. Besides those times, please contact me primarily via **Canvas**. I will reply within 24 hours during the weekdays. Contact me via email if and only if you haven't received any response for a long time.
3. When you contact me, please provide as much information as possible on the subject you intend to discuss.
4. **Never hesitate to reach out.**

Online Discussion Tools We will use online discussion tools such as discord. You are encouraged to collaborate and answer each other's questions. You can find more details on Canvas.

L^AT_EX L^AT_EX is widely used for mathematical writing. You will need basic L^AT_EX for this course. To start, look at the .tex files I provide you. You can upload them to online L^AT_EX editors such as [Overleaf](#), or import them into a local editor. Then google anything beyond the files, and use the online resources such as [Tex Stack Exchange](#), [Overleaf knowledge base](#), and [L^AT_EX wikibook](#). If you need help getting started, please contact me.

Academic Integrity All members of the UCSC community benefit from an environment of trust, honesty, fairness, respect, and responsibility. You are expected to present your own work and acknowledge the work of others to preserve the integrity of scholarship. For the full policy and disciplinary procedures on academic dishonesty, refer to the [Academic Misconduct page](#) at the Division of Undergraduate Education.

Accessibility (DRC) UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, preferably within the first two weeks of the quarter. At this time, I would also like us to discuss ways we can ensure your full participation in the course. I encourage all students who may benefit from learning more about DRC services to contact the DRC by phone at 831-459-2089 or by email at drc@ucsc.edu.

CAPS (Counseling and Psychological Services) The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. See [the CAPS page](#) for more information.

COVID-19 Information for In-person Courses

■ **WHAT WE CAN EXPECT FROM EACH OTHER** Each individual at UC Santa Cruz should act in the best interests of everyone else in our community. Please take care to comply with all university guidelines about masking in indoor settings, performing daily symptom and badge checks, testing as required by the campus vaccine policy, self-isolating in the event of exposure, and respecting others' comfort with distancing. Please do not come to class if your badge is not green. If you forget your mask, you can ask me for one; there is a limited supply of disposable masks in each classroom. If you are ill or suspect you may have been exposed to someone who is ill, or if you have symptoms that are in any way similar to those of COVID-19, please err on the side of caution and stay home until you are well or have tested negative after an exposure. Let me know if you're not feeling well, and I'll respond about how best you can keep learning.

■ **WHAT YOU CAN EXPECT FROM ME** I have designed our course following campus guidance and with current public health guidelines in mind. However, these guidelines

may change in accordance with shifting infection rates or the emergence of new variants. If updated public health recommendations and university requirements make our current course format unfeasible, or if I experience a need to self-isolate, I will alter the format. This may include moving in-person sessions onto Zoom, modifying course assignments to work in a remote format, and reconfiguring exams (if applicable). I will communicate clearly with you via email or Canvas announcement about any changes that occur. I will provide as much advance warning as possible and give you all the information you need to transition smoothly to the new format. If you have questions about the changes, please reach out to me, so I can answer them.

▪ **WHAT I EXPECT OF YOU** If you experience an illness or exposure that requires you to miss class sessions or to attend remotely, please communicate with me as soon as possible, and I will provide you with options to allow you to continue making progress in the class.

Title IX and Care Advisory UC Santa Cruz is committed to providing a safe learning environment that is free of all forms of gender discrimination and sexual harassment, which are explicitly prohibited under Title IX. If you have experienced any form of sexual harassment, sexual assault, domestic violence, dating violence, or stalking, know that you are not alone. The Title IX Office, the Campus Advocacy, Resources & Education (CARE) office, and Counseling & Psychological Services (CAPS) are all resources that you can rely on for support.

Please be aware that if you tell me about a situation involving Title IX misconduct, I am required to share this information with the Title IX Coordinator. This reporting responsibility also applies to course TAs and tutors (as well as to all UCSC employees who are not designated as “confidential” employees, which is a special designation granted to counselors and CARE advocates). Although I must make that notification, you will control how your case will be handled, including whether you wish to pursue a formal complaint. The goal is to make sure that you are aware of the range of options available to you and that you have access to the resources you need.

Confidential resources are available through [CARE](#). Confidentiality means CARE advocates will not share any information with Title IX, the police, parents, or anyone else without explicit permission. CARE advocates are trained to support you in understanding your rights and options, accessing health, and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more. You can contact CARE at (831) 502-2273 or care@ucsc.edu.

In addition to CARE, these resources are available to you:

- If you need help figuring out what resources you or someone else might need, visit the [Sexual Violence Prevention & Response \(SAFE\) website](#), which pro-

vides information and resources for different situations.

- [Counseling & Psychological Services \(CAPS\)](#) can provide confidential counseling support. Call them at (831) 459-2628.
- You can also report gender discrimination and sexual harassment and violence directly to the University's [Title IX Office](#), by calling (831) 459-2462 or by using their [online reporting tool](#).
- Reports to law enforcement can be made to the UC Police Department, (831) 459-2231 ext. 1.
- For emergencies, call 911.

Report an Incident of Hate / Bias The University of California, Santa Cruz is committed to maintaining an objective, civil, diverse, and supportive community, free of coercion, bias, hate, intimidation, dehumanization, or exploitation. The Hate/Bias Response Team is a group of administrators who support and guide students seeking assistance in determining how to handle a bias incident involving another student, a staff member, or a faculty member. To report an incident of hate or bias, please use the following form: [Hate/Bias Report Form](#).

Religious Accommodation UC Santa Cruz welcomes a diversity of religious beliefs and practices, recognizing the contributions differing experiences and viewpoints can bring to the community. There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request reasonable accommodation for religious practices. The instructor will review the situation to provide reasonable accommodation without penalty. You should first discuss the conflict and your requested accommodation with your instructor early in the term. You may also seek assistance from the [Dean of Students office](#).

Tutoring and Learning Support At [Learning Support Services \(LSS\)](#), undergraduate students build a strong foundation for success and cultivate a sense of belonging in our Community of Learners. LSS partners with faculty and staff to advance educational equity by designing inclusive learning environments in Modified Supplemental Instruction, Small Group Tutoring, and Writing Support. When students fully engage in our programs, they gain transformative experiences that empower them at the university and beyond.