

MATH 4107 Syllabus

Abstract Algebra I, Section AU/AG, 3 credit hours

Summer 2026

Course Meeting Times: TR 9:30 am - 11:40 am in Mason 3133

Instructor Information

Instructor: Dr. Hunter Lehmann

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Office: Skiles 218C

Office Hours: TR 12:00 pm - 1:00 pm

I will have some flex hours available to make appointments electronically as well - see Canvas.

General Course Information

Description

MATH 4107 explores the fundamental definitions, theorems, and proofs in groups, rings, and fields through proofs, examples, counterexamples, and computations. Material will include:

- Groups: Definitions, examples, subgroups, normal subgroups, isomorphisms and homomorphisms, quotient groups, Lagrange's theorem, symmetric groups.
- Rings: Definitions, examples, integral domains, ideals, quotient rings, polynomial rings
- Fields: Definitions, examples, quotient fields, finite fields

Course Learning Outcomes

Upon successful completion of the course, students will be able to:

- Write to communicate the topics of abstract algebra using accepted proof writing conventions, explanations, and correct mathematical notations.
- Identify fundamental structures of abstract algebra including groups, rings, fields, and integral domains.
- Comprehend abstract definitions and theorem statements by building examples and non-examples of definitions, and drawing conclusions using definitions and theorems given mathematical information.
- Demonstrate problem solving skills in the context of abstract algebra topics through consideration of examples, pattern exploration, conjecture, proof construction, and generalization of results.
- Analyze similarities and differences between algebraic structures including groups, rings, fields, and integral domains.

Prerequisites

- Familiarity with proofs: MATH 2106 or equivalent

I also expect that you have some familiarity with matrix operations, modular arithmetic, and the properties of functions.

Required Course Materials

We will follow (for the most part) the book *Contemporary Abstract Algebra*, 10th edition, by Joseph Gallian. It is not important that you have specifically the 10th edition, or even that you have this particular algebra textbook, but it is important to have a copy of some text on abstract algebra - you will want a good reference material as you work through the course.

A few open online resources are listed below in no particular order:

- Abstract Algebra: Theory and Applications, Tom Judson
- Algebra Abstract and Concrete, Frederick Goodman
- Visual Algebra Videos, Matthew Macaulay

Other good print texts include:

- *A Book of Abstract Algebra*, Steven Pinter
- *A First Course in Abstract Algebra*, John Fraleigh
- *Abstract Algebra*, I. N. Herstein (**Denser, more advanced**)
- *Abstract Algebra*, Dummit and Foote (**Denser, more advanced**)

My Philosophy

I believe everyone can do mathematics, that mathematics is inherently collaborative, and that making mistakes is a crucial part of learning. To that end:

- *I want you all to succeed.* My job is to guide you through the course content and I take that responsibility very seriously.
- *We learn by doing things, not listening and watching other people do things.* Correspondingly, class each day will feature substantial work time for you as students.
- *We learn from consistent practice and mistakes.* I expect you to make mistakes the first time you try something new. You are not expected to get everything right at first, and the course is built for you to learn from your mistakes. You are also encouraged to work a little each day throughout the semester instead of cramming before exam days.
- *You will be lost sometimes.* This is normal and expected. When you feel lost, reach out to me, your classmates, or the LA for help.

Course Meetings

Our class is set up to promote your *active engagement* with the course. Each day, you'll be expected to have done some preparation before class. During class time, we will pick up where that preparation left off. We'll start each class with some time for questions and clarifications. This will *not* be a lecture or a repetition of the material you prepared on your own. Instead, it will be a time for you to ask questions about anything you found confusing in the preparation. After that, there may be a mini-lecture to introduce new concepts, but most of the class time will be devoted to working on problems and activities in groups to develop your understanding.

Course Assignments

There are six kinds of assignments in our course. Each type of assignment is designed to help you build your understanding of the course material differently. Together, they will help you achieve mastery of the course learning outcomes.

The first broad class of assignments are *formative assessments*, which are low-stakes assignments designed to help you practice and build your skills. These include Startup/Review Assignments, Daily Preps, Weekly Practices, and Problem Sets. These are all graded only on a completion/effort basis - if you put in a good-faith effort to complete the assignment, you will receive full credit for it. You will receive feedback on these assignments to help you improve your understanding of the material.

There are also *summative assessments*, which are where you will demonstrate your mastery of the course content based on the skills you have built through the formative assessments. These will form the basis of your course grade.

- **Startup/Review Assignments:** Assignments done in the first few weeks of the semester to build or rebuild your fluency with the course and its prerequisite knowledge. There are 3 Startup/Reviews planned.
- **Daily Prep:** Before each class day, I will ask you to watch a short (~ 10 – 15 minute) video or read a short section from the text and answer questions. These will help you learn the basics of new material and prepare you for higher-level focused work in class. There are 20 Daily Preps planned.
- **Weekly Practice:** Short homework sets given weekly to help you build the basic skills needed to understand the course concepts. These have either computational or true/false type problems. These will be generally be due on Tuesdays at the start of class. There are 10 Weekly Practices planned.
- **Problem Sets:** Extended problem sets centered on writing proofs. These will generally be due one week after we finish the material they cover at the start of class (one for each of the four course modules). There are 4 Problem Sets planned.
- **Exams:** These are in-class assessments a few times during the semester after the first week of the semester. They will assess your knowledge of the major content areas of the course without the use of outside resources. There are 4 Exams planned.

Each of these exams will consist of a series of short TF/MC/give a definition questions and then a section of longer answer questions. Exams 1-3 also have a reattempt opportunity about a week later. Each original exam will pull its problems predominantly from the Weekly Practice and Problem Set problems, while the reattempt will have similar but not identical problems.

During the final exam period, you will first take Exam 4 using the first 75 minutes of the period. After a short break, you will then have take a reflective Connections Exam that asks you to consider your overall learning this semester and address the connections between the different content areas of the course. This Connections Exam can be used to replace one of your previous exam grades if it is higher than that grade.

- **Video Project:** For the video project, you will form a group of 3 students and create a 10-minute video on an abstract algebra topic aimed at a first-year math major. You will write a script, create visuals, and record narration to explain the topic clearly and engagingly. The goal of this project is threefold: to deepen your understanding of the material by explaining it to others, to practice the crucial professional skill of working in a team, and to develop the skill of presenting mathematical ideas to a non-mathematician (essential in many professional and academic contexts). Complete details about the project's timeline, requirements, and grading will be provided on Canvas.

Grading Policy

This course will be graded differently than you are likely used to from your other college courses. Most components of your grade come from assignments **without point values attached**; no point values means **no partial credit and no averaging**. Instead, these assignments have **specifications** which are descriptions of what constitutes “successful” work. These are given in detail in the **Grading Specifications** page on Canvas. Rather than attaching points to items on these assignments, I use that document to see if the work meets the standard for success. Depending on the extent to which it does, it will be marked with one of a few adjectives describing it. See below for details.

After I grade your work, in most cases you will receive **detailed feedback** that will tell you whether your work meets the standards, and if not, what was missing and how you might go about fixing it. For exams you will then have the opportunity to **reattempt** or possibly **revise** items on the exam if needed so you can put the feedback you received to work and improve on the second attempt.

This feedback loop represents and supports the way that people learn: By trying things, making mistakes, reflecting on those mistakes, and then trying again. You can make mistakes as long as you eventually demonstrate evidence of skill. This also mirrors the way most of the world works outside of school. For example, in a job setting, you don't get a point value for your performance review and then have your continued employment depend on that point value. Instead, there are performance standards, you get feedback and coaching on how to improve, and then you act on the feedback to show your boss that you have improved.

Your final grade in the course is not determined by point totals or averages (as there aren't such). Instead it is based on **how many learning tasks you've successfully accomplished** by the end of the semester, using the simple table below.

Engagement Credits Throughout the semester, you can earn **engagement credits** by completing various assignments designed to keep you engaged with the course. Some of these are repeated opportunities: for example each day of class has engagement credits to earn via Daily Prep and attendance. There are also one-off opportunities like the formative assessments (Weekly Practices and Problem Sets) and there will be others announced throughout the semester as well. The engagement credits earned for the already-set assignments are as follows:

Task	Engagement Credits
Successful completion of a Daily Prep	1
Attending a class meeting (90 minutes or more)*	2
Successful completion of a Weekly Practice	5
Successful completion of a Problem Set	12

* Does not include exam days or reattempt days. Days you are absent for any reason do not earn attendance engagement credits.

Please see the **Grading Specifications** for the requirements on successful completion of each of these items. Other items that contribute to engagement credits will have the amount of credits they are worth specified in their instructions on Canvas, along with the requirements for successful completion. Your total engagement credits will be updated each week in the "Engagement Credit Total" column of the Canvas gradebook.

How Assignments are Marked and Recorded

- **Daily Preps, Weekly Practice, & Problem Sets.** These assignments do not receive marks themselves. Turning in a complete assignment on time with a good-faith attempt at all problems will earn you the appropriate engagement credits. You will receive feedback on your work to help you improve your understanding of the material and prepare for exams.
- **Exams.** Each exam consists of several parts (a multiple choice/true-false/definitions part and several problem groups). Each part will be marked *Success* or *Retry* and this will be recorded in Gradescope. The exam as a whole is marked *Master*, *Proficient*, or *Beginner* based on how many parts were marked *Success*. See the **Grading Specifications** for details.
- **Startup/Review Assignments.** These will be marked *Pass* or *No Pass*; see the **Grading Specifications** for details.
- **Video Project.** This will be marked *Master*, *Proficient*, or *Beginner* depending on how many of the project requirements were successfully met and at what level; see the **Grading Specifications** for details. Your project team will also have input into how individual performance and teamwork factors in to these requirements. There are also several required checkpoint assignments that *must* be completed to earn any mark above *Beginner* throughout the semester.

Tracking and Returning Work

I will give a grade and/or feedback on all submitted work within a week of submission. Comments on Weekly Practices, Problem Sets, and Exams will be available on Gradescope. I will also update your engagement credit total on Canvas weekly. If you ever have questions about your progress in the course, please reach out to me.

Several Problem Sets are due on the day of the exam that covers their material. If you would like feedback on those problems before the exam, please submit them by the class day before the exam instead. You will still get full engagement credit for submitting them on the exam day, but you will get feedback earlier to help you prepare for the exam if you submit them early.

Final Course Grade

Each grade has a requirement specified in its row in the table. **To earn a grade, you will need to meet all the requirements in the row for that grade.** Put differently, your grade is the **highest** grade level for which **all** the requirements in a row of the table have been met or exceeded.

Grade	Exams	Video Project	Engagement
A	3 Master & 1 Proficient	Master	165
B	2 Master & 2 Proficient	Proficient	140
C	1 Master & 3 Proficient	Proficient	115
D	3 Proficient	Beginner	95

Reattempts of Assessments

An important feature of this course is the opportunity to **redo many of your assessments** to take feedback into account and improve your understanding. This is what I offer instead of partial credit, and I expect you to make use of the opportunity and learn from it.

Exams

All but the final exam will have an opportunity for you to take a reattempt at the exam. If you earned *Master* or are otherwise happy with your initial attempt on an exam, you are not required to attend the reattempt day for that exam. Unlike the initial attempt, the reattempt may not include problems taken directly from Problem Sets and Weekly Practices, so it's to your advantage to do as well as possible the first time. **Only the indicated exam may be reattempted on each date.** There is also a Connections exam during the second half of the final exam which can be used to replace one previous exam grade.

Because Exam 4 occurs during the final exam period, there is no reattempt opportunity for it.

Before each reattempt you will complete a short reflection assignment on Canvas about your preparation for and performance on the initial exam. This reflection must be completed to be eligible to reattempt that exam.

Course Websites

Canvas: Course Canvas Site

Canvas will be used for course grades, supplemental videos, assignments, announcements, and course-related documents.

Links to the other websites in this section can be found on Canvas as well.

Ed Discussion: Course Ed Discussion Forum

You can use Ed Discussion to ask questions about course content, assignments, and logistics. You can also answer your classmates' questions. Our LA and I will monitor Ed Discussion and answer questions there as well.

Gradescope: Grading of all Weekly Practice, Problem Sets, and Exams will be done on Gradescope. You will access Gradescope through Canvas to turn in your Weekly Practice and Problem Set assignments. Exams will be taken on paper and then scanned and uploaded to Gradescope for grading.

Other Course Policies

Attendance and Technology

You are expected to come prepared and actively participate in every class session. We will devote substantial class time to group work and problem-solving, and you will get the most out of the course by being present and engaged.

Class disruptions of any kind will not be tolerated and may result in your removal from the classroom. Please show courtesy to your classmates and instructor by adhering to the following class rules:

- Electronic devices should be kept away unless we specifically need them for an activity. The only exceptions are tablets being used for hand-written note taking or any assistive technology needed for accommodations.
- Come to class on time and stay for the entire class period.
- Refrain from conversing with your fellow students about non-mathematical topics during class.
- Put away any reading materials unrelated to the course.

In the event of an absence, you are responsible for all missed materials, assignments, and any additional announcements or schedule changes given in class.

Academic Integrity

Do not cheat! Abide by the honor code at all times. See <http://honor.gatech.edu> and [here](#).

Any evidence of academic dishonesty or other violations of the Georgia Tech Honor Code will be submitted directly to the Office of Student Integrity. Academic dishonesty includes, but is not limited to:

- Using a phone, books, or any form of notes on exams.
- Copying directly from any source, including friends, classmates, tutors, internet sources, generative AI, or a solutions manual. **Your work should be your own, in your own words.**
- Allowing another person to copy your work.
- Taking an exam in someone else's name, or having someone else take an exam in your name.
- Asking for a regrade of a paper that has been altered from its original form.

Cheating does not include working together with your friends and classmates on your Daily Prep, Weekly Practice, or Problem Set assignments, although your work still must be in your own words. If you do work with others on these assignments, you must clearly indicate who you worked with on the assignment itself. You may use generative AI and other tools to help you get started on these same assignments, but relying heavily on these will likely result in poor performance on Exams if you do not develop your own understanding of the material. AI tools also sometimes make mathematical errors and the rate of these errors increases with complexity, so be careful in applying them.

Accommodations for Students with Disabilities

Georgia Tech complies with the regulations of the Americans with Disabilities Act of 1990 and offers accommodations to students with disabilities. If you are in need of classroom or testing accommodations, please make an appointment with the Office of Disability Services to discuss the appropriate procedures. More information is available on their website. Please also make an appointment with me to discuss your accommodation, if necessary.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate

some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Email policy

I will respond to emails within one to two business days. Emails sent after 5:00 pm will not receive a response until the next day. Emails sent on the weekend will not receive a response until Monday.

For questions relating to course structure, please check the syllabus and Canvas course information pages first, as your question may already be answered there. If you have a question about an assignment, please check the assignment instructions on Canvas first. Exam dates, policies, etc. are available on the syllabus and on Canvas.

Let's not discuss grades by email. Any questions about grades should be asked during office hours or in an appointment scheduled outside of office hours. **In particular, do not send me emails at the end of the semester asking for your grade to be changed. They will not help and I will not respond to such emails.**

Inclement Weather and Digital Learning Days

In cases where campus may be physically closed due to events such as inclement weather, a digital learning day may replace in-person classes. Should this event occur on a regular class day, then class will either be streamed live, or a recording will be posted for students to watch asynchronously. If a digital learning day occurs on an exam date, then class will meet online or asynchronously instead, and that exam will be rescheduled to the next class day.