
Math 217: Linear Algebra

Winter 2024

Required text:

Linear Algebra with Applications (5th edition)
by Otto Bretscher

Prerequisites:

Math 215, 255, or 285.

Students should register for Math 201 concurrently, particularly if they have not previously seen mathematical proofs at the college level.

Course coordinator:

Dr. Michael Weiss EH 4079

Instructors (Sections):

Dr. Paul Kessenich (001, 004)	EH 3843
Dr. Seungsu Lee (002, 003)	EH 4839
Dr. Michael Weiss (006, 008)	EH 4079
Dr. Wijit Yangjit (005)	EH 4823
Dr. Scott Schneider (007)	EH 3851

Office:

Course Topics and Goals:

This course is designed to give potential math majors, and those interested in mathematical theory and proof, a rigorous introduction to linear algebra. The topics we will cover are, roughly: systems of linear equations; matrix algebra; vectors, vector spaces, and their subspaces; geometry of \mathbb{R}^n ; linear dependence, bases and dimension; linear transformations; eigenvalues and eigenvectors; diagonalization; orthogonality and inner products.

There are essentially three main learning outcomes for Math 217:

- (1) Becoming fluent with computations in linear algebra (solving systems of equations, matrix arithmetic, etc);
- (2) Learning the theory supporting those computations (vector spaces, linear transformations, etc);
- (3) Learning to read and **write** mathematics (proofs!).

Students should leave this course prepared to use linear algebra and also to succeed in subsequent theoretical courses in mathematics. Math 217 is a challenging course, and those interested only in the computational side of linear algebra should consider Math 214 or 417 as alternatives. In addition, **all students who have not already had a formal introduction to mathematical proofs** (such as Math 175-176, 185-186, 295, or EECS 203) **should simultaneously enroll in Math 201**, which is a 1 credit “credit / no credit” introduction to mathematical writing. We will not check that you have done so; however, be warned that many students who ignore this advice find it difficult to succeed in Math 217 and come to regret their choice.

Attendance, Participation, and Punctuality:

Attendance is required. Your individual instructor may have specific policies regarding attendance, but in general **students are expected to attend class regularly**, to show up **on time** for class, and to **participate actively** in solving worksheet problems during class time.

Math 217 uses an educational technique called “Inquiry Based Learning” (IBL) in which students work together in small groups on carefully designed exercises to develop core ideas themselves. Research shows that IBL students learn material at a deeper level and retain it longer and better. To maximize your chances for success in this course:

- (1) Come prepared! Be sure you have done the reading and are ready to work at class-time.

- (2) Actively develop, question, rephrase, reinterpret, and engage with the material as you are working with your peers in class.
- (3) Participate! Introduce yourself to your group-mates and get to know the other students and all the Math 217 instructors.

When “life happens,” students should contact their instructors about expected (or unexpected) absences. Consult your instructor for questions about making up section work (such as worksheets or quizzes) missed during absences.

We understand the heightened risk that Covid has wrought, and understand that students may miss class due to illness or isolating. If this happens to you, please communicate with your instructor about what is happening and we will attempt to be as flexible as we can regarding attendance and assignments. In particular, **students will not have their grade reduced for failing to attend class when ill or isolating.**

Grading:

Your course grade will be determined as follows:

Written homework:	15%
Part A:	5%
Part B:	10%
Web homework:	10%
Quizzes:	10%
Midterm 1:	20%
Midterm 2:	20%
Final exam:	25%

Details about each type of these assessments are below.

Written Homework:

The weekly written homework consists of two parts which must be written up and submitted separately. **Part A** will consist of shorter or more computational problems, often from the textbook. **Part B** will typically have several longer problems each requiring some insight and a carefully written solution. A total of 11 written homework sets will be assigned. We will drop one Part A score and one Part B score, the lowest in each category, from the total homework score.

Written Homework assignments will be posted to the course Canvas page, generally about a week before they are due. There will be no written homework sets during the weeks of the midterm exams. All homework sets will be **due Thursday night at 11:59pm sharp, Ann Arbor time**. Homework submitted between 12:00am and 12:59am will be marked half off, and homework submitted at 1am or later will not be accepted.

As a general rule we do not offer extensions on HW assignments except under very unusual circumstances. However, we do understand that nearly every student will get sick, or have a family emergency, at least once per semester; this is precisely why we drop every student’s lowest HW Part A score and their lowest HW Part B score, so that one bad week doesn’t have an outsized effect on their grade.

Written homework sets are to be submitted **as PDF files** electronically via Gradescope. There is a link from our Canvas page to Gradescope that you may use. Parts A and B must be submitted separately, each in PDF form. At the time of submission, **you must match problem numbers to PDF pages** in order to be sure your work will be graded. Failure to do so may result in earning a score of zero points on un-matched problems.

Students may seek help and hints from each other. You are encouraged to work together on homework assignments, but **you must write up your solutions independently**. Be sure to cite your collaboration with other students clearly on your homework so that you are not accused of plagiarism.

You can and should freely use course materials to solve problems, but you should **carefully cite any external source you use**. We strongly recommend *against* using any source beyond our textbook, handouts and worksheets for homework help, including other texts or other course websites, previous Math 217 materials, Wikipedia, Stack Exchange, etc. There are several reasons for this. First, our homework is designed to be done by students using the materials we provide; if you can't do it, that means that you are missing something, in which case you should get help from an instructor to fill out your knowledge. Second, definitions and assumptions are not always the same across different platforms; you must use the definitions and theorems from our course to get full credit on homework. Third, you may be asked to explain how you got your solution to a homework or exam problem, and you may be penalized if you cannot do so using the language and materials of Math 217. Fourth, **googling problems is very likely to lead to a violation of the academic integrity policy. In particular, posting or using solutions provided by "experts" on Stack Exchange, Chegg, Course Hero or any other website or textbook will be considered a violation of the academic integrity policy and the consequences will be severe.**

Solutions should be written clearly and legibly, showing all of your work, providing careful citations (even to course materials), and fully explaining your reasoning. *You should really think of Math 217 as a writing course.*

You are allowed, but certainly not required, to type your homework solutions using L^AT_EX. If you write out your homework solutions by hand (as is typical) then you should scan your solutions for electronic submission, for example by using a scanning app for your phone or simply by taking a photograph of your homework using your phone. **However, you must combine your individual images into a single PDF document before uploading to Gradescope.** *You* are responsible for ensuring that your homework submissions are in PDF form and are legible; any submissions that are not legible may be marked down or given a score of zero.

Web Work:

WebWork includes weekly web homework assignments as well as shorter but more frequent reading assignments. There are links to WebWork from canvas, or you can go directly via <https://instruct.math.lsa.umich.edu/webwork2/ma217-w24/>.

It is your responsibility to check WebWork regularly to determine when new WebWork assignments and reading questions are available. Note that in some cases the due dates may vary by course section.

Students who succeed in Math 217 take the WebWork seriously: they read the book seriously and test their knowledge with the WebWork so that they can get the most out of the worksheets in class. They have the web homework finished by the weekend, because they know that the computational skill they gain by completing it early will help them understand the reading, complete the worksheets, and make progress on the written homework. They get the WebWork out of the way so that they can get started on Part B of the written homework with plenty of time to solve the challenging ones and also get help in office hours if needed.

Gateway Exams:

Two "Gateway Exams," one early in the semester covering elementary matrix operations, and one at the end of the semester covering diagonalization.

Gateway Exams are administered in the math testing lab; please pay attention to Canvas Announcements where opening and closing dates, and details of location, will be announced. Students must bring ID; No notes or calculators are allowed. The Gateway Exams are mastery based: you may take them twice per day until you pass, up until the deadline. Students will lose a third of a letter grade (from

their final course grade) for each Gateway Exam they do not successfully pass at some point during the open periods. Proctored Gateway Exams are administered in the Mastery Assessment Lab (B069 EH) and may be taken **no more than twice per day**. Students may practice the Gateway from any computer at any time (and as many times as desired) during the open dates for the exam. Students must score at least 7 out of 8 to pass the first Gateway, and 5 out of 5 to pass the second.

Quizzes:

Quizzes will be short, in-class assignments designed to test comprehension of recent material, given at least once per week. A quiz could involve definitions, True/False questions, computations, or short proofs. Quizzes must be completed in class, except for excused absences at the discretion of the instructor. The Quiz component of your grade is the only part of the course that is not uniform across all sections; each instructor has sole discretion on writing, administering and grading quizzes. Please consult your instructor for the specific policies regarding the quizzes in your section.

Written Exams:

There will be two midterm exams and one final exam. No calculators, books, notes, or other outside materials are allowed on any exam.

First Midterm:	Wednesday, February 21, 6:00-8:00pm
Second Midterm:	Wednesday, April 3, 6:00-8:00pm
Final Exam:	Thursday, April 25, 10:30am-12:30pm

Generally, alternate exams will only be available to students who have a serious emergency, a strongly compelling personal reason, or grave academic conflict. Grave academic conflict is defined as having two examinations scheduled so that you cannot physically attend both, or having four or more examinations scheduled on the same day. All conflicts will be verified through the undergraduate office. Known conflicts should be reported **as soon as possible**, and **no later than January 23**.

Office Hours:

All instructors, as well as the course coordinator, welcome all students enrolled in Math 217 to their office hours. You are encouraged to interact with all instructors in Math 217, not only your own section instructor. However, you should attend your own class section.

Accommodations for students with disabilities:

The University of Michigan is committed to providing equal opportunity for participation in all classes, programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Services for Students with Disabilities (SSD) Office located at G664 Haven Hall. The SSD phone number is 734-763-3000 and their website is ssd.umich.edu. Once your eligibility for an accommodation has been determined, this information will be reflected in SSD's Accommodate system. Please use Accommodate to request that this information be shared with the course coordinator and your instructor at the beginning of the term, or at least two weeks before you need the accommodation for an exam or other assignment.

Academic Integrity Policy:

There is a zero tolerance policy for any kind of cheating in Math 217.

Specifically, students should submit only their own work for all assignments, including webwork, written assignments, quizzes, gateway exams, midterms, and final exams. Students may work together on written homework assignments but must always write their own solutions in their own voice; it is a good idea to acknowledge collaboration on your work lest you get accused of plagiarism.

Likewise, students should not consult other textbooks or websites such as Chegg, Quora, Stack Exchange, etc, for “homework help.” We understand that you may read broadly or watch videos to enhance your general understanding of the material. However, any failure to cite a source (beyond the course materials) used for homework help, ideas, or approaches will violate the academic integrity policy. Absolutely **no consultation** with outside sources for any quiz or exam, including gateway exams, is allowed, except where explicitly described as allowed in a particular situation. In particular, machine assistance is not allowed on the gateway exams.

Students who cheat in any way will be severely penalized. The minimum penalty will be referral to the dean and a score of zero for the assignment, but at the instructor or course coordinator’s discretion, a zero for the entire assignment category, or a failing grade in the course, may be deemed more appropriate. For example, a student may get a score of zero on the entire homework category (worth 15% of their grade) if instructors determine that the student has used solutions from Chegg on a single homework assignment. In most cases, cheating on an exam will result a failing grade for the course. There may be even more serious consequences, such as expulsion from the University, at the discretion of the dean’s office. Of course, most students are honest and will never have to worry about any of this.

Student Responsibilities:

This course will present you with an opportunity to take control of and responsibility for your own learning. You will have numerous resources available to you, including your instructor, your classmates, the textbook, class worksheets, and homework sets, not to mention a vast array of external sources from the library or the web that you may find useful. Everybody learns differently, and in this class you will want to identify and cultivate learning strategies that work best for you.

College students are often advised to spend 2 to 3 hours outside of class for every hour of time spent in class. This rule of thumb is for the typical college class; math and science classes usually fall more towards the 3 hour end, and it is not unusual for Math 217 students to spend about 12 hours per week on the course, on average, outside of class. If you are regularly spending more than 15 hours per week outside of class, you should speak with your instructor about the work load and your studying strategies since this is more time than is intended.

People who take Math 217, like EECS 280 and a few other intense courses on campus, quickly learn that it is best to begin projects the moment they are assigned, and we *strongly recommend* that you take the same approach to your Math 217 homework. Experience shows that students who attempt a substantial portion of their written homework the weekend after it is assigned do quite well in this course, independent of their previous grades in math courses. The same is true of web homework: we recommend doing it as soon as it is open, as it provides valuable practice with computation that makes the class worksheets and homework flow more easily.