MATH2210Q – Applied Linear Algebra

Section 2 (5127) meets Tuesday/Thursday from 12:30pm – 1:45pm in Monteith 110

Section 4 (5129) meets Tuesday/Thursday from 3:30pm – 4:45pm in Monteith 419

Instructor: Ben Lantz

Email: Benjamin.Lantz@uconn.edu

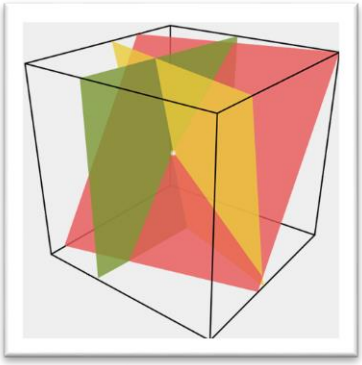
Office: Monteith 405

Office Hours

Tuesday/Thursday 9:30 am – 11:30 am

Friday 10:00 am –11:00 am

Or by Appointment (contact me via email)



Course Description

Linear Algebra is one of the most useful mathematics courses to take as an undergraduate. The applications of linear algebra stretch into many diverse fields and is used fundamentally today in many disciplines including engineering, computer science, physics, economics, and more.

Linear algebra is often an undergraduate student's first exposure to a math course that explores abstract ideas in depth. This course will act as a bridge to more abstract courses in mathematics and transition away from more computationally focused courses such as the Calculus sequence of courses.

One reason that I enjoy Linear Algebra so much is that we get to tell the same story throughout the whole semester in different ways. We will build connections and see that seemingly completely different topics are remarkably similar. We will constantly reference the first few weeks of introductory material throughout the whole semester and will build a solid foundation of linear algebra.

In this course we will cover the following broad topics: systems of equations, matrices, determinants, linear transformations on vector spaces, characteristic values and vectors from a

computational point of view. The course is an introduction to the techniques of linear algebra with elementary applications.

Syllabus TL;DR

- We have class two days a week in which we have traditional lecture mixed with a lot of group work and class work.
- Each week you have a weekly worksheet (40% of your grade) due on Gradescope on Thursdays at 11:59 pm. Part of this worksheet will be graded on completion and part of this worksheet will be graded on correctness.
- Write ups for in-class "Tasks" (10% of your grade) are due Tuesdays on Gradescope the week after the task is done in class.
- Late work is accepted for Weekly Worksheets and Task Write Ups at a 10% penalty. Below are the last days to turn in late homework:
    - Unit 1: Monday October 7th at 11:59 pm (Monday after the first Exam)
    - Unit 2: Monday November 18th at 11:59 pm (Monday after the second Exam)
    - Unit 3: Thursday December 12th at 11:59 pm (After the Final Exam)
- There will be two midterm exams (15%x2=30% of your grade) in class scheduled for Oct 3 and Nov 14 as well as a Final Exam (20% of your grade) during Finals week.
- Use the textbook, other classmates, office hours, tutoring in the Q-center, posted lecture videos, solutions to homework, extra practice problems, and myself to help guide you through the course.
- If you ever have a question or if anything arises throughout the semester, please email me at Benjamin.Lantz@uconn.edu. I am good at returning emails and can help with whatever you need.

Topics Covered

Unit 1: Systems of linear equations

Linearly independent sets

Row reduction and echelon forms

Bases and Coordinate Systems

Solution sets of linear systems

Dimension of a vector space

Linear independence

Rank

Linear Transformations

Change of Basis

The matrix of a linear transformation

Eigenvectors and eigenvalues (of linear transformations)

Matrix operations

Characteristic polynomial

Inverses and invertible matrices

Diagonalization

Determinants

Inner product, length, orthogonality

Vector spaces, subspaces

Gram–Schmidt process

Null spaces, column spaces

Expectations

We will be going over highly abstract ideas in this course that are sometimes difficult to grasp. You are expected to struggle and not immediately catch on to these abstract ideas. We will dedicate the entire semester to learning these ideas (so do not fret if it does not come immediately).

It is expected that you will work with others during class and outside of class. Please use each other as a resource when learning abstract materials. Also know that my job is to help you learn, and you should reach out to me early and often with any questions over material, the course, and with any concerns that may arise. Please know that office hours are for YOU, and you should use this resource as much as you would like. You do not need to make an appointment during normal office hours, please feel free to drop in unannounced (even if just to say hi or to ask a quick question).

You are expected to attend class each day. We will always be going over new material which will be built upon for the whole semester. You should expect to dedicate a large portion of time (4-8 hours per week) outside of class to homework and understanding material.

Prerequisites

MATH 1132Q, 1152Q or 2142Q. Recommended preparation: A grade of C- or better in MATH 1132Q. Not open for credit to students who have passed MATH 2144Q or 3210.

Textbook

"Linear Algebra and Its Applications" David Lay, Steven Lay, Judi McDonald 6th edition

We will be following the textbook throughout the semester. We will not be using MyMathLab throughout the semester however. There are other options for the e-text that are cheaper than what is offered through the Husky Book Bundle, mainly through the pearson website:

https://www.pearson.com/en-us/subject-catalog/p/linear-algebra-and-its-applications/P200000006235/9780136880929

This link should offer the e-text at $10.99/month which would amount to $44 instead of $95 at the bookstore.

Furthermore, you are welcome to find an old edition of this book and use this instead. I understand the buying/renting books can be a struggle, so please reach out if you have any questions about this process.

Academic Integrity

Cheating is prohibited in all aspects of the course. Cheating includes, but is not limited to, communication with other students during an exam, asking other students to complete your coursework, and copying or soliciting solutions from the internet. UCONN and I both take academic dishonesty very seriously; any academic dishonesty will result in severe consequences.

Please see the university policy at the end of the syllabus for more information on Academic Integrity.

Lecture Notes

I created lecture videos for Linear Algebra during the pandemic for most (unfortunately not all) of the sections that we will cover in the course. I will post these videos and lecture notes to HuskyCT in the corresponding sections. Although there will be overlaps, you should expect the lecture to be different than that of the lecture videos. It is important to attend class and participate in the discussions and class work provided. I will work to have supplemental materials for the sections in which I do not already have lecture videos.

Class work and Inquiry Oriented Learning

Each day in class, a large portion of the class will be dedicated to class work and small group work. Please come into class ready to work on open-ended questions and to work and discuss with others in the class. As we get more comfortable in this setting, the amount of lecture needed each day will decrease, and the amount of group work and exploration of topics will

increase. Although I will help guide the classroom, the direction of the discussion and topics will often be left up to the students themselves. Attendance is very important for this reason, and you will be missing out on a major component of this course if you are not present in the classroom.

Tutoring

Tutoring is available for this class in the Q-center (Quantitative Learning Center) https://qcenter.uconn.edu/. For this course, tutors may not always be present, so please check the availability of tutors who know this topic with the Q-center.

Extra Practice Problems

If you need more practice problems than the ones given in class and on the worksheets there are two other resources for practice problems. For some of the sections in class I have solutions written out for a handful of practice problems. These are available on HuskyCT. Also, there is a selection of problems from each section of the textbook covered listed on the Weekly Worksheet. None of these problems are mandatory and are here purely for your convenience.

Class Cancellation Policy

If for some reason in-person class must be cancelled (snow day, I am sick, etc.), I will send an email as soon as I am able and if given enough time, we will try to hold class via Webex.

Communication

Please communicate with me often. I am available for questions about material at any time and I am very good at responding to emails quickly. Furthermore, please use the drop-in office hours at any time. You do NOT need to make an appointment for these times.

If you need to miss class, miss an assignment, or miss an extended period of time please communicate with me. I do not need to know any personal details of what is going on in your life, but I can work with you to come up with a plan on how to overcome any obstacles that may be present.

Communication is KEY! Please reach out early and often with any questions or concerns.

Late Policy

All homework (Weekly Worksheets and Task Write Ups) will be accepted for late credit at a 10% penalty up until a time after the Exam for that unit of material. Completion of the homework is particularly important, and I want to incentivize doing the homework as much as possible. That said, falling behind with homework can be difficult to return from. Please do not rely on the late policy, but rather use it as a safety net in case anything were to happen throughout the semester. Below are the last days to turn in late homework:

Unit 1: Monday October 7th at 11:59 pm (Monday after the first Exam)

Unit 2: Monday November 18th at 11:59 pm (Monday after the second Exam)

Unit 3: Thursday December 12th at 11:59 pm (After the Final Exam)

Assessment and Grading

The course grade will be based on homework via Weekly Worksheets (40%), Task Write Ups (10%), Two Midterm Exams (2x15% = 30%), and a Final Exam (20%). Grades will be consistently maintained in the HuskyCT gradebook (you should always have a general idea of what your grade is in the course).

Weekly Worksheets (40% of total grade)

Each week there will be a weekly worksheet due on Thursday at 11:59 pm on Gradescope going over the material from the previous week. A pdf should be uploaded to Gradescope before the deadline. These worksheets should be a central focus of time spent outside of class. Part 0 of these worksheets will include a silly question each week, a list of extra practice problems from the textbook, and other miscellaneous exercises. Part 1 of these worksheets will include questions that will be graded mostly on a completion basis. Part 2 of these worksheets will be graded on correctness. The problems in Part 2 will be graded as if they were exam problems, and I will try to offer as much feedback as I can. Feedback will be given directly on Gradescope in a timely manner (before the beginning of the next week). Late worksheets will always be accepted at a 10% penalty until the Monday after the corresponding Exam (See above for Late Homework policy). Furthermore, solutions will be made available on HuskyCT for the worksheets after you have turned in the worksheet.

Task Write Ups (10% of total grade)

Throughout the semester we will be doing classwork in the form of “Tasks”. We will plan on completing these problems in class and discussing them fully, but it is important to internalize the problems on your own. The Tuesday after the task is done in class, you will be expected to write up the solution to the problem fully (on your own) to Gradescope. Late write ups will always be accepted at a 10% penalty until the Monday after the corresponding Exam (See above for Late Homework policy).

Exams (15% each for 30% of total grade)

There will be two in-class midterm exams on Thursday October 3rd (covering Chapters 1 and 2) and on Thursday November 14th (covering Chapters 3, 4, and 5). The exams will be mostly short answer with questions like those seen on the homework. On the exams you will be allowed a reference sheet (details to follow). If you are sick or need a makeup exam, you must

communicate with me BEFORE the exam. I will try to work with you to schedule a makeup exam, but this is only possible if you communicate with me.

Final Exam (20% of total grade)

During Finals Week, there will be a cumulative final exam covering material from the entire course (including Chapter 6 which will be covered after Exam 2). The date and time of this Final Exam is to be determined.

Reference Sheet on the Exams

On each of the exams in class you will be allowed a reference sheet. You can put anything you want on the reference sheet except for any example problems. You should expect to put definitions, basic facts, theorems, etc. on the reference sheet. I will go around at the beginning of the exam to check if your reference sheet follows the guidelines, and if not, it will not be allowed on the exam. On the two midterm exams, you will be allowed one side of an 8.5”x11” sheet of paper, and on the Final Exam you will be allowed both sides of an 8.5”x11” sheet of paper.

Grading Scale

Letter grades will be assigned using the following scale:

A	:	93.00% and above
A-	:	90.00% - 92.99%
B+	:	87.00% - 89.99%
B	:	83.00% - 86.99%
B-	:	80.00% - 82.99%
C+	:	77.00% - 79.99%
C	:	73.00% - 76.99%
C-	:	70.00% - 72.99%
D	:	63.00% - 69.99%
D-	:	60.00% - 62.99%
F	:	59.99% and below

Letter grade cutoffs may be lowered if deemed necessary (although this is not likely and should not be expected).

Policy on Academic, Scholarly, and Professional Integrity and Misconduct (ASPIM)

https://policy.uconn.edu/2023/07/11/academic-scholarly-and-professional-integrity-and-misconduct-aspim-policy-on/