

Math 3410 Course Outline

Sean Fitzpatrick
University of Lethbridge

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1 Introduction to Math 3410

Welcome to Math 3410, Linear Algebra. Although it doesn't take up as much space in our list of course offerings as Calculus, Linear Algebra is arguably the more useful subject, in this era of computer graphics and big data.

There are many of us in this class, coming from many different backgrounds and situations. I want my classroom to be as inclusive as possible. If the “default settings” for the class don't work for you, please don't hesitate to ask for accommodation.

We begin with some introductions: to the university, to the staff, and to the course.

1.1 Welcome to the University of Lethbridge

Oki, and welcome to the University of Lethbridge. Our University's Blackfoot name is Iniskim, meaning Sacred Buffalo Stone. The University of Lethbridge acknowledges and deeply appreciates the Siksikaitapii peoples' connection to their traditional territory. We, as people living and benefiting from Blackfoot Confederacy traditional territory, honour the traditions of people who have cared for this land since time immemorial. We recognize the diverse population of Indigenous Peoples who attend the University of Lethbridge and the contributions these Indigenous Peoples have made in shaping and strengthening the University community in the past, present, and in the future.

As usual, everything you need to know for the course will flow through our [Moodle](#)¹ learning management system. Make sure you check in regularly to keep on top of what's happening in the course.

Don't hesitate to reach out if you have questions. I'll do my best to answer all of your course-related questions as quickly as possible. If you have questions that are not related to the course, you can ask those too, and I'll try to answer, or to direct you to someone who can. Some resources can be found on the University's [Health and Safety website](#)².

1.2 Course staff and contact information

My name is [Sean Fitzpatrick](#)³. I can be reached via email at sean.fitzpatrick@uleth.ca⁴.

Student hours: you are not going to get everything you need during class time. I will be available throughout the week for consultation, either one-on-one, or in small groups. Drop-in hours will be Monday and Wednesday from 1–3 p.m., and I will have appointments available throughout the day on Thursday.

¹moodle.uleth.ca

²uleth.ca/services-for-students/health-safety

³www.cs.uleth.ca/~fitzpat

⁴<mailto:sean.fitzpatrick@uleth.ca>

1.3 Course description

Math 3410 is the continuation of the study of linear algebra you began with Math 1410. Some topics will be familiar, like vectors, matrices, and systems of equations. But Math 3410 has a much greater focus on theory and proof.

At many universities, linear algebra is offered as a first course with rigorous proof. (Many places do not have an equivalent of Math 2000.) One reason for this is that most proofs in linear algebra are straightforward (relatively speaking). Many theorems in linear algebra follow the classic “if ... then” format of a conditional statement. The corresponding proofs tend to follow a familiar script:

1. Assume the hypothesis.
2. Translate the hypothesis using the definition of some term in the hypothesis.
3. Rearrange some terms (i.e. do some algebra).
4. Recognize that you’ve met the definition of some term in the conclusion.
5. Translate to the conclusion using that definition.

We won’t focus entirely on theory and proof, however. Linear Algebra has many interesting applications, and we’ll try to fit in a few. We’ll also include computational content. In particular, we’ll spend some time learning how to use the computer to do some of our calculations for us.

2 Essential course information

This section covers essential course information, including the meeting times, textbook, and grading scheme.

2.1 Course website

The primary course website is [Moodle](#)¹. On Moodle, you can expect to find everything you need to navigate the course, including weekly topics, homework assignments, and other resources.

In case there’s a day when Moodle isn’t working properly and you need access to course materials, you can find some of them (like this syllabus) on my [personal website](#)². The textbook for this course is available on our [Open Textbook Server](#)³, along with textbooks for most other math courses.

2.2 Scheduled classes

Our class meets on Monday, Wednesday, and Friday at 10 a.m. in SA7202. Friday classes will be basic lecture-style classes, where I give an overview of the material we’ll be working on in the following week.

The Friday lectures will *not* be comprehensive. You will be responsible for filling in the gaps by reading the textbook.

Monday and Wednesday classes will be hands-on. Some classes will involve **lab assignments**; these are computer-based assignments where we’ll learn some computational tools. A few classes will be used for tests. The rest will involve working in groups at a whiteboard to solve problems.

Lab assignments will involve a bit of light coding in Python, in a Jupyter notebook environment. Jupyter notebooks will be hosted on the University of Lethbridge [Syzygy](#)⁴ server. You’ll need a computer, but will not need to instal any software.

¹moodle.uleth.ca

²www.cs.uleth.ca/~fitzpat/teaching.html

³opentext.uleth.ca

⁴uleth.syzygy.ca

For most students, the biggest challenge in Math 3410 is learning to write proofs. The only way to learn to write proofs is by trying to write proofs, so we will try to spend a lot of class time on working together to write proofs, and comparing our results.

2.3 Course textbook

The official course textbook is *Linear Algebra: a second course, featuring proofs and Python*, by Sean Fitzpatrick (yes, me!) This book started as a collection of computational examples, then grew to include lecture notes, and eventually turned into a complete book.

Links to this book (and several other useful resources) can be found on the [linear algebra section of the open textbook server](#)⁵.

However, this year we will be trying out a new way to access the book, using a service called [Runestone](#)⁶. You will log into the textbook via Moodle, and the Runestone software will track your progress through the book. In particular, I will assign homework directly in the textbook, via Runestone.

If for some reason you are unable to access the book through Runestone, please see me and we will try to come up with alternate arrangements for the homework.

2.4 Grading

Your overall grade will be calculated from the following components, using the indicated weights.

Homework (25%)	Homework will be assigned via Runestone ⁷ , using links from Moodle. Homework assignments will include both assigned reading and exercises.
Labs (25%)	These will be done in class, in groups. Completed labs will be submitted on Crowdmark. Group submission is expected, but individual submissions will be accepted if a student misses class due to illness.
Assignments (10%)	There will be two assignments, consisting mostly of written work, although in some cases there may be some computational content as well. You are encouraged, but not required, to do these in groups. Assignments will be graded on the validity of your proofs, as well as the quality of your presentation. Assignments will come in three pairs: you will have three choices for Assignment 1, and this will also determine what you do for Assignment 2. Details about these assignments will be provided on Moodle.
Tests (20%)	There will be three tests in total. Each test will be written in class, on the following dates: <ul style="list-style-type: none">• Test 1, on Chapter 1: January 24th.• Test 2, which will cover Chapter 2: February 7th.• Test 3, which will cover Chapter 3, and part of Chapter 4: March 13th. The tests will be reflective of the problems worked on during class time.
Final exam (20%)	The final exam will take place during the exam period. Approximately 50% of the final exam will be on material covered after Test 3. The other 50% will be on earlier material.

⁵opentext.uleth.ca/linalg.html

⁶runestone.uleth.ca

⁷runestone.uleth.ca

Each of the grade components above will be assigned a numerical score. These will be added to get a score out of 100. Your score out of 100 is converted into a letter grade according to the following table.

Table 2.1 Conversion of percentage scores to letter grades in Math 3410

A+	A	A-	B+	B	B-
96-100	91-95	87-90	83-86	78-82	74-77
C+	C	C-	D+	D	F
70-73	65-69	61-64	57-60	50-56	0-49

2.5 Other grading policies

A note on due dates Most due dates are flexible, and provided primarily for your benefit, to help with planning. (A course without deadlines can be a disaster for those who procrastinate.) One exception is the workshop activity before each test. Because we can't begin the peer review portion of the workshop until the submission deadline passes, we have to have a deadline for the activity to proceed.

A due date extension request form will be available via Moodle. If you need more time to complete an assessment, simply fill out the form. Unless you are contacted to say otherwise, you can assume that your request has been granted.

Revisions For tests, labs, and assignments, you will be invited to submit revisions for any incorrect work. Revisions must be submitted within *one week* of receiving your feedback.

There will be resubmission forms available on Moodle. You may either:

1. Submit a revision for *one* problem, in which case your revised grade will replace the original score, or
2. Submit revisions for all problems, in which case each correct revision will earn you back 50% of the points originally lost.

Note that you will not be able to submit revisions for the fourth test, since we will not be able to have feedback returned to you before the end of the semester, and we cannot ask for term work to be submitted during the exam period.

You may not use revisions to submit work for a question you initially skipped. For a revision to be accepted, you must first attempt the problem. You are also not allowed to submit revisions to make up for a grade of zero assigned due to academic misconduct.

Dropping lowest grades I will drop your lowest grade in each grade category. Missing grades will be counted as zero, so (for example) if you miss a test, the grade for your missed test will be dropped.

3 Course policies (an FAQ)

This section deals with questions about accommodations, missed tests, and other exceptional (yet common) cases.

1. *This week is super busy and I don't think I can finish the homework on time. Can I have an extension?*

Yes. There's a form for that, provided on Moodle. I don't need to know why you need the extension; just what you want extended, when you want it extended to, and whether you need anything from me to help complete the work.

2. *What happens if I get sick?*

I'll do my best to be accommodating of any illness that interrupts your studies. There is no need to provide details of the illness. If you miss a week or more of work, please get in touch to make a plan for catching up. One of the biggest challenges in math is that once you fall behind, it's difficult to catch up on your own.

If you're staying home to avoid spreading illness to others (thank you!), but well enough to attend class, I'll try to provide you with a video link via Teams or Zoom.

3. *What exactly does academic honesty mean?*

In short, that any work you represent as your own, is your own. Much of your work can be done in groups, but not all of it. I will assume that you have access to a calculator, including online tools Symbolab, or Wolfram Alpha, or our Jupyter notebooks.

Use of these tools is acceptable, but take care that you are not overly reliant on them. What is not acceptable is having someone else do your work for you. This includes tutors, classmates, friends, family members, and online "homework help" sites. If you submit work that somebody else did for you, you are committing an academic offence. ***This includes getting AI to write your assignments.***

Penalties for academic dishonesty are outlined in the [Academic Calendar](#)¹. Depending on the severity of the offence, penalties for a first offence can range from a grade of zero on an assessment, to an F in the courses. Academic offences are also reported to the Dean of Arts & Sciences. They keep a record of each offence, and students with multiple offences can be subject to supplementary discipline.

4. *Does that mean I'm not allowed to get help with my homework?*

Not at all! But keep in mind that your course instructors will be available for help, free of charge. (OK, maybe not free of charge, but you've already paid for it with your tuition.) We will be responding on the discussion forum regularly, There will be time to ask questions in every class, and there will be online office hours. The Student Success Centre will also be running free help sessions (details TBA).

Some of you may still decide to pay for tutoring, and that's fine. But you have a duty to disclose sources of help on an assignment, and the individual tests are still tests, even if you won't have someone watching over your shoulder.

You should probably avoid the various paid "homework help" websites. Most of these don't offer help. They offer worked solutions for a price. Getting those solutions won't help with your understanding. More importantly, the people working for these sites are paid (poorly) per solution, and they often provide incorrect and/or badly written work. (We saw plenty of examples of this last Spring, and yes, all those students now have discipline reports on file.)

5. *What do I do if I can't write a test during the scheduled time?*

If you know in advance that you will not be able to write during the test window, let me know, and I'll arrange for an alternate time. If you miss a test due to illness, your test score will be replaced by your exam grade, or the average of your other three tests, whichever is higher.

6. *What if I miss the final exam?*

¹uleth.ca/policy/resources/student-discipline-policy-academic-offences-undergraduate-students

If you are unable to write the final exam, you will need to contact Academic Advising. They are responsible for authorizing rescheduling of exams. Usually if you miss an exam due to illness, an incomplete grade is recorded. You will write a makeup exam at a later date, at which point your grade will be updated.

7. *Do I need a doctor's note?*

No. This wastes health care resources and your time. Just email me to say you were sick, and spare me the details. However, if you miss more than one test due to illness, we'll need to meet to discuss how to adjust your grade.

8. *I receive learning accommodations. What arrangements can I make?*

First, make sure that you have registered with the University's [Accessible Learning Centre](#)². No need to let me know: they notify me of every student with accommodations.

If there are any adjustments I can make to facilitate your learning, please do not hesitate to get in touch with me. All students deserve an equal opportunity to learn. Note that the HTML textbook is designed with accessibility in mind, and should work with screen readers.

9. *Life intervened and I can't keep up this week. What do I do?*

Send me an email. Extensions are usually granted as long as they're granted ahead of time. Online homework extensions need to be in place before solutions become available. Book an appointment with me as soon as you feel like you're falling behind and I'll do my best to get you up to speed.

4 Course schedule

We will follow the schedule below as closely as possible. Friday classes will consist of lecture overview of content for the following week.

If nothing is indicated for a certain class, assume that we will be working together on problems from the sections covered on the previous Friday.

Table 4.1 Schedule for Spring 2024

Monday	Wednesday	Friday
	Jan. 3: Syllabus, overview.	Jan. 5: Sections 1.1 - 1.3
Jan. 8	Jan. 10	Jan 12: Sections 1.4 - 1.6
Jan. 15: Lab 1	Jan. 17	Jan. 19: Sections 1.7 - 1.8
Jan. 22	Jan. 24: Test 1	Jan. 26: Sections 2.1 - 2.2
Jan. 29: Lab 2	Jan. 31	Feb. 2: Section 2.3
Feb. 5	Feb. 7: Test 2	Feb. 9: Sections 3.1 - 3.2
Feb. 12	Feb. 14	Feb. 16: Section 3.3
Feb. 26: Lab 3	Feb. 28	Mar. 1: Sections 4.1 - 4.2
Mar. 4: Asst. 1 due	Mar. 6	Mar. 8: Section 4.4
Mar. 11: Lab 4	Mar. 13: Test 3	Mar. 15: Sections 5.1 - 5.2
Mar. 18	Mar. 20	Mar. 22: Section 5.3
Mar. 25	Mar. 27	Mar. 29: no class (Good Friday)
Apr. 1: no class (Easter Monday)	Apr. 3: 5.5 and 5.6, or 4.3 and 4.6.	Apr. 5: Lab 5
Apr. 8: Asst. 2 due, no class		

²ulethbridge.ca/accessible-learning-centre