Course Syllabus: Math 1410B
Elementary Linear Algebra
Department of Mathematics and Computer Science
University of Lethbridge, Spring 2015

Course instructor: Sean Fitzpatrick **Email address:** sean.fitzpatrick@uleth.ca
Office: UHall C530 **Course website:** via moodle.uleth.ca
Office hours: MWF 11:30 am - 12:30 pm, TR 1:00 - 2:00 pm, or by appointment.
Lectures: TR 10:50 am -12:05 pm in UHall B650
Tutorial: Tuesday in C620. (Time depends on tutorial section.)
Tutorial instructor: Allysa Lumley

Course Description

This is a first course in linear algebra. The focus of the course is primarily computational rather than theoretical: although you will be expected to develop a conceptual understanding of the material, you will not be responsible proofs of theorems. Topics covered include systems of linear equations, matrices, determinants, vectors in $\mathbb{R}^n$, complex numbers, and eigenvalues and eigenvectors.

Course Objectives

Students in this course will be expected to develop a working knowledge of the basic algebraic techniques of linear algebra, including elementary row operations, matrix algebra, and manipulation of determinants. Although many aspects of this course are algorithmic in nature and can be performed without any deep conceptual understanding, students should also become comfortable with basic concepts such as the algebraic and geometric structure of $\mathbb{R}^n$, and be able to apply techniques of linear algebra to solve practical problems.

Required Textbook:

A First Course in Linear Algebra, by Ken Kuttler. This is an "open-source" textbook, provided by Lyryx. A PDF version will be available to download for free, and you can also request a printed copy from the University of Lethbridge bookstore, or print it out yourself. The textbook comes packed with an online learning system which we will be using for weekly assignments. Details will be available on our course Moodle page.

Evaluation

Your grade will be determined according to the following table (see below for explanations of each component):

Component	Quizzes	Written Assignments	Online Assignments	Term Tests	Final
Weight	10	15	10	25	40

Quizzes:

Quizzes will take place **in tutorial**. Each quiz will be short (about 10 minutes) and graded on a pass/fail basis. To get a passing grade on a quiz you must (a) actually be present for the quiz, and (b) make significant progress towards a solution. In other words, you won't be penalized for small mistakes, but you won't get credit for something completely wrong (or for doing nothing). There will be 11 quizzes in total, and you will need to complete 10 of them for full credit.

Written Assignments:

There will be five written assignments, in which you will be asked to submit solutions to several problems. You are allowed to work with others on the assignments, and to ask for help from the instructors or the Math Help Centre. Note however that while it is acceptable to discuss the problems, it is **not** acceptable to borrow someone else's completed written solution. Copying is considered plagiarism and is serious academic misconduct with serious consequences.

Online Assignments:

There is an online homework component provided by Lyryx. I will be providing instructions on Moodle for how to register for the Lyryx system and access the assignments. New assignments will appear on Sundays, and must be completed by 9 pm the following Saturday. Your grade will be based on the best 10 out of 12 assignments.

Participation:

Class participation is encouraged, but not required. We will have a class discussion forum at piazza.com available through Moodle for online participation. Piazza is a Q & A forum that supports mathematical notation and allows you to post anonymously, in case you're worried about posting a bad question or wrong answer.

Midterm:

There will two term tests written in class on **Thursday, Feburary 12th**, and **Thursday, March 19th**.

Letter grade conversions:

The percentage grades earned in this class will be converted to letter grades according to the following table:

Letter grade:	A$^+$	A	A$^-$	B$^+$	B	B$^-$	C$^+$	C	C$^-$	D$^+$	D	F
Minimum % required:	95	85	80	77	73	70	67	63	60	55	50	0

Course policies

Communication:

Communication between students and myself can take place in several ways:

- Announcements on Moodle. Any updates and reminders will be posted on Moodle. These announcements will be sent to your uleth.ca email address by default, so be sure to monitor that account. It is also highly recommended that you log into Moodle on a regular basis to keep up to date on the course.

- In person, during office hours. (Recommended, especially if you are having trouble with a concept.)

- Online discussion forum, via Piazza.com. (This can also be used to earn participation credit; see below for details.)

- Email. You are welcome to email me with questions about the course, and I will do my best to answer as soon as I can. I do, however, have a few email etiquette rules:

  - Include the course number in your subject heading, and your full name in the message text. Since I teach several classes at once, this will help to ensure a prompt reply. (For example, if your email consists only of "Yo prof, when's the test?" I won't be able to give you an answer since my courses have tests at different times.)
  - Questions about how to solve a particular homework problem should be directed to the discussion forum rather than email: the discussion forum can properly display math symbols, and it's usually the case that several students will have the same question.
  - Questions that can be answered by reading this syllabus (e.g. "When's the test?") will usually not be answered in a timely fashion, and the replies will generally be grumpy/sarcastic in nature.

Calculators:

For term tests and the final exam, you will be allowed to use a simple **five function** calculator. (That is, you can use a calculator that is limited to addition, subtraction, multiplication, division, and percentages.)

Homework:

The easiest way to master the material in Math 1410 is to do as many exercises as you can. In addition to the assignments, you will find many exercises in the course textbook. Working in groups is highly recommended, and if there are problems that you don't understand, you should see me or Allysa sooner rather than later. Doing a little bit of work on a regular basis is easier and more effective than trying to cram before the exams. (The online homework and quizzes are designed to keep you on pace.) You are also encouraged to use the online forum to ask questions.

Lecture:

I will use Moodle to keep you informed regarding which sections of the textbook are being covered each week. Please do the required readings in advance of each lecture. This way, we can spend more time on examples and your questions about the material, rather than just delivery of information.

Tutorials:

All students are expected to attend tutorials. (Attendance is necessary in order to earn your quiz grade.) You will be provided with a worksheet containing several problems in advance of each tutorial. To get the most out of each tutorial, please attempt these problems on your own before your tutorial. You will have time to discuss the solutions with each other, and some of the problems will be solved for you on the board. Most tutorials will conclude with a quiz.

Special arrangements:

If you are a student who has registered for accommodations with the Accommodated Learning Centre, please ensure that I am informed of the necessary arrangements as soon as possible, and please feel free to meet with me if there are any adjustments I can make to improve your learning experience.

Academic honesty:

Students are expected to be familiar with, and abide by, the rules laid out in the Academic Calendar regarding academic honesty, cheating, etc. and the penalties assessed for disregarding those rules.

Tentative course schedule

The schedule below is a rough guideline. Any changes will be detailed on Moodle.

Date	Topic	Assigned Reading
January 8$^{\text{th}}$	Introduction	§1.1
January 13$^{\text{th}}$	Elementary operations	§1.2.1
January 15$^{\text{th}}$	Gaussian elimination	§1.2.2
January 20$^{\text{th}}$	Homogeneous systems	§1.2.4
January 22$^{\text{nd}}$	Matrix arithmetic	§2.1.1-2.1.3
January 27$^{\text{th}}$	Matrix multiplication	§2.1.4, 2.1.5
January 29$^{\text{th}}$	Transpose and inverse	§2.1.6 - 2.1.8
February 3$^{\text{rd}}$	Computing inverses	§2.1.8, 2.1.9
February 5$^{\text{th}}$	Elementary matrices	§2.1.9, 2.1.10
February 10$^{\text{th}}$	Determinants	§3.1.1, 3.1.2
February 12$^{\text{th}}$	Term Test 1	§Covers Ch. 1 and 2
February 17$^{\text{th}}$ - 21$^{\text{st}}$: Reading week – no classes		
February 24$^{\text{th}}$	Properties of determinants	§3.1.3, 3.1.4
February 26$^{\text{th}}$	Applications of determinants	§3.2.1, 3.2.2
March 3$^{\text{rd}}$	Algebra of vectors in $\mathbb{R}^n$	§4.1, 4.2
March 5$^{\text{th}}$	Geometry of vectors in $\mathbb{R}^n$	§4.3-4.5
March 10$^{\text{th}}$	Parametric lines	§4.5, 4.6
March 12$^{\text{th}}$	Dot product and planes	§4.7, 4.8
March 17$^{\text{th}}$	Cross products, subspaces	§4.9, 4.10
March 19$^{\text{th}}$	Term Test 2	Covers Ch.3 and §4.1-4.8
March 24$^{\text{th}}$	Orthonormal bases	§4.10
March 26$^{\text{th}}$	Complex numbers	§5.1, 5.2
March 31$^{\text{st}}$	Calculations with complex numbers	§5.3, 5.4
April 2$^{\text{nd}}$	Eigenvalues and eigenvectors	§6.1.1
April 7$^{\text{th}}$	Computing eigenvalues and eigenvectors	§6.1.2, 6.1.3
April 9$^{\text{th}}$	Diagonalization	§6.2
April 13$^{\text{th}}$	Applications of spectral theory	§6.3
April 16$^{\text{th}}$	Review	