# MATH 1160: Linear Algebra
## Winter 2023
Last Modified: January 9, 2023

**Lectures**: 5:30 PM- 6:50 PM Monday/Wednesday (ROZH 104),

*Note:* Due to illness, inclement weather, or other unforeseen circumstances. It may be necessary to have some lectures delivered remotely. If this is required, the it will be through ZOOM with ID **956 2796 5689** and passcode **1160**. You must be an authenticated user through your UOGUELPH account in order to access. Remote lectures will be recorded and posted to eclass.

**Instructor:** Safia Athar
**Office:** MACN 542
**Email:** sathar@uoguelph.ca
For privacy and security purposes, please only email me using your uoguelph email address. Emails from other addresses will not receive a reply. I will only respond to emails during business hours 9-5 Monday-Friday. I will try to respond to email within a few hours of receiving it.

**Office Hours:**
Wednesdays: 4-5 PM

**Prerequisite**: 4U Calculus and Vectors or 4U Advanced Functions
**Restrictions**: ENGG*1500, MATH*2150, MATH*2160
*Course Notes:*

- Workbook for this course: Students must buy the 'fillable'lecture notes for this course at the University Bookstore (cost about $25). (No textbook required).
- Math Preparedness Booklet :you should work through this booklet during the first week of class. It is found under the Contents section in Courselink.
- In-class Discoveries: these are investigations that we do together in class, and can be found under the Contents section in Courselink.

**Webpage: https://courselink.uoguelph.ca/d2l/home/796932**

**Calendar Outline:** On course Link
**What you will need during lectures**

- The fillable lecture notes (aka Workbook) that you bought at the University Bookstore.
- Discoveries (see Contents section of Courselink).
- Blank paper, pens/pencils.
- Simple Scientific calculator, NO TI-84 series.

**Class schedule**: Found in the Contents section of Courselink.

**Content Description:** This course provides an introduction to linear algebra in Euclidean space. Topics covered include: N-dimensional vectors, dot product, matrices and matrix operations, systems of linear equations and Gaussian elimination, linear independence, subspace, basis and dimension, matrix inverse, matrix rank and determinant, eigenvalues, eigenvectors and diagonalization, orthogonalization and projections, linear transformations. Some fundamental proofs and applications of these topics will be included. You are responsible for all material in classes that you miss.

**Learning Outcomes:**

- Have a basic understanding of the algebra of matrices
- Understand how linear algebra is needed to work with systems of linear equations
- Be familiar with some applications of linear algebra
- Have a basic understanding of some theoretical linear algebra concepts, including proof.
- Have gained some experience in using computer software (MATLAB) to manipulate matrices

**Home work:** Both the homework problems and solutions are found in the Contents section of Courselink and will (along with class examples) be the basis for the tests and final exam questions. For every examination question type there will be a similar question in the homework questions! For this reason it is very important that you do the homework and follow up with your TA if you have problems.

**Course Evaluation:** Course evaluation for winter semester is as follows:

| | |
|---|---|
| 3 Assignments | 30% |
| Class Participation | 5% |
| Midterm | 30% |
| Final | 35% |

**Important Note:** The instructor reserves the right to modify the course evaluation due to other unforeseen circumstances such as class shutdowns due to COVID-19 outbreaks. If the course outline needs to change, an updated version will be posted to eclass and an announcement made about the change.

Course participation is given to those students who attend classes and complete assigned work. Students may be de-enrolled from the course without prior warning if they lack the necessary prerequisites or if they fail to complete sufficient course work before the final exam.

**Midterm & Final Exam: All exams are closed book and calculators are permitted.** Midterm will be on March 1st during class. Further details will be posted on Course link later. All tests will be shredded 24 hours after the final exam in the course is completed.

If a student misses a Midterm, they shall email (using their UOGUELPH email address) their instructor within 48 hours of the day of the test with a clear and detailed explanation as to why

the test was missed. Emails received after the 48 hour window or from non-UOG email addresses will not be considered, and a grade of zero will be entered for the test.

**Assignments:** There will be **3** homework assignments. Deadlines are enforced. Assignments are to be done independently. The tentative assignment schedule is as follows:

| Assignment | Released | Due |
|---|---|---|
| 1 | Jan 16 | Feb 6 |
| 2 | Feb 13 | March 8 |
| 3 | March 20 | April 5 |

**Teaching Assistants and Office hours** TAs provide either face-to-face office hours, or, virtual (online) office hours using Microsoft Teams or Zoom. When available, a list of TAs along with their schedule will be provided below.

Please only attend the office hours that correspond to your last name: details – TBA

If you need to see me (**Safia Athar!**) please email me to make an appointment. This should be for when you need to discuss any concerns you have about the course or your performance, or you feel that a meeting with a **TA** did not resolve your math issues. **IF YOU NEED MATH HELP, PLEASE ALWAYS SEE THE TA WHO YOU ARE ALLOCATED TO FIRST (NOT YOUR PROF!)**.

**The Math & Stats Learning Center:**

The Mathematics & Statistics Department operates a drop-in learning center where you'll find a team of tutors that can help you understand and solve problems in Math 1160. The learning center is located on the third floor of the McLaughlin Library in the Science Commons. The hours of operation are as follows:

| Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|
| 9:30-15:30 | 10:00-16:00 | 9:30-15:30 | 10:00-16:00 | 9:30-14:30 |

See https://mathstat.uoguelph.ca/tutoring

**Texts recommended for background reading:** There are MANY books you can consult for background reading. For example:

- Bernard Kolman & David R. Hill: *Elementary Linear Algebra with Applications,* Pearson/Prentice Hall, 9th Edition, ISBN-13: 978-0-13-229654-0.
- Also, see the links in the Workbook to four open-access textbooks in Linear Algebra.

**Email Etiquette:** Although we try to respond to all email messages, please don't ask for class notes; tell us that you are going to miss a lecture; or generally ask us a question that you can find out for yourself. Keep your messages to the point, polite, and clearly state your question, with name, student ID, and course details.

**Email Communication:** As per university regulations, all students are required to check their **uoguelph.ca** e-mail account regularly: e-mail is the official route of communication between the University and its students.

**Academic consideration:**

- There will be NO MAKE-UP TESTS. If you miss a test due to serious illness of yourself or a death in your immediate family, or due to personal grounds, please contact us by email ASAP explaining the reason for missing the test. You do NOT need to get a doctor's note. If consideration is granted we will readjust the weight of assessed material.

  **HOWEVER, ONCE YOU HAVE TAKEN AN EXAM NO ACCOMMODATIONS CAN BE GRANTED** (it is general University of Guelph procedure to NOT grant accommodations retrospectively). For further details concerning Academic Consideration see

  https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-consideration-appeals-petitions/

- **UNDER NO CIRCUMSTANCES WILL ANY EXAM BE RE-SCHEDULED AT A DIFFERENT TIME AND/OR DATE.**

- If you miss the final due to catastrophic events such as serious illness of yourself or death of your immediate family, you will receive an "Incomplete" grade, then (depending on circumstance determined by an independent committee) you may be allowed to take a deferred exam to receive a letter grade. If you miss the final you should (a) inform me by email, and (b) contact your program counsellor for advice.

**Illness:** Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).
**Procedure used to re-adjust the weight of assessed material:** If consideration is given for missing a test the percentage of missed material is moved to the final. Please **DO NOT ASK FOR ALTERNATE ARRANGEMENTS AS FOR REASONS OF FAIRNESS TO OTHER STUDENTS IT WILL NOT BE GRANTED**.

**Regulations regarding seeing your final exam:** If you wish to see your final exam you must submit your written request to the chair of the department by the 5th class day of the new semester, see

https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/examinations/

If you are granted permission to see your final exam you will be provided with: (a) your electronic answers, (b) a copy of the exam paper, and (c) written solutions.

**Regulations regarding a grade-reassessment:** If you believe that an error has been made in the determination of your final grade then you must write to the chair of the department (by the 10th class day of the new semester) requesting a grade re-assessment. This can lead to the grade staying the same, a grade increase, or a grade decrease. Please note that this should not be used as a means of 'trying to get a few extra marks', but for situations where you have grounds for believing that mistakes have been made in the determination of your final grade. Remember also that your final exam is multiple choice and graded by a computer. For further information see

https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/grade-reassessment/

**Academic Accommodation of Religious Obligations :** If you are unable to complete a course requirement due to religious obligations, please let the instructor know within the first two weeks of class. See the academic calendar for more information:
https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-accommodation-religious-obligations/

**Academic Misconduct:** The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offenses from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offense should consult with a faculty member or faculty adviser. The Academic Misconduct Policy is detailed in the Undergraduate Calendar: The Academic Misconduct Policy is outlined in the Undergraduate Calendar.

**Web-sites that facilitate cheating:** The use of web-sites like Chegg.com and Coursehero.com to get help on online tests is cheating and academic misconduct. All tests have non-removable copyright statements on them and we are actively working with these sites to identify students who upload tests to them. You have been warned!

**Accessibility:** The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student. When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway. Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time. More information https://wellness.uoguelph.ca/accessibility.

**Drop date:** Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars. Undergraduate Calendar - Dropping Courses
https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/dropping-courses/
Graduate Calendar - Registration Changes

https://calendar.uoguelph.ca/graduate-calendar/general-regulations/registration/registration-changes/

Associate Diploma Calendar - Dropping Courses https://calendar.uoguelph.ca/associate-diploma/associate-diploma-regulations-procedures/dropping-courses/

**Course Evaluation Information :** Please see https://mathstat.uoguelph.ca/sites/uoguelph.ca.mathstat/files/public/Teachevaluationform1.pdf.

**Recording of Materials:** Presentations which are made in relation to course work – including lectures – cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

**Resources:** The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

**Mental Health Services:** One in five students in Canada experiences some sort of mental health issue at some point in their academic career. If you find yourself facing a mental health crisis, or just need to talk to someone, please consider taking advantage of one of the following resources available to University of Guelph students:

- **Counselling Services (x53244)** is located at Health Services (J.T. Powell Building) and offers individual and group counselling sessions by appointment or walk-in.
- **Student Support Network** is located in JT Powell Building, 1st floor room 1149 (offers confidential, peer-based, drop-in support).
- **Good2Talk (1-866-925-5454)** is a free, 24/7 student hotline that provides professional counselling and referrals for mental health, addictions, and well-being.
- **Here 24/7 (1-844-437-3247)** specializes in assessment, referral and appointment booking and is available 24/7 for crisis support.

  You are not alone and you will not be judged for asking for help.

**MATLAB:** The Workbook provides a gentle introduction to using computer software (MATLAB) to manipulate matrices. To use MATLAB there are a few options:

- MATLAB is available on the machines in the data resource center of the Library (1st Floor).
- There are machines for individual use (providing a class isn't running) in the New Science block (SCIE 1303, 1305).
- Use your own account at your own department if your department has the MATLAB license.
- Buy a Student Version of MATLAB.
- (Best Option): Install Octave, which is free software and emulates MATLAB. Octave is compatible with Linux, MacOS and Windows. Caution: Most likely you can do all the (numerical) homework exercises, but we have not tested all the exercises yet. To download Octave go to https://www.gnu.org/software/octave/download.html

**MATLAB Tutorials:** For a particularly simple introduction we recommend you work through the 1st tutorial linked from the Contents section of Courselink. There is also a more comprehensive tutorial at the same location. For additional details, the official MATLAB manual is available from http://www.mathworks.com/access/helpdesk/help/helpdesk.shtml.

There are also numerous online MATLAB tutorials.

**Disclaimer:** Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via Courselink and/or class email.

**COVID-19 Safety Protocols:** For information on current safety protocols, follow these links:

- https://news.uoguelph.ca/covid-19/safety-practices/
- https://news.uoguelph.ca/covid-19/spaces-events-services/-ClassroomSpaces

Please note, that these guidelines may be updated as required in response to evolving University, Public Health or government directives.