

MATH 115 – Fall 2021

Linear Algebra for Engineering

Instructor Information

Lecture Section	Corresponding Tutorial Section	Instructor	Email
LEC 001	One of TUT 101,102,103	Matthew Harris	m33harri@uwaterloo.ca
LEC 011	TUT 131		
LEC 002	One of TUT 104,105,106	Ghazal Geshnizjani	ggeshniz@uwaterloo.ca
LEC 012	TUT 132		
LEC 003	One of TUT 107,108,109	Ghazal Geshnizjani	ggeshniz@uwaterloo.ca
LEC 013	TUT 133		
LEC 004	One of TUT 110,111,112	Matthew Harris	m33harri@uwaterloo.ca
LEC 014	TUT 134		
LEC 005	One of TUT 113,114,115	Matthew Harris	m33harri@uwaterloo.ca
LEC 015	TUT 135		
LEC 006	One of TUT 116,117,118	Ryan Trelford	r2trelfo@uwaterloo.ca
LEC 016	TUT 136		
LEC 007	One of TUT 119,120,121	Ryan Trelford	r2trelfo@uwaterloo.ca
LEC 017	TUT 137		
LEC 008	One of TUT 122,123,124	Ryan Trelford	r2trelfo@uwaterloo.ca
LEC 018	TUT 138		
LEC 009	One of TUT 125,126,127	Adina Goldberg	adina.goldberg@uwaterloo.ca
LEC 019	TUT 139		
LEC 010	One of TUT 128,129,130	Kwan Tsaan Lai	ktlai@uwaterloo.ca
LEC 020	TUT 140		

All lectures are delivered asynchronously. Tutorials 101–130 are delivered in person. Lecture sections and tutorial sections in red refer to sections that are entirely online for students who cannot be on campus during the fall semester. Please visit [here](#) for a complete schedule.

Course Description: This is a course on linear algebra and its applications to engineering. Topics to be covered include complex numbers; vectors, lines and planes; systems of linear equations; matrices, linear transformations and determinants; introduction to vector spaces; eigenvalues, eigenvectors and diagonalization; and additional topics as time permits. We approach the material through a blend of theoretical ideas, computational methods and some applications.

Intended Learning Outcomes:

- Solve problems using complex numbers and describe how they differ from real numbers
- Solve geometrical problems using vectors, lines, and planes
- Explain the concepts of linear independence, spanning, subspaces, and bases
- Solve systems of linear equations using matrices and inverse matrices
- Recognize the link between matrices and linear mappings, and work with certain linear mappings including projections, reflections, and rotations
- Compute determinants, understand their algebraic properties and use them to compute areas and volumes
- Locate the eigenvalues and eigenvectors of a matrix and diagonalize a matrix
- Understand the basic concepts of abstract vector spaces

Textbook: The required text is *An Introduction to Linear Algebra for Science and Engineering (Third Edition)* by Daniel Norman and Dan Wolczuk. The textbook is available at the [W Store](#) in one of two formats (paperback, digital copy). A looseleaf copy is also available [here](#). Practice problems will be assigned from the textbook and it will act as another source for the presentation of the course material.

Website: Announcements, course materials and other important information will be available on [LEARN](#). Students are expected to visit this website at least once per day.

Piazza: We will be using Piazza to answer questions about the course material. Students will receive an email containing a link to activate your Piazza account near the beginning of the term and once logged in, students can post questions anonymously, and also answer other students' questions. The course instructors will monitor the website and also answer questions. The use of Piazza is not mandatory, but is recommended over email for math related questions.

Lectures: The lectures will be delivered asynchronously. On Monday of each week, four lectures will be uploaded to the appropriate Weekly Course Materials folder on LEARN as a pdf file with accompanying mp4 files (videos with further explanation based on the lecture notes). Students are expected to work through these lectures in their own time. See the *Lecture Schedule* in the Course Information folder for a week-by-week breakdown of the lectures and topics covered.

Tutorials: Tutorials 101–130 will be taught in-person and students will attend only the tutorial they are enrolled in. During these tutorials, the instructors will solve problems related to the week’s homework assignments. Since Tutorials 131–140 are online, a video will be posted in the corresponding Assignment folder on LEARN during the week where the tutorial problems are solved. Nothing done in the tutorials will be for marks, but students are encouraged to attend in order to see problems solved in person and ask questions about anything course-related that they don’t understand. Tutorials will begin on Monday, September 13.

Office Hours: Office Hours will be held online using Microsoft Teams. Once the term begins, students will gain access to “MATH 115 - Fall 2021 - Office Hours” on Microsoft Teams. Whenever an office hour is being held, students may join that office hour. Note that any student can attend any office hour and not just the office hours of their instructor. A schedule of the available office hours will be posted in the Course Documents folder on LEARN as well as on Microsoft Teams. Office hours will begin on Monday, September 13.

Grading Scheme: Your final grade in MATH 115 will be computed as follows:

Written Assignments – 20%	Möbius Assignments – 10%	Midterm – 30%	Final Exam – 40%
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You must obtain at least 35 of the possible 70 marks from the midterm and final to pass MATH 115. If not, then your final score in the course will be computed as $x/70$ where x is the total marks you received from the midterm and final exam.

Written Assignments: There will be approximately 10 evenly weighted written assignments due every Wednesday by 8:30am (EDT), except during Reading Week and the week of the midterm. These assessments will require students write out their solutions on paper and upload them to the Crowdmark website for grading. The first assignment, called Assignment 0, is due for marks on Wednesday, September 15 by 8:30am (EDT). At the end of the term, we will drop your two lowest written assignment marks when computing your written assignment average. Written assignments will be posted on LEARN on the Monday of the week before that assignment is due. Please see the Written Assignment Instructions posted in the Assignments Folder on LEARN for more details.

Möbius Assignments: There will be approximately 9 evenly weighted Möbius assignments due every Wednesday by 8:30am (EDT) alongside the written assignments. These assignments will require students to follow a link on LEARN and answer questions by typing in the solutions. Students will have three attempts at each Möbius assignment with their best attempt counting as their mark for that assignment. At the end of the term, we will drop your two lowest Möbius assignment marks when computing your Möbius assignment average. Möbius assignments will coincide with written assignments 1-9, and will also be posted on LEARN on the Monday of the week before that assignment is due. Please see the Möbius Assignment Instructions posted on LEARN for more details.

Midterm Exam: The midterm is scheduled for Monday, October 25 from 7:00pm to 9:00pm (EDT) and will be written remotely. More information regarding the format and coverage of the midterm will be given later in the course.

Final Exam: A final examination will be scheduled by the Registrar’s Office during the examination period from Thursday, December 9 to Thursday, December 23, 2021. Students are expected to be available during the final exam period. Students unable to write an exam due to preexisting travel plans will not be accommodated.

Missed Assessments: If you become seriously ill and are forced to miss an exam or an assignment, you must immediately contact the [First Year Engineering Office](#) and tell them about your condition. You must also promptly provide a medical certificate. If you are experiencing flu-like symptoms and will be absent for 14 days or less, then you can [self-declare](#) your illness without documentation, but you should still contact the First Year Engineering Office to alert them of your situation.

- If an assignment is missed, then it will count as one of your lowest assignment marks and will be dropped. If more than two assignments are missed (with proper documentation for all missed assignments), we will count the first two as the lowest marks and drop them, and then omit the remaining missed assignments when your assignment grade is computed.
- If the midterm is missed (with proper documentation), we will normally assign a weight of 70% to your final exam.
- If the final exam is missed (with proper documentation) and you have obtained a grade of at least 30 out of the possible 60 marks available throughout the assignments and midterm, then you may be eligible for an [INC grade](#).

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. Check the [Office of Academic Integrity](#) for more information.

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt please be certain to contact the department’s administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing academic offenses and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the undergraduate associate dean. For information on categories of offenses and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties check [Guidelines for the Assessment of Penalties](#).

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals](#).

Note for Students with Disabilities: [AccessAbility Services](#), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Mental Health: If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.

On-campus Resources:

- [Campus Wellness](#)
- [Counselling Services](#)
- [MATES](#) One-to-one peer support program offered by the Federation of Students (FEDS)

Off-campus Resources:

- [Good2Talk](#) Free confidential help line for post-secondary students
 - Phone: 1-866-925-5454
- [Here 24 Seven](#) Mental health and crisis service team
 - Phone: 1-844-437-3247
- [OK2BME](#) Support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo
 - Phone: 1-519-884-0000 ext 213

Diversity: It is our intent that students from all diverse backgrounds and perspectives be well served by this course, and that students' learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular, we will gladly honour your request to address you by an alternate/preferred name or gender pronoun. Please advise us of this preference early in the semester so we may make appropriate changes to our records. We will honour your religious holidays and celebrations. Please inform of us these at the start of the course. We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.