MATH 115 – Fall 2020
Linear Algebra for Engineering

Instructor Information		
Section	**Instructor**	**Email**
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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
- Locate the eigenvalues and eigenvectors of a matrix and diagonalize a matrix
- Understand the basic concepts of abstract vector spaces

Textbook: We will be using *An Introduction to Linear Algebra for Science and Engineering (Third Edition)* by Daniel Norman and Dan Wolczuk. The textbook is available in one of three formats (paperback, looseleaf, digital copy).

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 can go to piazza.com/uwaterloo.ca/fall2020/math115 to sign up. 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.

Grading Scheme: Your final grade in MATH 115 will be computed as follows:
Written Assignments – 30% Mobius Assignments – 20% Term Tests – 50%
However, the average of your three term tests (see below) **must** be at least 50% in order to pass the course. If the average of your three term tests is below 50%, then your final grade in MATH 115 will instead be the average of your three term tests.

Lectures: This course will be held online. There will be approximately four lectures every week, each of which will be posted on LEARN on Monday of each week in a pdf file. Students are responsible for learning the material presented in each of these lectures. To aid in this, each lecture will be accompanied with an mp4 file where the lectures are explained in a bit more depth. Each section of MATH 115 has regularly scheduled lecture sections, but these will be used as online office hours rather than formal lectures, where the instructors will offer further explanations on course material as well as give clarification and help for assignment problems. Please look in your instructor's folder on LEARN to see which lecture sections they will be using as office hours. Note that there are no tutorials for MATH 115 – this is why the TUT sections of MATH 115 have no time displayed.

Written Assignments: There will be approximately 10 evenly weighted written assignments due every Friday by 8:30am with the exception of those weeks where there is a term test due. These assessments will require students to access the assignment on LEARN, write out their solutions and upload them to the Crowdmark website for grading. The first assignment, called Assignment 0, is due this Friday, September 11 by 8:30am. This assignment will require students to answer some simple questions and is designed to ensure students are comfortable with the Crowdmark submission process. At the end of the term, we will drop your two written assignments with the lowest average and only use the remaining assignments to compute your Written Assignment average. Each remaining written assignment will be posted on Friday afternoons.

Möbius Assignments: There will be approximately 9 evenly weighted Möbius assignments due every Friday by 8:30am with the exception of those weeks where there is a term test due. These assignments will require students to follow a link on LEARN and answer questions by typing in the solutions. Students will have two attempts at each assignment with their best attempt counting as their mark for that assignment. At the end of the term, we will drop your two Möbius assignments with the lowest average and only use the remaining assignments to compute your Möbius Assignment average. Each Möbius assignment will be posted on Friday afternoons.

Term Tests: There will be 3 evenly weighted term tests throughout the semester. These will be take–home exams that students will complete on their own. The first term test is due on Friday, October 9 by 8:30am; the second term test is due on Friday, November 13 by 8:30am; and the third term test will be due during the final exam period (the exact date and time will be determined later). Each term test will focus on material covered since the last term test, but could contain questions from any topic already covered in the course. More information regarding the term tests will be given closer to the time of the test.

Midterm Exam and Final Exam: There will be no midterm exam and no final exam for MATH 115 during the Fall 2020 semester.

Missed Assessments: If you become seriously ill and miss an assessment or a test, you must immediately contact the First Year Engineering Office and tell them about your condition. You must also promptly provide a medical certificate. If one of the first two term tests is missed (with proper documentation), we will normally distribute the weight of that term test among the *remaining* term tests. If the last term test is missed (with proper documentation) then you will receive an INC grade provided your average on the first two term tests is 50% or greater. If a student misses two or more term tests (with proper documentation), then an INC grade will normally be awarded provided the student's average on all other assessments is 50% or greater. Any missed assessment with no documentation will receive a grade of zero.

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 bene t 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.