MATH 1104: Linear Algebra for Engineering or Science, Winter 2021, Course Outline(Tentative)

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1 Basic information on the course

- **Instructor:** Ranjeeta Mallick

- **Email:** rmallick@math.carleton.ca

- **Textbook:** Linear Algebra and Its Applications (with MyLab Access Code), Sixth Edition, David C. Lay, Stephen R. Lay, and Judi J. McDonald. E-textbook with MyLab Access Code is available from the university bookstore.

- **Prerequisite:** Ontario Grade 12 Mathematics: Advanced Functions, or MATH 0005, or equivalent, or permission of the School.

- **Calendar description:** Systems of Linear Equations; Matrix Algebra; Determinants; Invertible Matrix Theorem; Cramer's Rule; Vector space R^n; Subspaces; Bases; Eigenvalues; Diagonalization; Linear Transformations; Kernel; Range; Com- plex Numbers (including De Moivre's Theorem); Inner Product Spaces and Orthog- onality; Applications.

- **Synchronicity vs. Asynchronicity:** This course offers a exible hybrid model. In the lectures, new material is presented to the students, who are not expected to study the material (the relevant sections of the textbook and lecture notes) themselves. However, lecture notes will be posted on cuLearn ahead of time (on Friday for the lectures of the following week), so students can read through the material before the lectures (and are encouraged to do so, to be able to follow the lectures more easily).

- **Lectures vs. Tutorials:** The purpose of the lectures is to present new theory to the students. Of course, some examples will be discussed in the lectures, but tutorials are the primary occasion for students to practice computations.

- **Lectures (online via BBB in cuLearn):** Mondays and Wednesdays, 7:35pm-8:55pm. The first lecture is on Monday, January 11, 2021, and the last is on Wednesday, April 14, 2021.

- **Tutorials (online via BBB in cuLearn):** Wednesdays, 9:05pm-9:55pm. Tutorials start on January 21, 2021.

- **Offce hours (online via BBB in cuLearn):** Wednesdays, 5pm-6pm.

- **Class conduct:** Students are expected to behave in a professional manner at all times. Disrupting a class is considered to be an Instructional Offence (see University Calendar). Please adhere to the same standards of behavior online that you follow in a real classroom.

- **Evaluation:**
    - 8 online weekly quizzes (best 5 out of 8): 10%
    - 2 assignments: 25%
    - 1 online midterm exam: 25%
    - Online final exam: 40%

- The weekly quizzes, midterm and final exam will all be in MyLab.

- Quizzes are released on Thursdays and are due by Sunday of that same week.

- Each assignment is released on a Thursday, along with a quiz, but is only due on Sunday of the following week. Moreover, the week after an assignment is released, there is no quiz in order to give students time to work on the assignment. Likewise, there will be no quiz in the week of the midterm exam.

- **Online midterm exam:** There will be an 80-minute online midterm exam during the class time on Wednesday, February 24, at 7:35pm-8:55pm. No make-up, early or late midterm exam will be given. Missing midterm exam will be counted as zero. If you miss the midterm exam for medical reasons, an official medical note (written in English) must be presented.

- **Online final exam:** There will be a 3-hour online final exam scheduled during the exam period (April 16-27). It is the responsibility of each student to be available at the time of the final examination.

2 Important notes

- You are responsible for keeping up with information announced during the lectures and tutorials, or sent to your Carleton e-mail account, or announced on cuLearn.

- Be sure that you know the academic integrity standards at Carleton, which can be found at https://carleton.ca/secretariat/wp-content/uploads/Academic-Integrity-Policy.pdf.

- Please use your Carleton e-mail account for all course-related e-mails.

- Whenever possible, I will answer course-related e-mails within two workday. In case I get lots of e-mails with similar questions of general interest, I may answer them by sending an e-mail to all course participants.

- If you are physically in a different time zone, please e-mail me (using your Carleton e-mail account) during the first week of classes with the details of your time zone to discuss suitable accommodation.

3 Policies regarding academic accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

- **Academic accommodations for students with disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic med- ical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or https://carleton.ca/pmc/ for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test requiring accommodation. After requesting accom- modation from PMC, we can have a talk to ensure accommodation arrangements are made. For the deadline to request accommodations for the formally-scheduled exams, visit the PMC website, https://carleton.ca/pmc/.

- **Religious obligations and/or accommodation for pregnancy:** Write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the student guide at https://carleton.ca/equity/accommodation/-academic/students/.

4 Course schedule

The following is an overview of the course, listing important events and deadlines on a weekly basis. The section numbers in parentheses after each lecture title refer to the relevant sections of the textbook.

- **Week 1 (Jan 11-17):**
  - (Section 1.1 - 1.4): Systems of Linear Equations, Row Reduction and Echelon Forms, Vector Equations, and the Matrix Equation.

- **Week 2 (Jan 18-24):**
  - (Section 1.5, 1.7): Solution Sets of Linear Systems, Linear Independence.
  - Thu, Jan 21: Quiz 1 released.
  - Sun, Jan 24: Quiz 1 due.

- **Week 3 (Jan 25-31):**
  - (Section 2.1-2.2): Matrix Operations, Inverse of a Matrix.
  - Wed, Jan 27: Tutorial 1.
  - Thu, Jan 28: Quiz 2 released.
  - Sun, Jan 31: Quiz 2 due.

- **Week 4 (Feb 1-7):**
  - (Section 2.3, 3.1): Characterizations of Invertible Matrices, Determinants.
  - Wed, Feb 3: Tutorial 2.
  - Th, Feb 4: Quiz 3 and **Assignment 1 released**.
  - Sun, Feb 7: Quiz 3 due.

- **Week 5 (Feb 8-14):**
  - (Section 3.2, 3.3): Properties of Determinants, Cramer's Rule
  - Wed, Feb 10: Tutorial 3.
  - Sun, Feb 14: **Assignment 1 due**.

- **Week 6 (Feb 15-21):** Winter break (no classes)

- **Week 7 (Feb 22-28):**
  - (Section 1.8) Linear Transformation.
  - Wed, Feb 24: **MIDTERM**, Tutorial 4

- **Week 8 (Mar 1-7):**
  - (Section 1.9, 1.6, 1.10): Matrix of Linear Transformation, Applications of Linear Systems.
  - Wed, Mar 3: Tutorial 5
  - Thu, Mar 4: Quiz 4 released.
  - Sun, Mar 7: Quiz 4 due.

- **Week 9 (Mar 8-14):**
  - (Section 2.8, 2.9): Subspaces of $\mathbb{R}^n$, Dimension of a Subspace and Rank of a Matrix.
  - Wed, Mar 10: Tutorial 6.
  - Thu, Mar 11: Quiz 5 and **Assignment 2 released**.
  - Sun, Mar 14: Quiz 5 due.

- **Week 10 (Mar 15-21):**
  - (Appendix B, Section 5.1, 5.2): Introduction to Complex Numbers, Eigenvectors, Eigenvalues and the Characteristic Equation.
  - Wed, Mar 17: Tutorial 7
  - Sun, Feb 21: **Assignment 2 due**.

- **Week 11 (Mar 22-28):**
  - (Section 5.3, 5.5): Diagonalization, Complex Eigenvalues.
  - Wed, Mar 24: Tutorial 8.
  - Thu, Mar 25: Quiz 6 released.
  - Sun, Mar 28: Quiz 6 due.

- **Week 12 (Mar 29-Apr 4):**
  - (Section 6.1, 6.2, 6.3): Inner Product, Length, Orthogonality, Orthogonal Sets .
  - Wed, Mar 31: Tutorial 9.
  - Thu, Apr 1: Quiz 7 released.
  - Sun, Apr 4: Quiz 7 due.

- **Week 13 (Apr 5-Apr 11):**
  - (Section 6.3, 6.4): Orthogonal Projections, The Gram-Schmidt Process.
  - Wed, Apr 7: Tutorial 10.
  - Thu, Apr 8: Quiz 8 released.
  - Sun, Apr 11: Quiz 8 due.

- **Last class (Apr 12):**
  - Review.

- **Exam period (Apr 16-27):** Final exam (exact date and time to be announced).