MATH 2107A [0.5 Credit] Linear Algebra II

Basic Information:

Class Schedule:	Pre-recorded videos posted in Brightspace In-person Problem-solving Tutorials during the lecture time (Mondays and Wednesdays 18:35 – 19:55 starting May 9, 2022)
Tutorials:	In-person tutorials on Mondays from 17:35 - 18:25 starting May 16, 2022.
My Office Hour Schedule:	Tuesdays and Thursdays from 13:00 – 16:00 in the MTC (HP 3422)
Course Instructor:	Kyle Harvey
Email:	kyle.harvey@carleton.ca
Course Webpage:	All course material will be made available through Brightspace. Please check Brightspace regularly for updates on the course.

Course Information:

Prerequisites: MATH 1104 or MATH 1107 and a grade of C- or higher in MATH 1007 or equivalent, or permission of the School.

Textbook: Linear Algebra and Its Applications, by D. Lay, S. Lay and J. Mc-Donald, sixth edition. The textbook is not mandatory but will be a resource for those who wish to use it.

Course Overview: Finite-dimensional vector spaces (over R and C), subspaces, linear independence and bases. Linear transformations and matrices. Inner product spaces (over R and C); Orthonormal bases. Eigenvalues and diagonalization. Bilinear and quadratic forms; principal axis theorem. Precludes additional credit for MATH 1102 (no longer offered), MATH 2152

Classes: 1) All lectures will have pre-recorded videos with corresponding Powerpoint Presentations posted on Brightspace. It is highly recommended that you print the slides or have them available through other means to use in conjugation with the watching the videos.
2) Doing the lectures at home will allow for the lecture time to be used as problem solving tutorials. These are optional, but bonus will be awarded for those who attend (see assessment section for details).

Calculators: You will be permitted to use a non-graphing non-programmable calculator for all tests and final exam. It is also recommended that you utilize an online RREF calculator for the assignments. Here is a link to a good RREF calculator: https://www.symbolab.com/

Additional Practice/Tutorial: There will be additional homework documents with final answers posted in Brightspace. Selected practice problems will be covered in the tutorial.

Assessment:

Tests (30%): There will be 3 **in-person** tests to be taken place in the tutorials. The best 2 out of three tests will be used for your test grade. Each test will be weighted equally. **There will be no make up tests**. If you provide adequate documentation (doctor's note, etc...), then I will adjust the weight of each test accordingly, otherwise a mark of 0 will be given for the test. You must bring your student card to each test and exam and place it on your desk where it is visible. **The dates of the tests will be: Jun 6, Jul 18, & Aug 8.**

Assignments (20%): There will be 12 online assignments due on Tuesdays at 11:59 pm. The specific due dates of the assignments can be found below. The best 10 out of 12 assignments will be used to calculate your final grade (assignments are weighted equally at 2% each). Note that the last assignment is due during the exam period, but it is an optional assignment as only 10 out of 12 assignments will be counted. All assignments are available now so that you can get ahead if you so wish.

Due Date	Assignment	Lessons of Focus for the Assignment
May 24	1	1, 2, 3
May 31	2	4, 5, 6
Jun 7	3	7, 8
Jun 14	4	9, 10
Jul 5	5	11, 12
Jul 12	6	13, 14
Jul 19	7	15, 16
Jul 26	8	17, 18
Aug 2	9	19, 20
Aug 9	10	21, 22
Aug 16	11	23, 24
Aug 23	12	25, 26

Assignments will be run through WebWork. More details will be posted in Brightspace as to how to access the assignments. Brightspace will also be demonstrated in the first week in-person sessions instead of a problem-solving tutorial.

Final Exam (50%): The final exam will be a three hour **in-person** closed book exam to be held during the exam period set by Carleton University. The questions will be similar to those seen on the tests, and in the homework. Students who wish to review their final examination paper must do so within two weeks from the release of final grades. This privilege is for educational purposes and not an opportunity to argue about the marking.

Bonus There is a bonus for those who come to class to participate in the in-person Problem Solving Tutorials:

1) During the problem-solving tutorials, students will work in groups of up to 4 working on practice questions. There will be a total of 6 practice questions in each session.
2) Groups that can answer 3 questions correctly will be awarded a point. Groups that can answer 5 questions correctly will be awarded 2 points.
3) I will walk around the classroom helping groups who may be stuck on a problem to help guide them.
4) The total points any student can get is 40. This bonus is divided by 16 which will give you a flat bonus that will be added to your final grade. Thus, a total of 40 / 16 = 2.5 can be awarded as a final grade (which in most cases would result in a letter grade increase like from a B to B+).

Policies:

Academic Integrity:
Be sure that you know that academic integrity standards at Carleton which can be found here.

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

Pregnancy obligation: 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

Religious obligation: 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

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 medical 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 pmc@carleton.ca 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 or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable).

Course Progression:

The following topics will be covered in this course:

Topic	**Chapter**
Spaces and Vector Spaces ($R^n, C^n, M_{mn}, P_n,$)	4.1
Subspaces	4.1
Linear Combinations and Span	4.2 + 4.3
Linear Independence	4.3
Basis and Dimension	4.3 + 4.5
Col Space, Row Space, Nul Space, Rank, and Nullity	4.2 + 4.6
Coordinate Vectors	4.4
Change of Basis Matrix	4.7
Eigenvalues and Eigenvectors	5.1
Characteristic Equation and Algebraic Multiplicity	5.2
Eigenspaces and Geometric Multiplicity	5.2
Diagonalization and Fast Matrix Multiplication	5.3 + 5.5
Linear Transformations	4.2 + 5.4
Kernel and Range of Transformations	4.2 + 5.4
Transformation Matrix Representation	5.4
Injective, Surjective, and Inverse Linear Transformations	5.4
Dot Products, Norm, Distance, and Angles Between Vectors	6.1
Orthogonal Vectors, Sets, and Complements, and Orthonormal Matrices	6.2
Orthogonal Projections and Decompositions	6.3
Gram Schmidt Process and QR Factorization	6.4
Least Squares Problem and Linear Models	6.5 + 6.6
Inner Product Spaces	6.7
Diagonalization of Symmetric Matrices and The Spectral Theorem	7.1
Quadratic Forms	7.2
Principle Axis Theorem	7.3