MATH 1104 Linear Algebra for Engineering or Science
Section C and G, Winter 2021

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Office Hours There will be no formal office hours, so email is best. Any questions related to course operation should be emailed to the Professor. Any questions regarding tutorial, assignments, or homework should be emailed to the TAs (TA email addresses will be posted on cuLearn).

Lectures There are no scheduled lectures. Instead, the style of presentation will be **recorded** podcasts and **live** Zoom sessions to summarize key ideas. **Previous year's** scanned notes and **tutorial sessions** will serve to support learning.

Notes Notes and additional content will be posted in advance of the related podcasts.

Podcasts Content will be posted at a quasi-regular interval to maintain a steady flow.

Zoom Sessions Weekly Zoom Sessions will be held to answer questions of all kinds.

Tutorials TAs will present tutorials from the Tutorial Manual every week. The *Tutorial Compendium* is a highly recommended resource - it is a record of all possible tutorial questions (with full solutions) you can possibly be asked!

MyLab Access to MyLab is required for this course. Many evaluations will use this online resource, which will be accessible through cuLearn. In particular, regular online homework sets will be assigned for the purpose of practice, and to gain proficiency on the platform. The midterm and final exam will also use this platform.

Assignments Assignments will be due at regular intervals throughout the term. They will be long answer form, so all work must be shown. Please note submission details as they are announced.

Midterm Test The test will be hosted on MyLab on 24 February during the official lecture time.

Textbook *Linear Algebra and its Applications, 6th Edition* (**with MyLab access code**) by David C. Lay, Pearson Education (Please purchase access through the link provided **ONLY**).

Tutorial Manual *The Tutorial Compendium for Linear Algebra for Engineering and Science, 2nd Edition* by Mark Blenkinsop, Prometheus Press (availability details TBA).

Grading

Homework Sets (hosted on MyLab):	10%
Assignments (2 in total, each worth 12.5%, hosted on cuLearn):	25%
Midterm Test (hosted on MyLab):	25%
Final Exam (hosted on MyLab):	40%

Evaluation

• Scientific calculators and online calculators are permitted in this course, and it is worthwhile learning all functions they have to offer to help learning and understanding.

• Tutorials are compulsory, but not graded. They form one of the best opportunities for learning, and are an integral part of overall understanding, and preparation for the final exam. Tutorial participation can provide the Professor with additional indications to assist evaluating the students. The listed Tutorial Compendium is a proven reference for students: It is a record of all tutorial questions **and** solutions you may face throughout the term, and serves as an excellent study guide. Tutorial books are available from Haven Books; an eBook option will also be made available (details TBA).

• Homework sets will be hosted on MyLab at regular intervals. Any grading issues on MyLab will not be corrected. Instead a grade compensation scheme will be implemented. It is IMPERATIVE you learn the correct syntax MyLab requires.

• The midterm test will be hosted on MyLab at specified dates and times. An alternate time will be offered to account for time differences and other circumstances. If the test is missed for valid reason, alternate arrangements will be made at the discretion of the Professor.

• Assignments are comprehensive: They are challenging, thorough, and encourage learning. You may seek outside assistance, but it is imperative that you understand all the solutions you present. Assignments must be submitted electronically in pdf format (please familiarize yourself with scanning apps, such as CamScanner). Late submissions may be subject to penalty, at the discretion of the Professor. While unforeseen circumstances may arise, once solutions to the assignment are posted, no further amendments will be considered. Please note all submission details as they are announced.

• All term grades must be resolved before the date of the final exam. Any changes after the fact will only be done at the discretion of the Professor.

• A 3-hour final examination will be held during the exam period, covering the entire course. The exam will be hosted online on MyLab, accessible through cuLearn. The option of 100% Final Exam is **NOT** available.

Conduct and Content Policies

• TAs are here to help! Anyone seeking assistance solving homework problems, tutorial topics, or assignment questions are encouraged to ask their TA.

• Zoom sessions will be held by the Professor on a weekly schedule (days and times TBA). All important aspects will be repeated and reinforced during all time slots within a week to provide fair access to all students. Thus, you aren't expected to attend all session – at most one per week! In fact, Zoom sessions are not compulsory, not recorded, not formal, not scripted, etc.. They are a free form much like usual questions in or after class, or in office hours.

• Incidents of cheating will be dealt with in a formal fashion. All suspected incidents and supporting documentation will be forwarded to The Office of The Dean of Science.

• All classroom teaching and learning activities (lectures and tutorials), and cuLearn content is COPYRIGHTED. Students are encouraged to use the notes and download any and all course materials for their own educational use. However, students are NOT PERMITTED to post or share files externally, or distribute content in any way without permission.

Accommodation Policies

• Students with disabilities entitled to academic accommodations in this course must register with the Paul Menton Centre (PMC) for a formal evaluation, and have a Letter of Accommodation sent to the Professor by their Coordinator. Students entitled to accommodation must confirm their needs with the Professor before the first test or assignment. Students who require accommodations only for the final exam must request accommodations by the last official day to withdraw from classes.

• All other accommodations will be followed in accordance with University policy, and administered by the Office of Equity Services.

Generalized List of Topics

Complex numbers:
Operations and properties, including rationalizing the denominator
Standard form, polar form, and DeMoivre's Theorem

Vectors:
Operations and properties
Norms and normalization
Angle between vectors
Projections

Matrices:
Operations and properties
Matrix multiplication
Classic matrix types and forms, including Elementary Matrices
Matrix computations
Rank of a matrix

Systems of Linear Equations:
The Matrix Equation
Row operations and Row Reduced Echelon Form (RREF)
Solutions types, including Vector Parametric Form
Homogeneous systems (with a preview of Eigenvales and Eigenvectors)

Matrix Inverses and Determinants:
Operations and properties
Methods for computing the inverse (determinant-adjoint method, and row operations method)
Methods for computing determinants (co-factor expansions, +/- patterns, row/column operations)
Application of inverses and determinants (Cramer’s Rule)

Eigenvalues, Eigenvectors, Diagonalization:
Definition and properties
Characteristic polynomial
Methods to solve for Eigenvalues and Eigenvectors (real and complex)
Diagonalization (including algebraic and geometric multiplicity)

Linear Transformations:
Definitions and properties
The standard matrix and compositions
Images, One-to-one, Onto, and invertability

Vector Set Theory:
Linear combinations
Linear dependence and independence
Vector spaces, subspaces, column spaces, row spaces
Orthogonality (including orthogonal projections, Gram-Schmidt process, Least Squares approximation)