# MATH 1104 Linear Algebra for Engineering or Science
# **TENTATIVE OUTLINE FOR:** Section A, Summer 2022

**Instructor** Mark Blenkinsop
**Office** 5260 HP
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**Office Hours** To be announced. Any questions regarding tutorial, tests, assignments, or homework can be be directed to the TAs. (TA email addresses will be posted on BrightSpace).

**Lectures** Monday and Wednesday 18:35 to 19:55 in 301 Azrieli Theatre. We will review key topics and go over examples from the notes. During these sessions, the emphasis will be on completing examples, not explaining definitions (and the like), so please come prepared, **BUT: Any and all of your questions are always welcome!**

**Notes** **Previous year's** notes and additional content will be posted on BrightSpace. The relevant portions must be reviewed prior to associated lectures - you will be notified!

**Tutorials** Monday 17:35 to 18:35 in 301 Azrieli Theatre (same room as lectures). 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!

**Assignments** Assignments will due at regular intervals throughout the term. They will be posted at least for the full week in advance of the **DUE DATES**: TBD.

**MyLab (and Homework Sets)** Access to MyLab is required for this course and accessible through BrightSpace (purchase options will be shared). Regular online homework will be posted for the purpose of practice, and to gain proficiency on the platform. Specified homework sets will be required for grading (posted a week in advance and **DUE ON** dates TBD). The tests and final exam will also use this platform.

**Tests** Test weeks will be hosted on MyLab. Each tests will be timed (100 minutes), and accessible for the entire week (**WEEK OF** Feb 14, Mar 14; **no make up tests**).

**Textbook** *Linear Algebra and its Applications, 6th Edition* (**with MyLab access code**) by David C. Lay, Pearson Education (availability details TBA).

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

**Grading**

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| Tutorial Work: | 15% |
| Homework Sets (4 in total, each worth 2.5%, hosted on MyLab): | 10% |
| Tests (2 in total, each worth 5%, hosted on MyLab): | 10% |
| Assignments (3 in total, each worth 10%): | 30% |
| Final Exam (hosted on MyLab): | 35% |

## Evaluation

• Scientific calculators and online calculators are permitted in this course, and it is worthwhile learning all functions they have to offer, however, direct copying of solutions of any kind is not permitted (see below - plagiarism).

• Tutorials are compulsory. They form one of the best opportunities for learning, and are an integral part of overall understanding, and preparation for tests and the final exam. 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 manuals will be available in various formats (details TBA).

• Tests and Homework Sets will be online, hosted on MyLab on specified dates. They will be accessible for a period of time; tests will be timed. Please note that these dates and times **may or may not** coincide with scheduled lectures or tutorials. If any of these are 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 to solve problems, but direct copying of solutions of any kind is not permitted. Late submissions may be subject to penalty, at the discretion of the Professor. No assignments will be accepted once solutions are made public. Please note all submission details as they are announced.

• A 3-hour final examination will be held during the exam period, covering the entire course. The exam will be online, hosted on MyLab. E-proctoring software will **NOT BE USED**. The option of re-weighting any amount of the term towards the Final Exam is **NOT** available.

## Conduct and Content Policies

• COVID has put stresses on many of us, and left many things uncertain. In particular, I, the Professor, have little kids, and they are obviously my priority. Please keep all of these kinds of factors in mind as we navigate through this course.

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

• The Professor, the TAs, and all students have the Right to Disconnect. None of us can expect 24/7 responses from anyone else. Only under certain circumstances would urgent matters be communicated, and they will be clearly marked.

• Violations of Carleton's Integrity Policy will be dealt with in a formal fashion. All suspected incidents will be forwarded to The Office of The Dean of Science. Students are expected to be familiar the Academic Integrity Policy.

• **Plagiarism** is a specific matter of Academic Integrity. Plagiarism includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source. In mathematics, an answer **can not** be plagiarized, but the **presentation of its solution can!** Thus, copying answers from fellow students, online posts, or online calculators (such as Wolfram, Symbolab, etc.) is strictly prohibited.

• **Copyright violation** is another specific matter of Academic Integrity. All classroom teaching and learning activities (lectures and tutorials), and online 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 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. Any such student must confirm their needs with the Professor before it can be applied to any evaluation element (test, assignment, exam, etc.).

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

# Generalized List of Topics for MATH 1104

**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)