

**DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES
UNIVERSITY OF TORONTO MISSISSAUGA**

**MAT223H5Y LEC6001
Linear Algebra I
Course Outline - Summer 2012**

Class Location & Time	Tue, 06:30 PM - 08:00 PM IB 335 Thu, 06:30 PM - 08:00 PM IB 335
Instructor	Mario Ventresca
Office Location	DV4038
Office Hours	Tues 4:00-5:30
Telephone	
E-mail Address	mario.ventresca@utoronto.ca
Course Web Site	Blackboard
Teaching Assistant	Ali Mousavidehshikh
Office Location	TBA
Office Hours	TBA
E-mail Address	ali.mousavidehshikh@utoronto.ca

Course Description

Systems of linear equations, matrix algebra, determinants. Vector geometry in \mathbb{R}^2 and \mathbb{R}^3 . Complex numbers. \mathbb{R}^n : subspaces, linear independence, bases, dimension, column spaces, null spaces, rank and dimension formula. Orthogonality, orthonormal sets, Gram-Schmidt orthogonalization process, least square approximation. Linear transformations from \mathbb{R}^n to \mathbb{R}^m . The determinant, classical adjoint, Cramer's rule. Eigenvalues, eigenvectors, eigenspaces, diagonalization. Function spaces and applications to a system of linear differential equations. The real and complex number fields. [36L, 12T]

Prerequisite: Grade 12 Advanced Functions (MHF4U), (Grade 12 Calculus and Vectors (MCV4U)/MAT102H5).

Exclusion: MAT222H5, 248Y5 (SCI)

Distribution Requirement: SCI

Students who lack a pre/co-requisite can be removed at any time unless received explicit waiver from department.

Textbooks and Other Materials

Required

Title: Linear Algebra and its Applications 4th edition

Author: David C Lay

ISBN: 978-0321385178

Publisher: Addison Wesley

Recommended

Title: Study Guide for Linear Algebra and its Applications 4th edition

Author: David C Lay
ISBN: 978-0321388834
Publisher: Addison Wesley

Suggested

Title: Matrix Analysis and Applied Linear Algebra
Author: Carl C Meyer
ISBN: 978-0898714548
Publisher: Publisher: SIAM: Society for Industrial and Applied Mathematics

Assessment and Deadlines

Type	Description	Due Date	Weight
Lab	LYRYX 1	2012-05-15	2%
Lab	LYRYX 2	2012-05-22	2%
Assignment	Written 1	2012-05-31	5%
Term Test	Test 1	2012-06-07	15%
Lab	LYRYX 3	2012-06-12	2%
Lab	LYRYX 4	2012-07-17	2%
Assignment	Written 2	2012-07-26	5%
Term Test	Test 2	2012-08-02	20%
Lab	LYRYX 5	2012-08-07	2%
Assignment	Written 3	2012-08-16	5%
Final Exam		TBA	40%
Total			100%

More Details for Assessment and Deadlines

Labs/Assignments

In total you will have 5 LYRYX labs (10% of your mark) and 3 written assignments (15% of your mark). LYRYX computer labs will be due on the respective Tuesday dates at exactly midnight. Written assignments will be due **AT THE START OF YOUR TUTORIAL**. Note that written assignments will cover all material from the first week of classes, whereas LYRYX labs will only cover particular sections.

More about LYRYX:

Computational exercises will be assigned through LYRYX Interactive Linear Algebra website. You will need to create an

account at <http://lyryx.com/> The cost for LYRYX labs is \$30 charged to your credit card when you register. A robot in Calgary will mark the labs. Labs can be completed at any time, from the time the lab is available up to the due date (Tuesdays at midnight weekly). These due dates will be available on the LYRYX website; these dates are firm and no late submissions are allowed. However, each lab may be repeated any number of times before the due date. The highest score achieved will count as the grade for that lab. So you should repeat each lab until you get it perfectly correct.

Tests:

The two midterm tests will be held **DURING TUTORIAL TIME**. It is your responsibility to ensure that you are properly registered in one of the tutorials and that you are ontime for the tests. The tests are 50 minutes each, and arriving late will result in a loss of time to write the test.

You are responsible to know all the material taught in class, tutorial and relevant textbook sections and handouts.

Penalties for Lateness

NO late labs or assignments are accepted. **You will be given a mark of 0.**

Procedures and Rules

Missed Term Work

To request special consideration, bring supporting documentation to the instructor in person during office hours at least one week in advance.

In case of illness, bring a U of T medical certificate to the instructor within one week of the missed work. The certificate must specify the exact period during which you were unable to carry out your academic work.

Missed Final Exam

Students who cannot write a final examination due to illness or other serious causes must file an [online petition](#) **within 72 hours of the missed examination**. Original supporting documentation must also be submitted to the Office of the Registrar **within 72 hours of the missed exam**. Late petitions will **NOT** be considered. If illness is cited as the reason for a deferred exam request, a U of T Medical Certificate must show that you were **examined and diagnosed at the time of illness and on the date of the exam, or by the day after at the latest**. Students must also record their absence on ROSI on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of \$70 is required for each examination approved.

Academic Integrity

Honesty and fairness are fundamental to the University of Toronto's mission. Plagiarism is a form of academic fraud and is treated very seriously. The work that you submit must be your own and cannot contain anyone else's work or ideas without proper attribution. You are expected to read the handout How not to plagiarize (<http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize>) and to be familiar with the Code of behaviour on academic matters, which is linked from the UTM calendar under the link Codes and policies.

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Final Exam Information

Duration: 3 hours
Aids Permitted: Open book (Textbook)

Additional Information

Should you have questions about the course material outside of lecture or tutorial time, please post your question on Blackboard, your TA will respond as soon as possible.

Tutorials will start May 10th; the first week of classes.

The TENTATIVE course outline is as follows:

Week	Book Sections	Topics
1	1.1, 1.2, 1.3	<ul style="list-style-type: none">• Systems of Linear Equations• Row Reduction and Echelon Form• Vector Equations
2	1.4, 1.5, 1.7	<ul style="list-style-type: none">• $Ax=b$• Solutions Sets of Linear Equations• Linear Independence

3 1.8, 1.9, 2.1

- Introduction to Linear Transformations
- Matrix of a Linear Transformation
- Matrix Operations

4 2.2, 2.3, 3.1

- Inverse of a Matrix
- Characterizations of Invertible Matrices
- Introduction to Determinants

5 3.2, 3.3, 4.1

- Properties of Determinants
- Determinants as Area/Volume
- Vector Spaces and Subspaces

6 4.2, 4.3, 4.4

- Null Spaces, Column Spaces, Linear Transformations
- Linearly Independent Sets, bases
- Coordinate Systems

7 4.5, 4.6, 5.1

- Dimension of a Vector Space
 - Rank of a Matrix
 - Eigenvalues and Eigenvectors
- 8 5.2, 5.3, 5.4
- The Characteristic Equation
 - Diagonalization
 - Eigenvectors and Linear Transformations
- 9 Appendix B, 5.5
- Complex Numbers
 - Complex Eigenvalues
- 10 6.1, 6.2, 6.3
- Inner Product, Length, Orthogonality
 - Orthogonal Sets
 - Orthogonal Projections
- 11 6.4, 6.5, 6.6
- Gram-Schmidt
 - Least Squares

- Diagonalization of Symmetric Matrices
- Quadratic Forms
- Singular Value Decomposition

Last Date to drop course from Academic Record and GPA is July 29, 2012.