MATH 223 Linear Algebra

Matrices, eigenvectors, diagonalization, orthogonality, linear systems, applications. **Intended for Honours students**.

Term	Day	Start Time	End Time	Building	Room
2	Mon Wed Fri	10:00	11:00	Leonard S. Klinck	460

Instructor: Jozsef Solymosi
Email: solymosi@math.ubc.ca
Office: MATH 220

Marking

Your mark will be based on homework assignments, two midterm exams and one final exam, weighted as follows:

- Homework: 20%
- Midterm I: 15%
- Midterm II: 15%
- Final Exam: 50%

No late homework will be accepted.

Exams

The midterm exams are scheduled as follows:

- Midterm I: Wednesday, February 7.
- Midterm II: Friday, March 16.

There will be no notes, books, calculators or "cheat sheets" allowed on any of the midterms. This holds also for the final exam.

No makeup exams will be given. If you miss a midterm, your final exam will count for 65% of your grade.

Textbook: A. Givental: Linear Algebra and Differential Equations.

Below is the syllabus which lists all topics from the book covered in this course.

1. **Geometry on the plane**.
(11 lectures and 3 homework assignments)
1.1. Vectors
1.1.1.Definitions. 1.1.2. Inner product. 1.1.3. Coordinates.
1.2. Analytical geometry.
1.2.1. Linear functions and straight lines. 1.2.2. Conic sections.
1.2.3. Quadratic forms.
1.3. Linear transformations and matrices.
1.3.1. Linearity. 1.3.2. Composition. 1.3.3. Inverses. 1.3.4. Matrix Zoo.
1.4. Complex numbers.
1.4.1. Definitions and geometrical interpretations. 1.4.2. The exponential function.
1.4.3. The Fundamental Theorem of Algebra.
1.5. Eigenvalues.
1.5.1. Linear systems. 1.5.2. Determinants. 1.5.3. Normal forms.

3. **Linear Algebra.(Part 1)**
(11 lectures and 3 homework assignments)
3.1. Classical problems of linear algebra
3.2. Matrices and determinants.
3.2.1. Matrix algebra. 3.2.2. The determinant function.
3.2.3. Properties of determinants. 3.2.4. Cofactors.
3.3. Vectors and linear systems.
3.3.1. 3D and beyond. 3.3.2. Linear (in)dependence and bases.
3.3.3. Subspaces and dimension. 3.3.4. The rank theorem and applications.
3.4. Gaussian elimination.
3.4.1. Row reduction. 3.4.2. Applications.

Linear Algebra.(Part 2)
(11 lectures and 3 homework assignments)
3. 5. Quadratic forms.
3.5.1. Inertia indices. 3.5.2. Least square fitting to data. 3.5.3. Orthonormal bases.
3.5.4. Orthogonal diagonalization. 3.5.5. Small oscillations.
3. 6. Eigenvectors.
3.6.1. Diagonalization theorem.
3.6.2. Linear ODE systems.