MATHEMATICS 225 (B1)

LINEAR ALGEBRA II

SUMMER SESSION 2005

INSTRUCTOR: I. E. Leonard, CAB 679
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OFFICE HOURS: Tuesday and Thursday: 3:00 p.m. – 4:00 p.m.
or by appointment

GRADING SCHEME:

Assignments	20%
Midterm Exam	30%
Final Exam	50%

ASSIGNMENTS: There will be 5 assignments, and you are encouraged to work together and discuss the solutions with your fellow students. Of course, the assignment that you submit for grading should be your own version, not a carbon copy of an assignment submitted by another student. Assignments are to be handed in before 5:00 pm on the date due, in the box provided on the 3rd floor in CAB.. Because of the rather tight schedule during summer session, late assignments will not be accepted.

EXAMINATIONS: Midterm Examination: Monday, July 25, in class.
Final Examination: Thursday, August 11, 3:00 – 5:00

SOLUTIONS: Solutions to the assignments and examinations will be posted on my home page on the web:

`http://www.cs.ualberta.ca/~isaac/`

TEXTBOOKS: **Required:**
Linear Algebra and its Applications, Third Edition
by David C. Lay

CALENDAR DESCRIPTION:

MATH 225 Linear Algebra II
Vector spaces. Inner product spaces. Examples of n-space and the space of continuous functions. Gram-Schmidt process. QR-factorization of a matrix and least squares. Linear transformations, change of basis, similarity and diagonalization. Orthogonal diagonalization, quadratic forms. Application in a variety of fields, numerical methods. Prerequisites: MATH 120 or 125 or any linear algebra course. Mathematics 31 or any calculus course. Note: This course cannot be taken for credit if credit has already been obtained in Math 121 or 227.

Linear Algebra II

Topics Selected From

Appendix A: ▶ Uniqueness of the Reduced Echelon Form

Appendix B: ▶ Complex Numbers

Chapter 4: Vector Spaces

- ▶ 4.1 Vector Spaces and Subspaces
- ▶ 4.2 Null Spaces, Column Spaces, and Linear Transformations
- ▶ 4.3 Linearly Independent Sets; Bases
- ▶ 4.4 Coordinate Systems
- ▶ 4.5 The Dimension of a Vector Space
- ▶ 4.6 Rank
- ▶ 4.7 Change of Basis
- ▶ 4.8 Application to Difference Equations
- 4.9 Applications to Markov Chains

Chapter 5: Eigenvalues and Eigenvectors

- ▶ 5.1 Eigenvectors and Eigenvalues
- ▶ 5.2 The Characteristic Equation
- ▶ 5.3 Diagonalization
- ▶ 5.4 Eigenvectors and Linear Transformations
- ▶ 5.5 Complex Eigenvalues
- ▶ 5.6 Discrete Dynamical Systems*
- ▶ 5.7 Applications to Differential Equations
- 5.8 Iterative Estimates for Eigenvalues

Chapter 6: Orthogonality and Least Squares

- ▶ 6.1 Inner Product Length and Orthogonality
- ▶ 6.2 Orthogonal Sets
- ▶ 6.3 Orthogonal Projections
- ▶ 6.4 The Gram-Schmidt Process
- ▶ 6.5 Least-Squares Problems
- ▶ 6.6 Applications to Linear Models*
- ▶ 6.7 Inner Product Spaces
- ▶ 6.8 Applications of Inner Product Spaces

Chapter 7: Symmetric Matrices and Quadratic Forms

- ▶ 7.1 Diagonalization of Symmetric Matrices
- ▶ 7.2 Quadratic Forms
- ▶ 7.3 Constrained Optimization*
- ▶ 7.4 The Singular Value Decomposition
- 7.5 Applications to Image Processing and Statistics

* Time permitting.