UNIVERSITY OF CALGARY

FACULTY OF SCIENCE

Department of Mathematics and Statistics

Mathematics 311 Linear Methods II

(see Course Descriptions for the applicable academic year: http://www.ucalgary.ca/pubs/calendar/)

Syllabus

Topics	**Number of Hours**
Vector spaces and subspaces; independence, basis and dimension; row and column space of a matrix; rank; applications.	10
Linear transformations; kernel and image; composition; the rank-nullity theorem; applications.	10
Orthogonality; the Gram-Schmidt algorithm; orthogonal diagonalization and least squares approximation; quadratic forms; singular value decomposition.	12
Change of basis.	4
TOTAL HOURS	36

Course outcomes

General outcomes.

This course is a continuation of Math 211 (Linear Methods I). We shall build upon the knowledge and skills acquired in Math 211 to learn about further topics in linear algebra. This course differs from Math 211 in that students will have to reason more abstractly, provide proofs of mathematical statements, and work with precise definitions. Specifically, by the end of this course, students will be able to

1. Explore the relationship between key linear algebra concepts and their geometric representation.
2. Seek to apply linear algebra techniques to a variety of practical problems.
3. Read and create proofs of mathematical statements about topics covered in the course.

Subject specific knowledge.

By the end of this course, students will be fluent in the abstract theory of linear algebra. Specifically, by the end of this course, students will be able to

4. State all of the technical definitions covered in the course (such as a vector space, span, independence, dimension, linear transformation, kernel, image, and other terms).
5. State all of the relevant theorems covered in the course.
6. Use these definitions and theorems from memory to construct solutions to problems and/or proofs.
7. Verify that an abstract mathematical object satisfies a given definition, or is a counterexample.
8. Analyze a finite dimensional vector space and its properties, including the basis structure of vector spaces.
9. Understand the concept of a linear transformation as a map from one vector space to another, and to be able to construct such maps given a basis of the domain.
10. Use the Gram-Schmidt process to produce an orthonormal basis.

* * * * * * *