

Senior Seminar (Capstone) - Math 4513 - Spring, 2009  
An Introduction to the Theory of Frames  
Instructor: Keri Kornelson

In this course, we will review some of the concepts from linear algebra (vector spaces, bases, norms, inner products, linear operators) and learn some new linear algebra tools (eigenspaces, self-adjoint operators, spectral theory in finite dimensions, operator norms, projections) as we learn about the theory of frames in an inner product space.

A frame is more general than an orthonormal basis for an inner product space. It allows for redundancy (which means the elements of a frame need not be linearly independent). This can be valuable in applied settings, since it allows for resilience to noise and losses. In this course, we will study the properties of frames, and operators associated to frames in finite-dimensional spaces.

Linear Algebra (MATH 3333) and Discrete Mathematics (MATH 2513) are strongly recommended prior to taking this course. Students will be expected to read and write mathematical proofs. Assignments in this course will include homework problems, presentations of some proofs to the class, reading mathematical literature, and a project which will result in both a written paper and a presentation to the class. There will be one midterm exam and a final exam.

The textbook for the course is *Frames for Undergraduates*, by Han, Kornelson, Larson, and Weber, American Mathematical Society, 2007.