Title: The intersection of homological algebra and numerical methods: finite element exterior calculus
Speaker: Dr. Tyler Kloefkorn, University of Arizona.
Date: Monday May 1st, 2017
Time and Location: 2:00-2:50pm in 8-4

Abstract: Finite element exterior calculus connects two seemingly unrelated fields: homological algebra and finite element methods. Homological algebra uses abstract algebra and topology techniques to study chain complexes. Finite element methods are used to find numerical solutions to partial differential equations, with boundary conditions, on various domains discretized into simple geometric elements (e.g. simplicies and cubes). These methods are applied in a variety of contexts, including animation, image processing, computational electromagnetism, atmospheric motion, and fluid mechanics. Unfortunately, finite element computations in these areas (and others) are ad hoc. Finite element exterior calculus calls on these two fields to establish a common computational language. In this talk and from an algebraic point-of-view, we will broadly describe finite element exterior calculus, the Periodic Table of Finite Elements, and related chain complexes.