Math 514: Numerical Linear Algebra
Instructor: John Bardsley

"The field of numerical linear algebra is more beautiful, and more fundamental, than its rather dull name may suggest. More beautiful, because it is full of powerful ideas that are quite unlike those normally emphasized in a linear algebra course in a mathematics department. (At the end of the semesters, students invariably comment that there is more to this subject than they ever imagined.) More fundamental, because, thanks to a trick of history, "numerical" linear algebra is really applied linear algebra. It is here that one finds the essential ideas that every mathematical scientist needs to work with vectors and matrices."

-from the Preface of the course text Numerical Linear Algebra

At the heart of 'applied mathematics' is the fact that continuous mathematical models (e.g., differential and integral equations) accurately capture many natural phenomena.

In practice, solving the continuous models that arise in applied and industrial mathematics often requires a numerical representation of the model that can be solved on a computer. The mathematical study of the algorithms used for computing such numerical solutions constitutes the field of *numerical analysis*.

Most numerical algorithms – even those used for solving nonlinear problems – make use of numerical linear algebra. The focus of this course is on the fundamental algorithms of numerical linear algebra, including methods for solving systems of linear equations (Ax=b) and matrix factorization methods such as the SVD and QR.

The course will be a mix of theoretical and computational, and so should appeal to both the theoretical and 'applied' mathematician. Programming in MATLAB will constitute a significant portion of the course, thus some experience (and certainly interest) in computation is desirable. However, introductory programming material will also be presented.

The text is a good one: *Numerical Linear Algebra*, Trefethen and Bau, SIAM 1997.