COSC 106: Numerical Linear Algebra

Fall 2009
MWF 1:45-2:50, Sudikoff 115

- **Course Outline**

This course is about how to solve, computationally, linear algebra problems. It is not a course to introduce linear algebra (you are expected to already have some background in this - see prerequisites), although we will review this material as needed and you might be asked to demonstrate understanding of this. It is also not a course on the applications of linear algebra. (For that, you could take COSC 36/136, for example.) Rather, it is on how to solve those linear algebra problems that you get in your applications: we will study the *algorithms* of linear algebra. Or, to quote one of the authors of our textbook (see the Appendix)

``Numerical analysis is the study of algorithms for the problems of continuous mathematics."

Please read the Appendix of the text book before the second class for a much more insightful and thorough discussion about what this course is about.

- **Topics**

This is a rough and tentative syllabus, that I have essentially copied from the textbook we are using.

- orthogonal vectors, norms, singular value decomposition
- QR factorization, Gram-Schmidt orthogonalization, and least squares problems
- conditioning and stability
- Gaussian elimination and Cholesky factorization
- eigenvalue problems, Raleigh quotient, QR algorithm
- iterative methods: Arnoldi, Lanczos, conjugate gradient
- preconditioning

- **Textbook**

This is the main text book. We will also use supplementary material.

L. N. Trefethen and D. Bau. *Numerical Linear Algebra*, SIAM, 1997.

- **Prerequisites**

Familiarity with linear algebra and with computers; "mathematical maturity"

- **Additional Information**

There will be weekly homeworks, and two exams in this course. The homeworks will involve a mix of problem solving, proving, and programming in Matlab.

Further information can be obtained from the instructor the first day of class.

Last updated September 2009.