MATH 504 — SPRING 2012

INTRODUCTORY NUMERICAL ANALYSIS: NUMERICAL LINEAR ALGEBRA

Time and Place: MWF 12:00-12:50pm, SMLC 352
Instructor: Monika Nitsche, SMLC 334, no phone, nitsche@math.unm.edu
Office Hours: Mon, Fri 1-2pm in office,
Wed 10-11 at Calculus Table (DSH 3rd floor, by elevator),
or by appointment

Prerequisite: Math 464/514 and some knowledge of programming

Website: `http://www.math.unm.edu/ nitsche/math504.html`

Text: *Numerical Linear Algebra*, by Lloyd N. Trefethen and David Bau, III, SIAM, 1997.

Description: We study direct and interative methods to solve linear systems of equations, the least squares problem, and the eigenvalue problem. For each algorithm we investigate its efficiency, stability and accuracy. The specific topics we will cover (although not necessarily in the order listed) are:

1. *Basics*
   Linear algebra review
   Matlab basics
2. *Matrix factorizations*
   Singular value decomposition
   QR Factorization
   Gauss Elimination and LU Decomposition
3. *Conditioning and stability*
4. *Least Squares Problems*
5. *Eigenvalue problems*
6. *Iterative methods for linear systems*
   Jacobi, Gauss-Seidel, SOR
   Conjugate Gradients
   GMRES
   Preconditioning

Grading Policy: Homework = 65%, midterm exam = 15%, final exam=20%.

Homework: The homework will include some computing problems for which I recommend using MATLAB. Some guidelines for your writeup:

- it should be legibly and neatly presented, and include all the required code, figures and tables, in the order assigned.
- figures and tables should be well-labeled printouts.
- any discussion and analysis should be either typed or neatly written.
- all sheets of paper must be stapled, your name written on front.

You are encouraged to work with each other on the homeworks, but the codes and your writeups have to be your own.

Final Exam Date: Friday, May 11, 10am-12pm.