Math 571 Numerical Methods for Scientific Computing I Winter 1999

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• Office Hours after each class plus an email group.

• Text: P. G. Ciarlet, *Introduction to Numerical Linear Algebra and Optimisation*, Cambridge University Press.

• Prerequisites

1. Linear algebra at the level of Math 419 or Math 513.
2. Computer programming in any language, with Matlab given preference.

• Summary.

The course deals with numerical methods for solving linear systems of equations ($Ax{=}b$) and the eigenvalue problem ($Ax{=}\lambda x$). The material will largely be taken from chapters 1-6 of Ciarlet's book. There are four principal goals.

1. Discuss many, but not all, fundamental algorithms of practical importance.
2. Master the fundamental concepts needed to analyse these and other algorithms.
3. Perform computations to become familiar with the performance of the algorithms.
4. Study a variety of scientific problems requiring the solution of the two fundamental questions. In this regard systems that arise from discretizing elliptic boundary value problems by finite-difference and variational methods will be emphasized.

In winter 99 the following supplementary topics were covered. The book of Trefethen is a good reference.

5. Over and undetermined systems and their least squares implementations using Householder triangularization.
6. Backward stability analysis.

• Approximate Grading Policy:

Homework $\sim$ 40%
Midterm Exam $\sim$ 20%
Final Exam $\sim$ 40%

• Homework Policy:

The weekly assignments will include problems to be solved using a computer. A good online matlab tutorial is at

http://www.mines.utah.edu/gg_computer_seminar/matlab/matlab.html .

Homework problems sometimes appear on exams. Homework solutions are kept on reserve at the Media Union.