CSE6643/MATH6643, Numerical Linear Algebra, Spring 2014
Mon. Wed. 3:05-4:25 pm
Instr Center 105, Prof. Haesun Park

Prerequisites: Introductory Numerical Analysis and Linear Algebra background, or Permission of the instructor.

Instructor's Office Hours: Mon. 2-3 pm and by appointment, 1306 Klaus Advanced Computing Building, phone:404-385-2170

TA: Mr. Aftab Patel, aypatel@gatech.edu
TA Office Hours: Thu. 2-3 pm, 1343 Klaus Advanced Computing Building.

Class webpage: on t-square

Evaluation:
4 Homeworks (Some programming in MATLAB, Fortran, C, or C++. You may use other programming languages with the instructors permission): 12% each
Midterm Exam: 15% (March 5, Wednesday, in class, open books/notes)
Project: 12% (March 26, Wednesday: Project Proposal Presentations, April 16, Wednesday: Project Due, April 21, Monday: Project Poster Presentations)
Final Exam: 25% (April 30, Wednesday, 2:50pm - 5:40pm, Instr Center 105, open books/notes)

Textbook:
Required textbook: Matrix Computations 4/e by Golub & Van Loan, Johns Hopkins, 2012 (you may use an older version but I will refer to the section numbers and pages based on the 4th edition.)

Supplementary (you do not need to purchase these books):
Applied Numerical Linear Algebra by J.W. Demmel, SIAM, 1997
Lloyd N. Trefethen and David Bau, Numerical Linear Algebra, SIAM, 1997
Introduction to MATLAB for Engineers and Scientists, D.M. Etter, Prentice Hall, 1996

Topics

- Introduction (1 week):
  - Floating point arithmetic, source of errors
  - Subspace, basis, orthogonality, projections, norms, condition number
  - Numerical softwares, Floating point operation counts
- Systems of Linear Equations (3 weeks):
  - LU factorization and Pivoting
  - Perturbation analysis, Condition number
  - Symmetric positive definite and banded systems
  - Introduction to iterative methods for large sparse matrices
- Solving Linear Least Squares Problems (4 weeks):
  - Orthogonal transformation, QR decomposition, pivoting
  - Householder methods, Givens method, Gram-Schmidt methods

  - Singular value decomposition

- Introduction to Eigenvalue Problems (1 week):
  - Properties, Schur decomposition
  - Power and inverse power methods
- Symmetric Eigenvalue Decomposition (3 weeks):
  - QR algorithm
  - Jacobi method
- Special Topics (2 weeks): special lectures on the current topics of interests from data analytics where numerical linear algebra is foundational.

Timely handling of grade disputes: Disputes of grading on assignments, exams, and project must be discussed within one week of their return or grade posting. Should you find yourself having an issue with a grade, contact the TA first. After you talk with your TA, if you are not satisfied you may contact the course instructor.

Late Work and Missed Exam Policy: Assignments must be turned in before the due date and time indicated to be considered "on-time". No late assignments will be accepted. There will be no makeups for missed exams. Any request for exceptions to this policy should be made in advance when at all possible. Requests should be due to incapacitating illness, emergency such as death in the family or something similarly serious, and should be accompanied by supporting documentation. Excuses such as not being aware of the exam will not be considered.

Email Policy for this Course: Please use your official Georgia Tech email accounts when sending emails to us. Please state CSE6643 or MATH6643 in the subject of your email! Technical questions in general should be addressed in person, e.g. during the TA and the instructor's office hours, and will not be answered by email.

Collaboration: Collaboration with other students in this class is allowed. The following guidelines will help you understand the difference between collaboration and plagiarism.

- Students may only collaborate with fellow students currently taking CSE6643/MATH6643, the TA's and the instructor. Collaboration means talking through problems, assisting with debugging, explaining a concept, etc. You should not exchange solutions/code or write solutions/code for others. You may collaborate but the final product has to be based on your work and unique.
- For collaborative project, you and your partner should turn in one assignment with both names on it.
- Your submission must not be substantially similar to another student's submission. Collaboration at a reasonable level will not result in substantially similar code. The instructor has the authority to determine whether any submissions are substantially similar.
- If you used any information from any books, papers, websites, then you should cite them.