UNIVERSITY OF WISCONSIN - MADISON

Computer Sciences Department

CS513, Spring 20

General Information

Course Name:

Numerical Linear Algebra

Lectures:

Time:	MWF 2:30-3:45	Place:	1221CS

Instructor:

Name:	Amos RON	Office:	CS7381
Phone:	262-6621	E-mail:	`amos@cs.wisc.edu`
Office Hours:	W 5-6, or by appoint.		

TAs:

Name:	Kartik Sreenivasan	Office:	CS5388
Office Hours:	R 16:30-17:30, F 9:30-10:30	E-mail:	`ksreenivasa2@wisc.edu`
Name:	Hugh (Yin) Liu	Office:	CS4237
Office Hours:	M 13-14, T 9-10	E-mail:	`yinl@cs.wisc.edu`

Text Book

Numerical Linear Algebra, L.N. Trefethen and D. Bau, SIAM, 1997. ISBN: 0898713617.
Recommended supplementary books:
Applied Numerical Linear Algebra, W. W. Hager, Prentice Hall.
An Introduction to Numerical Linear Algebra, C.G. Cullen, PWS, Boston.

Introduction

CS513 deals with **Numerical Algebra**, i.e., problems which are associated with linear systems of equations, matrices, determinants and other problems which can be reduced to such settings.

Syllabus

The main topics covered in this course are listed here. A detailed syllabus may appear at the web site.

`Matlab` overview, (Lec. 9), and discussion of machine precision (Lec.13)

Linear systems: Review of relevant properties of matrices as transformations (Lec.1) Norms of vectors and matrices (Lec.3) Orthogonal transformations (Lec.2)

Singular Value Decomposition (Lec.4)

Householder transformations (Lec.10), QR factorization (Lec.7) Least squares (overdetermined systems) (Lec.11)

Linear systems: LU factorization (Lec.20). Stability and conditioning (Lec.12,14). Pivoting (Lec. 21), complexity. Cholesky factorization.

Eigenvalue problems: the power method (Lec.25,27), the bisection method, and the QR method (Lec.28). SVD revisited (Lec.31)

Iterative methods (the exact syllabus here will be decided later).

Code

We will use *Matlab*. A `Matlab` primer (3rd. edition, by Sigmon) is found at our site. Introduction to `Matlab` is a part of this course. In general, the code is an important means to get numerical results. Bear in mind that interpreting correctly the output is at least as important as the quality of your program.

Machine

Student accounts will be accessible from any CS unix machine. Activate your account (may be done in different ways, for example online) ASAP, and familiarize yourself with the operating system, with an editor of your choice, and with `Matlab` (see above). Your account is already active (with the same `login` and `passwd`) if you are a CS major and/or you took a CS class last semester. The operating system is, essentially, *Unix*. In addition, you will need to use some editor. A comprehensive introduction to the editor `vi` (recommended if you had used that editor before), is available at our site on the web.

Class Account and class list

All information concerning this class is done via email, and via postings at our website. You should read your email frequently: at least once a day. Sending an e-mail message to
`compsci513-1-s20@lists.wisc.edu`
will send your message to the entire class, including the instructor and TAs. The messages are sent to your "preferred email address", which you may change/update via MyUW. Archives are available at `https://www-auth.cs.wisc.edu/lists/classes/` A valid CS username and password is required to access these archives.

Our website is at `www.cs.wisc.edu/~amos/cs513.html`
Most files are there `pdf`.

Assignments

Will be assigned on a fortnightly basis. There will be some shorter assignments that will be due a week after they are released. Due time will appear on each assignment.
Past due penalties apply as follows:

(1) Up to 6 class days (accumulated throughout the semester): no penalty.

(2) You loose 10% from the grade of the assignment for each day in excess of the 6 days above. The calculation is done for each assignment separately.

In this context "a class day" is each day when classes are held in UW. *Late assignments must be put in the TA's mailbox* (5th floor CS building). Once you deposited the assignment in the TA's mailbox, you need to send a message to the TA informing him on the submission. The timestamp of that message will be considered at the time of submission for the calculation of late days and grace days.

Save your grace days: you will not be granted further days even in case of a family emergency, or an illness. In particular, spending your grace days on the short assignments is, off-hand, unwise.

Grading Policy

One mid-term (35%), one final (40%), homework assignments (35%). Grades above 100 are considered as "A". All other grades are competitive. Final is comprehensive. No make-ups. Note: *the midterm is scheduled for Tuesday March 10 7:15-9:15.* Report on any conflict as soon as possible!

Scholastic Dishonesty

There will be a strict adherence to UW rules if such matters arise. I stress that a disclosure of any part of your written assignment to another student is considered a breach.

Prerequisites

The formal prereq. are math 340 and CS 302. In any case a good background in linear algebra is essential for your success in this course (yet doesn't guarantee this success...)