MA 580, section 001, Fall 2011

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WWW		http://www4.ncsu.edu/~ ctk/ (Tim) http://www4.ncsu.edu/~ ctk/ma580.html (Course) http://www4.ncsu.edu/~ ctk/MA580_Rules (This document)
Books:		Applied Numerical Linear Algebra, Demmel, SIAM 1997 Iterative Methods for Linear and Nonlinear Equations, Kelley, SIAM 1995 [3] (free download)

Prequisites. MA 580 is the introductory graduate course in numerical analysis. The topics covered in the course are numerical linear algebra and numerical solution of nonlinear equations. The required texts are [1] (at the bookstore) and a handout on iterative methods which you'll get in November.

Prerequisites for this course are knowledge of linear algebra, matrix theory, and advanced calculus at the undergraduate levels, and good programming skills. A good reference for the linear algebra background is [4].

This is not a programming course, and if you have no programming experience you should not be in this course. I expect that you are able to write, debug, and document your codes. Your grades on the programming assignments will not only reflect the correctness of your results, but also the readability of your programs.

Computing. It is your responsibility to become familiar with the NCSU computing environment. I will distribute most thing by email and prefer to receive homework electronically.

You must do all your computing in MATLAB. This environment is very convenient for this kind of course and allows you to get things running quickly. A good introduction to MATLAB is the MATLAB Primer, which you can download from the web page (old edition) or buy [5]. A **REALLY GOOD** introduction to programming in MATLAB is [2]. You should begin working through the MATLAB primer **TODAY**. You may obtain a postscript form of the MATLAB primer from the course web page.

The MATLAB environment has much of the code we'll need built in. Should you pursue advanced work in numerical analysis, you'll probably have to become proficient in FORTRAN or C sooner or later, but this course is not the place to do that.

The computing environment for this course are the workstations in the university. It is your responsibility to learn to use this environment. There are consultants in the computing center and some of the campus labs who can help, but if you take the time to play with it, you should get up to speed quickly. I'd suggest that you learn to use some form of TEX, as we insist that **all homework and writeups for the programming assignments be typeset**. If you prefer word, that's ok, but getting equations in there is no fun. You must also learn how to download files, use electronic mail, an editor, and a language. You can get started with LATEX by using the file sample.tex from the course web page.

I expect most of you to be familiar with the campus workstations and those of you who are not to learn the basics within a week. This requires sitting in front of a machine and playing. Problems with downloading, printing postscript files, TEX, and the language environments should be taken up with the consultants. There is no time for that in the context of this course. You should download and print the matlab primer, send me your e-mail address, download and print the sample.tex file, and begin learning MATLAB immediately.

Grades, Homework, Tests. Your grade is determined by 2.5 in class exams (250 pts.), homework and programs (100 pts.) and a final examination (200pts.) Homework will be assigned at least two weeks before it is due. You are expected to begin work on the homework immediately. I am willing to discuss homework in class if the questions come early enough. Since you'll begin your homework early and will be prepared, **no late homework will be accepted.** At the end of the term your total will be translated into a letter on the usual 90%, 80%, etc. basis at the very worst. I may

lower the cutoffs for some letter grades if one or more tests turn out to be more difficult than I anticipated. Under no circumstances will any grade $\leq 50\%$ be other than F.

I encourage you to **collaborate on the homework**. You may turn in assignments jointly, putting each participant's name on the paper. By doing this you are telling me that each participant contributed to the assignment. The in-class tests are to be done individually. There may be no more than five people on a team. It is your responsibility to make sure that you understand all parts of the homework done by your team. If you don't, I'll find out on the test!

It is my understanding that your signature on a test or assignment means that you neither gave nor received unauthorized aid. Your are responsible for understanding and following the university policy on academic integrity: `http://www.ncsu.edu/provost/academic_policies/integrity/reg.htm`.

READ THIS PARAGRAPH!! The first test (50 points) will be on Wednestay, August 31. The test will cover only the prerequisites. Dust off your calculus and linear algebra texts and your programming language manual. The purposes of this 50pt test are to let you know if your knowledge of the background material is sufficient and to force you to review so that you'll be ready for the good stuff that's coming up in the course. In calculus the topics will be computation of simple derivatives (including gradients) and integrals (including double integrals). Nothing will be more complicated than integration by parts. There will be no trick questions. In linear algebra the important concepts are matrix, vector, inner product, eigenvalue, eigenvector, solution of linear equations by elimination, determinants, matrix inverse, bases, orthogonality, and linear independence. You will be asked to compute things in very simple settings and to give some definitions. In terms of programming, I'll ask you to write a main program that calls some subroutines and/or functions. I'll be happy to accept MATLAB, FORTRAN, or C.

Topics covered in MA 580.

1. Introduction and Review: Chapter 1 of Demmel
2. Dense Linear Systems: Chapter 2 of Demmel
3. Lease Squares Problems: Chapter 3 of Demmel
4. Sparse Linear Systems: Chapter 6 of Demmel/Kelley's book.
5. Nonlinear Equations: Kelley's notes.
6. Eigenvalue Problems: Chapters 4 and 5 of Demmel

Things you need to do..

1. Learn to use the campus computing environment.
2. Learn to use your printers. get the MATLAB primer and from the course web page and print this postscript file.
3. Learn some form of TEX. I suggest LATEX because it's the best environment for thesis writing. Run sample.tex through LATEX and print out the formatted output.
4. Learn how to use MATLAB on the workstations.
5. Brush up on the prerequisites.
6. Start reading Chapter 1 in Demmel.

REFERENCES

[1] J. W. DEMMEL, *Applied Numerical Linear Algebra*, SIAM, Philadelphia, 1997.
[2] D. J. HIGHAM AND N. J. HIGHAM, *MATLAB Guide*, SIAM, Philadelphia, 2000.
[3] C. T. KELLEY, *Iterative Methods for Linear and Nonlinear Equations*, no. 16 in Frontiers in Applied Mathematics, SIAM, Philadelphia, 1995.
[4] C. D. MEYER, *Matrix Analysis and Applied Linear Algebra*, SIAM, Philadelphia, 2000.
[5] K. SIGMON AND T. A. DAVIS, *MATLAB Primer, Fourth Edition*, CRC Press, Boca Raton, FL, 6 ed., 2002.