UNIVERSITY OF DELAWARE
Mathematical Sciences Department
Math 426/Cisc 410 Introduction to Numerical Analysis and Algorithmic Computation, Fall 2008

Instructor: Dr. Richard J. Braun, Ewing 509, (302) 831-1869, `braun@math.udel.edu`, `http://www.math.udel.edu/~braun`.

Required text: *Foundations of Numerical Analysis: An Introduction Using Matlab* by T.A. Driscoll and R.J. Braun. The fist chapter will be handed out the first week; a bound version with all chapters for the remainder of the course will be available for $15 later (helps cover copying costs).

Software: This course is based on MATLAB and expect to use it frequently in class. Sources for help beyond the textbook will appear on the course web page.

Homework: Homework will be assigned in each class and will be graded (35% of final grade). These will include short programming assignments. Homework sets will be handed in roughly weekly; **they are due at the beginning of class on the due date.** Neatness counts; illegible work will earn a low grade.

Projects: At most 4 projects worth a total of 40% of the final grade. Projects will require significant computer work outside the class and a brief report. A premium will be placed on concise presentation and discussion of results.

Exam: On 50-minute exams will be given (13% of final grade) on the dates indicated below. This date will not change; the subjects on it will be adjusted if we don't maintain the tentative schedule and only subjects for which you have graded work returned to you will be on the exam. There will be no final exam; the final project may extend slightly into final exams, but I will try to avoid this.

Quizzes: I will give quizzes, most often announced and with variable worth, $\geq$ 10 times this semester. Total worth is 12% of the final grade. These quizzes may be about assigned reading in the text, solving a problem, giving definitions, etc. They may also include matlab work in class.

Grading: +/- grading will be used. Final grades will be based on the corresponding percentage of the total score: $A^- \geq 90\%$, $B^- \geq 80\%$, $C^- \geq 70\%$, $D^- \geq 60\%$, $F < 60\%$.

UNIX accounts: You should be members of a project group identified by the number **2039**. Before you start working on projects for this class do not forget to enter `newgrp 2039` after you login to *strauss* or *mahler*.

Rules for Exams: Absolutely no make-up tests will be given except where mandated by university rules. If a make-up exam is approved, the grade for the missing test will be taken to be the average of the grades from the other exams.

Rules for Assignments: The following rules apply to both homeworks and computer assignments:

- More than one page that you turn in must be stapled. The first page must be clearly labeled with your name, a title that distinguishes it from any other assignment (e.g., "Math 426–First project"), and the due date.
- Late work will not be accepted unless arrangements have been made with me before the due date.
- Answers should be well-documented and solution steps sufficiently described. *Do not give me long printouts of raw data or numbers that waste paper and contribute little or nothing to the assignment.*
- Unless otherwise indicated, all programming and project assignments are to be done independently. The problems and projects you hand in must be your own work and must not be copied from others. For complete information about University policies relating to academic honesty, read the online Student Handbook at `http://www.udel.edu/stuguide/08-09/code.html#honesty`.

The computer classroom: You will be required to use the generic student account when you are working on the Apple Macs in the computer classroom. It is local to each machine, but anything stored there is destroyed when you log out. You will therefore need to save it by one of the following methods: a USB key, mail files to yourself, or transfer the file(s) to another machine where you can store them. The USB key (memory stick, etc.) may be the easiest, but I will show you how to transfer files to the campus servers.

Email policy:

- I expect to check email twice daily for this class; I'll respond as soon as I can.
- I will respond in a timely and polite way if your email begins with a salutation, asks your question courteously (please and thank you, e.g.), and you close the email by signing it.
- Some questions are much more easily answered in person and I may encourage you to visit my office, so don't wait until late the night before the homework is due.

Advice for succeeding in this class:

- Do the homework and projects. You get practice using the ideas and solving problems; the value of this is far more than just the points awarded.
- Keep up with the class. Later topics depend on earlier ones.
- Study for the test by solving problems; you need to solve problems to do well.

Remarks: Information about homeworks, solutions to exercises and additional materials (e.g., handouts, demos from class) will be available at `http://www.math.udel.edu/~braun/`.

MATH 426/CISC 410 08F TOPICS COVERED – TENTATIVE SCHEDULE

Week	Date	Lecture	Topic	Textbook section
1	WE 9/3	1	MATLAB: Vectors, matrices, plots, etc	Matlab
1	FR 9/5	2	MATLAB: Scripts, functions, etc	Matlab
2	MO 9/8	-	MATLAB: Background, computation	1.1, 1.2
2	WE 9/10	3	MATLAB: Algorithms, Errors	1.3, 1.4
2	FR 9/12	4	Errors, conditioning, stability	1.4-1.6
3	MO 9/15	5	Linear algebra, triangular systems	2.1, 2.2
3	WE 9/17	6	Triang Sys, Gaussian Elim & LU fact	2.2, 2.3
3	FR 9/19	7	GE & LU, operation count	2.3, 2.4
4	MO 9/22	8	Pivoting	2.5
4	WE 9/24	9	Norms, conditioning and stability	2.6, 2.7
4	FR 9/26	10	Stability, special matrices	2.7, 2.8
5	MO 9/29	11	Linear systems	Ch 2, Matlab
5	WE 10/1	12	Linear least squares	3.1
5	FR 10/3	13	Normal eqns, orthogonality	3.2
6	MO 10/6	14	QR factorization	3.3
6	WE 10/8	15	Conditioning and stability	3.4
6	FR 10/10	16	Eigenvalues	4.1
7	MO 10/13	17	Conditioning, Schur decomposition	4.2
7	WE 10/15	18	QR iteration	4.3
7	FR 10/17	19	Shifting and deflation	4.4
8	MO 10/20	20	Hessenberg reduction	4.5
8	WE 10/22	21	Singular value decomposition	4.6
8	FR 10/24	22	SVD	4.6
9	MO 10/27	23	Sparse matrices, fill in, power iteration	5.1, 5.2
9	WE 10/29	24	Power and inverse iteration	5.2, 5.3
9	FR 10/31	–	Krylov subspaces, Arnoldi iteration	5.3
10	MO 11/3	25	Applications of Arnoldi iteration	5.4
10	WE 11/5	26	Practical considerations	5.5
10	FR 11/7	27	Newton's method	6.1
11	MO 11/10	28	Quasi-Newton methods	6.2
11	WE 11/12	29	Bracketing methods	6.3
11	FR 11/14	30	Combined methods	6.3
12	MO 11/17	31	Fixed Point iteration	6.4
12	WE 11/19	32	Systems of nonlinear eqns	6.5
12	FR 11/21	33	Review	
13	MO 11/24	34	**Exam**	**up to 6.4**
13	WE 11/26	–	**No Lecture–Happy Thanksgiving**	–
13	FR 11/28	–	**No Lecture–Happy Thanksgiving**	–
14	MO 12/1	35	Newton's method for systems	6.6
14	WE 12/3	36	Newton's method for systems	6.6
14	FR 12/5	37	Quasi-Newton methods for systems, Applications	6.6
15	MO 12/8	38	Applications, Matlab	6.6
15	WE 12/10	39	Applications, Matlab	6.6
15/16	WE 12/12	–	**No final exam will be given**	–