

Syllabus
Math 630, Section 01: Numerical Linear Algebra
Spring 2012, MW 4:00–5:15 pm, Sondheim 205

Instructor: Dr. Minkoff

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Office Hours: Monday and Wednesday 2:30–3:30 pm or by appointment.

Prerequisite: A working knowledge of a high-level programming language such as C or Fortran, or Matlab. Note that we will be using Matlab exclusively in this course. Even if you have not had exposure to Matlab previously, you will have time to master the basics of the language by working on the homework assignments.

Texts — Required: *Fundamentals of Matrix Computations*, 3rd Edition, by Watkins. Publisher: Wiley-Interscience, 2010.

Additional References: (1) *Numerical Linear Algebra* by Trefethen and Bau. Publisher: SIAM, 1997. (2) *Matrix Computations* by Golub and Van Loan. Publisher: The Johns Hopkins University Press. (3) *Mastering MATLAB*, by Hanselman and Littlefield. Publisher: Prentice Hall, Inc.

Grades:

Homework	30%
Midterm Exam	35%
Final Exam	35%
Total	100%

Homework and computer assignments: There will be one homework (which may include paper and pencil and/or computer work) due every week on Wednesdays. Homework is to be turned in at the START of class on Wednesday or can be slipped under my office door *prior* to class on Wednesday if you must miss class for some reason. *Late homework will not be accepted.*

Please note that the homework constitutes a substantial portion of your overall grade. In order to learn the concepts and be able to apply them to solving problems on exams, etc., you are strongly encouraged to devote as much time as possible to working the homework problems. I encourage you to discuss the homework assignments with other students in the class. However, I expect the homework you submit for grading to be written up by you alone (this includes computer programs which must not be duplicates of programs other students turn in).

Tests: No make-up exams will be given except *possibly* in the case of a serious emergency. In such a case I *must* be notified *in advance*. There will be no exceptions to taking the final exam at the date, time, and place specified by the University. (Monday 5/14/12 from 3:30–5:30 pm in Sondheim 205). The final exam will be comprehensive although material covered after the midterm will be emphasized.

Learning Goals and Course Motivation: Numerical Linear Algebra is a graduate subject intended to teach you how best to solve large linear systems and to find eigenvalues of those systems. One of the most important reasons we are interested in solving large matrix systems is that most physical systems are modeled by differential equations. These differential equations usually cannot be solved by hand, and hence must be discretized and solved approximately on a computer. This discrete pde approximation reduces the problem to solution of a linear system (often with millions or even billions of unknowns). The small matrix systems one studies in undergraduate linear algebra (which can be solved using paper and pencil) are rarely encountered by scientists working on real application or engineering problems. *Your goal in this course is to gain insight into why solution of linear systems is so fundamental in applied mathematics. You will learn about a variety of tools that exist for solving linear systems and finding eigenvalues of these systems. Further you will be able to evaluate when a problem should be solved using a direct or iterative method and what the advantages, disadvantages, and costs are for these methods. Moreover, you will gain fundamental insight into the way in which error in data can corrupt your solution and, therefore, how much confidence you can place in the solution you obtain.*

Academic Conduct:

I take academic dishonesty *very seriously* and will not tolerate it in this class in any form. Academic misconduct includes willfully cheating on or giving aid during an exam or copying homework assignments (computer or paper and pencil). Blatant copying on an exam, homework assignment, or computer assignment will result in a grade of zero for that work.

The university now stipulates that the following be included in all class syllabi:

By enrolling in this course, each student assumes the responsibility of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal.

To read the full Student Academic Conduct Policy, consult the *UMBC Student Handbook*, the *Faculty Handbook*, the *UMBC Integrity webpage* www.umbc.edu/integrity, or the *Graduate School website* www.umbc.edu/gradschool.

Class Attendance: I expect students to attend class and to turn up **on time**. Rarely do students do well in classes which they do not attend, and I will be less likely to give outside assistance to students who regularly miss class. Further, students arriving late for class disrupt

the entire class. Students who consistently turn up more than a few minutes late for class or who regularly miss class may be docked points from their final grade. Students should also note that I do not allow cell phones, laptops or other electronic devices to be used in class and will ask that these items be turned off at the start of class.

Email: I am happy to answer questions about the class via email. However, it is much better for you if we can talk in my office at the board. Answers given over email will be brief and intended merely to answer your direct question rather than to explain concepts. I reserve the right not to respond to email if I feel it would be best for the student to discuss his/her question in person during my office hours. I will not respond to email which does not include the name of the sender.

Tips for Succeeding in this Class:

1. The textbook is intended to *supplement* in class lectures (and vice versa) so if you attend class but do not read the appropriate section in the book you will miss out on a wealth of good information and on an alternate view of the material. The text is an invaluable resource as it acts as a second teacher and as a reference point when topics are unclear.
2. Before you attempt the homework you should *read the sections* in the book which explain the concepts covered in the homework.
3. You will benefit greatly from working with others in the class so long as you use your peers as a way to hash over concepts and not a way to “get the answers”. In other words, *start early* and use your fellow-classmates to discuss the best way to approach the problems. Then go off and try to work out the details yourself.
4. **Begin the new homework assignment the same day you turn in the previous assignment!** Do not wait 3–4 days to start the homework as then you will not have enough time to digest the material or understand the point of the problems. Starting early is especially important for the computer homework. You must start the programming assignments as early as possible. If your code does not give output (i.e., does not run) you will lose at least half the points for that problem.
5. Come to office hours and get help if you are stuck. It is much better to get help early than to wait. I may ask you to show me what you’ve come up with at the board so you should have at least attempted the homework problems before asking for help.
6. If you have not previously used Matlab you will need to start playing with the software the first week of class. There are good tutorial pages at <http://www.umbc.edu/circ/workshops/matlab.html>.

Important Dates:

Date	Notes
1/30/12	First day of class
2/8/12	Last day to add course
2/8/12	Last day to drop class (without “W” on transcript)
3/14/12	Midterm Exam
4/16/12	Absolute Last day to drop class
5/11/12	Last day of classes
5/14/12	Final Exam