Math 371 Numerical Methods for Engineers Winter 2013

Section 1: TuTh 12-1:30pm, 2166 Dow
Instructor: Robert Krasny, 4830 East Hall, (734)-763-3505, krasny@umich.edu
office hours: Tu 3-4pm, W 3-5pm

Section 2: TuTh 12-1:30pm, 1033 EECS
Instructor: Li Wang, 4823 East Hall, (734)-763-1181, wangbao@umich.edu
office hours: F 10-12pm, and by appointment

Prerequisites: Math 216 or Math 256, Engin 101, familiarity with Matlab

Course Website: www.math.lsa.umich.edu/∼krasny/math371.html

Textbook: There is no required textbook. Instead, lecture notes will be posted on the course website after each class. For supplementary reading, the following options are recommended.

1. "Numerical Computing with Matlab", by Cleve Moler, SIAM, ISBN: 0-89871-560-1

   1a. a copy may be purchased from SIAM: ec-securehost.com/SIAM/ot87.html

   1b. a free copy is available at the MathWorks: www.mathworks.com/moler/chapters.html

2. "Numerical Methods", by Germund Dahlquist and Åke Björk, Dover, ISBN: 0486428079, this book can be purchased at store.doverpublications.com/0486428079.html

3. "A Friendly Introduction to Numerical Analysis", by Brian Bradie, Prentice Hall, ISBN: 0-13-013054-0, there should be inexpensive used copies available in local bookstores or online booksellers

Description: Scientific problems were traditionally studied by experiment and theory, but now computer simulations are also used in many fields. Examples include airplane design, weather prediction, and modeling the cooling system of a nuclear reactor. Math 371 presents a survey of the basic numerical methods used in computer simulations. There is software that can be used as a black box, but in this course we'll look under the hood and see how the methods work.

Syllabus

1. finite precision arithmetic, finite-difference approximation of a derivative
2. solving nonlinear equations, root-finding
3. numerical linear algebra, finite-difference schemes for boundary value problems
4. eigenvalues
5. polynomial and spline interpolation
6. numerical integration
7. time-dependent ordinary and partial differential equations

Grading: two quizzes = 10%, midterm exam = 20%, final exam = 35%, homework = 35%

Midterm Exam: Thursday, February 28, in class

Final Exam: Wednesday, May 1, 1:30-3:30pm, room tba

Homework : Homework will be assigned every 1-2 weeks. Students are encouraged to discuss the problems with each other, but each student should write up their own solutions. The presentation should be neat and legible. Please staple the sheets together. Some MATLAB exercises will be assigned.

Class Policies

1. Questions are encouraged in class (and outside class too). If you have a question about the lecture, or a problem doing the homework, ask the instructor for help.
2. Please - no cellphones, eating, web surfing, or reading newspapers in class. Thank you!