MATH 471, Fall 2010, Introduction to Numerical Methods, Section 002

Instructor: Weihua Geng, 1832 East Hall, (734)-936-4051, geng@umich.edu

Class Time/Location: MWF 2:00pm-3:00pm, 1084 East Hall

Office Hours: MWF 3:00pm-4:00pm or by appointment at my office


Prerequisites: Math 216 or Math 256, Engin 101

Course Website: http://www.umich.edu/~geng/teaching/math471_f10.html

Course Preface: Scientific problems were traditionally studied using theory and experiment, but now computer simulations are also used in many fields. Some examples include airplane design, weather prediction, and modeling the cooling system of a nuclear reactor. Math 471 presents a survey of basic numerical methods used in computer simulations and we’ll study the accuracy, stability, and efficiency of several methods. Of course there are software packages that can be used as a black box, but in this course we’ll look under the hood and see how the methods work. At the later stage of the class, we will extend our study to some newly emerging scientific computing concepts and practices.

Course Goals for the Students:
1. learn numerical methods used in engineering and science
2. practice programming of numerical methods
3. reinforce math learned in previous courses (calculus, differential equations, linear algebra)

Course Coverage:
- floating-point arithmetic (1.3-1.4)
- nonlinear equations and root-finding (2.1-2.7)
- numerical linear algebra (3.1-3.10)
- two-point boundary value problems (8.1-8.2)
- two-dimensional boundary value problems (9.1)
- eigenvalues (4.1-4.2)
- polynomial and spline interpolation (5.1-5.7)
- numerical integration (6.3-6.7)
- initial value problems for ordinary differential equations (7.1-7.5)
- Introduction to parallel computing: MPI, Open MP, GPU etc. (if time permits)

Final Exam: Wed. Dec. 15, 1:30 pm - 3:30 pm at regular classroom

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

Homework:
There will be homework assignments every 1-2 weeks. Students are encouraged to discuss the problems with each other. Students have the option to submit homework individually or form a team consisting of two people who submit one writeup for grading (include both names on the writeup). The presentation should be neat and legible. Please staple the sheets together.

Other 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, reading newspapers, or web surfing in class. Thank you!