Math 471, Fall 2013, Section 001

Instructor: Peter Bosler, 4823 East Hall, pbosler@umich.edu
Class Time / Location: Tu & Thu, 8 AM – 9:30 AM, 1123 LBME
Office Hours: W 3-4PM, F 11AM-12PM, and by appointment

Prerequisites: Differential equations (e.g. Math 216, 256, 286, or 316).
Linear algebra (e.g. Math 217, 417, or 419).

Course Website: www-personal.umich.edu/~pbosler/teaching/math-471-sec-001-fall-2013.html

Math 471 is a survey of numerical methods for science and engineering. A numerical method is an algorithm, or sequence of steps, for solving a set of equations. These can be linear equations, nonlinear equations, or differential equations. We will study the accuracy, stability, and efficiency of some of the basic methods.

Scientific problems were traditionally investigated by theory and experiment, but now computer simulations are increasingly relied upon for such problems as airplane design, weather forecasting, modeling the spread of diseases, and improving the efficiency of solar cells, to name just a few examples. Many models are solved by software packages that act as numerical “black boxes,” outputting model solutions for user-supplied input data. In this course we will examine the methods that provide the foundations for those software packages.

Syllabus:
- floating-point arithmetic
- nonlinear equations and root-finding
- numerical linear algebra
- two-point boundary value problems
- Poisson equations with Dirichlet boundary conditions
- eigenvalues
- polynomial and spline interpolation
- numerical integration
- initial value problems and ordinary differential equations

Exams:
- Midterm Exam: Thursday, October 31, in class
- Final Exam: Friday, December 13, 10:30 AM – 12:30 PM, room tba

Grading Policy: midterm = 20%, final exam = 40%, homework = 40%

Homework Policy: Homework will be assigned every 1–2 weeks. Some problems will require programming, for which Matlab is recommended. Students are encouraged to discuss the problems with each other, but each student must write up and submit his or her own solution set. This includes Matlab code—copying/pasting other students’ work is not allowed. Presentation must be neat and legible, and multiple sheets must be stapled. Loose papers will not be accepted.

Other policies:
1. Questions are encouraged in class (and outside of class too–use email or office hours).
2. Please – keep your electronic devices on silent. No texting, web surfing, etc., during class.