MA/CS/EGR 537-002 · Numerical Analysis

Spring 2015 · University of Kentucky

Lectures: MWF 11:00AM - 11:50AM , Patterson Office Tower Room 09

Web Site: http://www.as.uky.edu/~rlca238/ma537

Instructor: Russell Carden (*russell.l.carden@uky.edu*)
Patterson Office Tower 827, 257-5746

Office Hours: MWF 10:00AM - 11:00AM, 12:00PM - 3:00PM , or by appointment. I will not be available Tuesday afternoons or Thursday 10:30AM - 1:00PM

Prerequisites: Good knowledge of Linear Algebra, Calculus(I,II,III) and Differential Equations.
Experience with a programming language: Matlab/Octave, C/C++, Java, Python.

Grading: There will be a total of fifty problems assigned for the semester. Each problem will be worth ten points. Ten of the problems will come from the two mid-terms and the final. Homework and exams will account for for ≈80% and ≈20% of the final grade. Attendance will be taken into consideration in determining the final grade. Grades will be posted in Canvas.

Assignments: I will assign three to four problems each week. You may collaborate on the problems, but your write-up must be your own independent work. Assignments will be accepted through Canvas as well as in class. Solutions to assignments will be posted prior to exams.

Late Policy: An assignment is considered late, if it is not turned in either in class or through Canvas on or before the due date. You may turn in two problem sets one class period late without penalty. The instructor reserves the right to penalize all subsequent late assignments at most 20%.

Text: Walter Gautschi, *Numerical Analysis*, 2nd edition

Suggested Reading: Atkinson, *An Introduction to Numerical Analysis*
Süli & Mayers, *An Introduction to Numerical Analysis*
Stewart, *Afternotes on Numerical Analysis*
Greenbaum & Chartier,*Numerical Methods*
Kincaid & Cheney, *Numerical Analysis: Mathematics of Scientific Computing*
Atkinson & Han, *Elementary Numerical Analysis*
Moler, *Numerical Computing with MATLAB* (Free online)
Higham & Higham, *MATLAB Guide*

Programming: Utilizing the algorithms discussed in the course, can be facilitated immensely by using some sort of programming environment. You are encouraged to use whichever language you prefer. Examples from class will be either done in JavaScript, Google Sheets or Matlab.

Outline: The goal of this course is to introduce participants to some of the most basic and important methods for numerically solving problems of continuous mathematics. There are six topics:

- Error Analysis: Floating Point arithmetic, Conditioning, Cancellation
- Approximation of Functions: Least Squares and Orthogonal Polynomials, Best Approximation
- Interpolation: Lagrange, Newton, Hermite, Numerical Differentiation
- Numerical Integration: Piecewise polynomial, Newton-Cotes, Gaussian Quadrature, Romberg Integration, Peano-Kernel Analysis
- Rootfinding: Bisection, Newton, Secant Method, Fixed Point Iteration
- Numerical Methods for Differential Equations: Multistep Methods, Initial Value problems, Boundary Value Problem

Any student with a disability requiring accommodation in this course are encouraged contact the Disability Resource Center during the first week of class.

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