

# MA/CS 321-001 · Introduction to Numerical Methods

Fall 2014 · University of Kentucky

Lectures: MWF 11:00AM - 11:50AM , Funkhouser Biological Sciences Building Room 213

Web Site: <http://www.as.uky.edu/~rlca238/ma321>

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Office Hours: TBD

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 major topics:

- Error Analysis: Floating Point arithmetic, Conditioning, Cancellation
- Rootfinding: Bisection, Newton, Secant Method
- Interpolation and Approximation: Lagrange, Newton, Splines
- Numerical Integration and Differentiation: Trapezoid Rule, Simpson's Rule, Gaussian Quadrature
- Numerical Linear Algebra: LU factorization, Eigenvalues, Least Squares
- Numerical Methods for Differential Equations: Euler's Method, Numerical Stability, Multistep Methods, Partial Differential Equations

Prerequisites: Calculus , Basic Linear Algebra (matrix addition and multiplication, Gaussian elimination) and Differential Equations. Experience with a programming language such as Matlab/Octave, C/C++, Java, Python.

Grading: 55% problem sets, Three exams worth 15% each. (Class participation and improving performance on the exams will be considered when assigning borderline grades.)

Problem Sets: There will be weekly problem problem sets, each will involve some computational exercises. You may collaborate on the problems, but your write-up and your programs must be your own independent work. A problem sets grade may be based on all or a subset of the assigned problems. Problem sets must be turned in through blackboard.

Exams: Three timed, closed-book exams will each account for 15% of the final grade. The first will take place in early October, the second during early November, and third during the final exam period.

Textbook: *Elementary Numerical Analysis* by Kendall E. Atkinson and Weimin Han

Suggested Reading: Cleve Moler, *Numerical Computing with MATLAB*  
D. J. Higham & N. J. Higham, *MATLAB Guide*  
Check the course web site for additional suggestions.

Programming: Most homework assignments will require some programming. Your solutions should adhere to good programming standards, and must not be copied from online or other students.

Classroom Decorum: Students are expected to be attentive and courteous during class. During class, please put away newspapers, turn off cell phones, and refrain from using laptops or other electronic devices except for note-taking purposes.

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