Math 104A: Introduction to Numerical Analysis Winter 2019

INSTRUCTOR Paul J. Atzberger
http://atzberger.org/teaching
Office Hours: TR 9:15am – 10:45am

Department of Mathematics
Office: 6712 South Hall
Office Hours Location: TR: 6712 South Hall;

CLASS TIMES TR 8:00am – 9:15am.
Phelps 1425

DESCRIPTION Computational approaches play an important role in many fields ranging from basic scientific research to engineering to finance to machine learning and data analytics. This class will discuss both the mathematical foundations and the practical implementation of modern numerical methods. Examples also will be discussed from related applications areas. More information can be found on the course website.

PREREQUISITES Calculus, Linear Algebra, Differential Equations, and experience programming.

TEXTBOOKS *Numerical Analysis 10th Edition* by R. L. Burden and J. D. Faires.

GRADING

Homework	30%
Midterm	30%
Final Exam / Project	40%

POLICIES Assignments will be assigned in class and posted on the course website. Prompt submission of homeworks will be required. While no late homework will be accepted, one missed homework will be allowed without penalty. While it is permissible for you to discuss materials with classmates, the submitted homework must be your own work.

There is a policy of no video or pictures to be taken during lectures. Instead one should take notes or pay particular attention. There is also a policy of no texting, e-mailing, or social media during the class. It is hoped one is avoiding such distractions to make the most of the lectures.

EXAMS A midterm exam will be on Tuesday, February 12.
Final exam/project.

TOPICS

- Introduction to Numerical Computation
- Floating Point Number Representation
- Round-off Error
- Algorithms and Convergence
- Catastrophes Caused by Errors in Numerical Algorithms
- Finding Zeros of Equations (Bisection, Newton's Method)
- Interpolation Methods
- Numerical Differentiation
- Numerical Integration

- Adaptive Quadratures
- Initial Value Problems for ODE's
- Euler's Method
- Higher-Order Methods (Explicit / Implicit)
- Multistep Methods
- Stability
- Stiff Differential Equations
- Application Areas
    - Statistical Inference and Machine Learning
    - Approaches in Data Science
    - Computer Graphics and Visualization
    - Financial Modeling and Economics
    - Simulation in Engineering and the Sciences

WEBSITE http://atzberger.org/teaching