Math 104A: Introduction to Numerical Analysis Fall 2021

INSTRUCTOR Paul J. Atzberger
http://atzberger.org/

Office Hours: TR 12:15pm – 1:45pm
Location: see course website.

CLASS TIMES TR 11:00am – 12:15pm

DESCRIPTION Numerical approaches play an important role in many fields including in scientific research, engineering, finance, machine learning, and data analysis. This class will discuss both mathematical foundations and practical use 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 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 and 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 class.

EXAMS A midterm exam will be on Tuesday, October 26.

TOPICS Sample of 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
- See the website for additional topics and information.

WEBSITE http://teaching.atzberger.org/