Math 104C: Introduction to Numerical Analysis Spring 2015

INSTRUCTOR Paul J. Atzberger
http://atzberger.org/#Teaching
Office: 6712 South Hall
Office Hours: TR 9:30am – 11:00am

CLASS TIMES TR 11:00am – 12:15pm.
GIRV 1115.

TA HOURS John Kaminsky, Tuesdays, 4:00pm-5:00pm in South Hall 6432T (graduate tower).
Mondays, 5:00pm-7:00pm in Mathlab, South Hall (ground floor).

DESCRIPTION Computational approaches play an important role in many fields ranging from basic scientific research to the design of financial products. This class will discuss both the mathematical foundations and the practical implementation of modern numerical methods. Examples will also be discussed from applications areas. More information is on the website.

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

TEXTBOOKS *Numerical Analysis 9th Edition* by R. L. Burden and J. D. Faires.

GRADING

Homework	30%
Midterm	30%
Take-home Final Exam	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.

EXAMS A midterm exam will be on Tuesday, April 21st.
Final exam/project will be at the end of the quarter.

TOPICS Boundary Value Problems for Ordinary Differential Equations (ODEs)

- Linear Problems
- Iterative Methods
- Non-linear Problems
- Steepest Descent
- Newton Methods for Systems
- Shooting Methods
- Rayleigh-Ritz Method

Eigenvalue Methods

- Linear Algebra Background
- Standard Forms
- Geršgorin Theorem

- Power Method
- Householder's Method
- QR Decomposition and Algorithm
- Singular Value Decomposition (SVD)

Solving Partial Differential Equations (PDEs)

- Parabolic PDEs
- Elliptic PDEs
- Hyperbolic PDEs
- Finite Difference Methods
- Crank-Nicolson Method
- Lax-Wendroff Method
- Consistency, Accuracy, Stability of Methods
- Courant–Friedrichs–Lewy (CFL) Condition
- Lax–Richtmyer Theorem
- Finite Element Methods
- Lagrange and Hermite Elements
- Lax–Milgram Theorem

WEBSITE http://atzberger.org/#Teaching