Math 4640 Syllabus

Numerical Analysis I, A/AU/AG, 3 credits

Fall 2026

Instructor Information

Instructor: Haomin Zhou

Email: hmzhou@math.gatech.edu

General Course Information

Description

This course introduces fundamental concepts in numerical analysis, such as floating-point operations, function approximation, and error analysis. It covers some basic algorithms in computational mathematics, including numerical differentiation, integration, orthogonal polynomials, the Fourier transform, Gaussian elimination with pivoting, and power iteration for eigenvalue problems. The course helps students develop an understanding of foundational issues in scientific computation.

Course Learning Outcomes

After completing this course, students will be able to:

- Conduct error analysis for basic numerical algorithms.
- Implement numerical methods, including those for function approximation, numerical differentiation and integration, linear systems of equations, and eigenvalue problems.
- Select appropriate computational methods to solve complex scientific computation problems.

Required Course Materials

There is no required textbook for this course. The course is based on lecture notes that are collected from different books or research papers. Here are some references:

- *An Introduction to Numerical Analysis (Second Edition)*, by Kendall Atkinson, published by John Wiley and Sons.
- Elementary Numerical Analysis (3rd Edition), by S. Conte and C. de Boor, published by McGraw- Hill.
- Numerical Analysis: Mathematics of Scientific Computing (3rd Edition), by D. Kincaid and W. Cheney, published by Brooks/Cole.
- A First Course in Numerical Analysis, U. Ascher and C. Greif, SIAM.

Grading Policy:

Grades will be assigned on the following basis:

- Homework: 40% (4 assignments, 10% each)
- Midterms: 30% (best 2 out of the 3 midterms, 15% each)
- Final exam: 30%

The combined scores may be curved at the end of the semester if necessary (determined by the instructor).

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

Regrade requests should be made within 2 weeks of grades being released.

Description of Graded Components

The coursework involves lectures, readings, homework assignments, and exams. The lectures will focus on introducing theoretical concepts and analysis skills, basic numerical methods, and implementation-related issues. Students will learn essential methods and tools, as well as their applications. The course content will be accompanied by homework assignments that encourage students to gain hands-on experience in programming, mathematical modeling, algorithm analysis, and computer simulations.

Homework: There will be four homework assignments that include mathematical problems, programming problems, and conceptual questions. Homework assignments encourage students to gain hands-on experience in programming, mathematical modeling, algorithm analysis, and computer simulations. Homework should be submitted on Canvas by 11:59 pm ET on the due date. No email submissions. The submissions must be well-organized and written.

Please double-check your homework submission to make sure it is complete (include all your answers) before submission. Before the deadline, you can submit as many times as you like (your grader will only review the last submission).

You can work together with other students on homework, as long as your write-up and solutions represent your work. You are also allowed (and encouraged) to ask the instruction team questions, but keep in mind that a good-faith effort to work through the material beforehand will often help you form good questions. Any academic misconduct is subject to an F grade as well as referral to the Dean of Students.

Homework accommodations: With prior approval from the instructor (requested before the deadline) for special reasons (such as emergency or institute-approved absence), homework may be submitted up to 2 days late without penalty. Otherwise, late work is not accepted. Additional extensions require documentation from the Dean of Students.

Midterms and Final: There will be three in-class midterm exams and a final exam. The exams will generally involve conceptual and mathematical problems, rather than programming.

Course Policies

Attendance and/or Participation

Everyone is expected to attend all lectures.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

No applicable.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment

to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

MATH 2403 or MATH 2413 or MATH 24X3 or MATH 2552 or MATH 2562 or MATH 25X2 or MATH 2603.

Extra Credit Opportunities

No extra credit is offered.

Collaboration, Group Work, and Use of Generative AI

You can work together with other students on homework, as long as your write-up and solutions represent your work. You are also allowed (and encouraged) to ask the instruction team questions, but keep in mind that a good-faith effort to work through the material beforehand will often help you form good questions. Any academic misconduct is subject to an F grade as well as referral to the Dean of Students.

In this course, the use of Generative AI tools is encouraged as part of your learning and creative process. These tools can support brainstorming, revising drafts, exploring alternative perspectives, and practicing communication with emerging technologies. However, responsible use is expected.

Generative AI tools are not allowed in tests, exams, and the theoretical parts of HW assignments and projects. Generative AL tools are only allowed for brainstorming and support tasks, such as grammar refinement and code assistance in submitted work, including projects and HW assignments. If AI tools are used, your submission must include a brief AI Usage Statement outlining:

- Which tools were used
- When they were used
- What prompts or questions were given
- How did the AI output inform or shape your final submission

You are expected to critically engage with any AI-generated content and ensure your final work reflects your own understanding and academic voice. Generative AI should never be used to fabricate data, cite non-existent sources, or bypass learning objectives. Use of Generative AI must comply with Georgia Tech's Honor Code and academic integrity guidelines.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Sometimes life circumstances arise that make it difficult to fulfill academic obligations. In these circumstances, you do not need to disclose details to the instructional team – instead, please seek a note from the Dean of Students (for personal issues or serious illness) or an institute-approved absence (for attending conferences, athletic events). For

absences due to religious observances, please let the instructor know within the first two weeks of the semester.

Additional homework extensions (beyond a 2-day extension) require a note from the Dean of Students. Rescheduling of in-class midterms and presentations requires an institute-approved absence or note from the Dean of Students. In general, there will be no makeup midterm given. If you must miss the midterm for any Institute-approved reason, please let the instructor know as far in advance as possible.

Inclement Weather and Digital Learning Days

We will follow the Georgia Tech Modified Operations Policy and Digital Learning Days Policy.

Student Use of Mobile Devices in the Classroom

Mobile devices, such as cell phones, are not allowed during tests and exams, unless permissions are obtained from the instructor.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness-related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)