Course Syllabus
MATH 315 - Section 2
Numerical Analysis
Fall 2025

Instructor: Jimena Martín Tempestti.

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Office: White Hall, Room 306.
Office Hours:

Tuesdays & Thursdays: 2:30 PM - 3:30 PM (In-person at White Hall, Room 310, or by request via Zoom).

Teaching Assistance: Caleb Fikes.

Email: cfikes@emory.edu
Office Hours: Wednesdays, 4 p.m. - 5 p.m., in person (White Hall 310)

Lectures: Math & Science Center - W301, Tuesdays and Thursdays, 1:00-2:15 pm

Labs: Math & Science Center - N306, 1:00-1:50 pm

Course Learning Outcomes

Upon successful completion of the course, students will be able to:

- Understand the representation and limitations of floating-point numbers in computing environments.
- Implement algorithms for the solution of linear systems using techniques such as Gauss elimination, LU decomposition with partial pivoting, and Cholesky factorization.
- Apply curve fitting methods to analyze and interpret data, including least squares regression and interpolation techniques.

- Utilize differentiation and integration algorithms to approximate derivatives and integrals numerically.
- Implement root-finding algorithms to locate zeros of functions efficiently.
- Apply univariate minimization techniques to find optimal solutions for single-variable functions.

Materials and Tools

- **Textbooks:**
  - Introduction to Scientific Computing using MATLAB by I. Gladwell, J. G. Nagy, and W. E. Ferguson, Jr.
  - Explorations in Numerical Analysis, Python Edition by Lambers et al.

  Numerical methods in engineering with Python 3 by Jaan Kiusalaas, 2013.
- **Course Page:** All course content will be hosted on Canvas. This includes homework assignments, exams, discussions, and more. All announcements will be made through Canvas. Additionally, uploading work and grading will be done through Canvas. For more information, visit https://canvas-support.emory.edu/.
- **Lecture Slides:** The slides are intended to be self-contained when students take notes and complete them during lectures. It is recommended to consult the referenced sources used in creating the slides for a deeper understanding. Complete versions of the slides will not be provided. In the event of an absence, lecture notes should be obtained from a classmate or by consulting the references.
- **Python:** We will primarily code in Python in this course.
- **AI Tools:** Students are permitted to use AI tools to assist in generating Python and LaTeX code. However, AI-generated content must be carefully reviewed for accuracy, as any conceptual errors in the code will result in 0 points for that portion of the assignment. Additionally, students must include a disclaimer statement indicating the use of AI.

  - **Example Disclaimer:**

    "The Python/LaTeX code provided in this submission was partially generated with the assistance of AI tools. The code has been reviewed and modified where necessary to ensure its correctness."

- **Calculators:** Calculators and other electronic technology will not be used for in-class graded activities or exams.

Course evaluation scheme

Type	Percentage	Details
Problem Sets	30%	Approximately 10 assignments, including homework and in-class assignments, with the lowest two grades dropped. No makeup assignments.
Lab Work	10%	Approximately 10 assignments, with the 2 lowest grades dropped. No makeup assignments.
Midterms	30%	2 exams, equally-weighted.
Final Exam	30%	Cumulative.

- **Problem Sets (30%)**

  Each week, you will be assigned problem sets covering a mix of numerical analysis and Python implementation, either to solve at home or during lecture hours. There will be **NO late submissions allowed** for any reason. Nonetheless, to account for unforeseen circumstances at the end of the semester, the lowest two assignment scores will be dropped.

  - **Homework**
    You will have the freedom to choose your groups for these assignments. For the first two homework assignments, you are allowed

to change groups if desired. However, starting from Homework 3 (including Homework 3), groups will be fixed. If you do not choose groups, they will be assigned randomly. You will work on these assignments in teams of 2-3 members. For group work, each team should develop one submission, which may include solutions to math problems, Python code, results from Python experiments, plots, etc. A single PDF document for each group should be uploaded to Canvas. Make sure your submissions are typeset and typed using LaTeX (i.e., not handwritten work embedded as an image). Homework will be graded based on completion, accuracy, and clarity of presentation. There will be approximately seven homework assignments due every week, excluding exam weeks and weeks with in-class activities. Homework is due on **Thursdays at 5:59 p.m.**.

  - **In-class Activities** Throughout the semester, we will have occasional in-class activities designed to deepen your understanding of course topics through guided practice. Some of these will be completed individually, while others will be collaborative. The expected format (individual or group) will be clearly specified each time. Group work is only allowed with students physically present in class that day—students not in attendance cannot participate or contribute remotely. These activities will be open-book, and you are welcome to ask the instructor for clarification during the activity. A topic will be announced in advance, and you are expected to read or review the relevant material beforehand to be prepared.

- **Lab Work (10%)**

  Attendance at your designated lab session each week is mandatory. Labs are designed to reinforce and extend your understanding of the material covered in class and to help identify and correct misconceptions early. Lab assignments will be graded based on completion, and each group of 2–3 students must submit one assignment per session.

  You may choose your group members each week from among the students present, but if no group is selected, one will be assigned to you. **Only students who are physically present during the lab session may participate and be listed on the submitted assign-**

ment. If a student is absent, they may not contribute to the lab work or receive credit for that week's submission.

In some sessions, you may be asked to answer multiple-choice questions instead of submitting a traditional lab report.

All lab assignments are **due at the end of the lab session**. There will be no makeup lab assignments. However, to account for unforeseen absences, the lowest three lab grades will be dropped. This policy is meant to accommodate unavoidable absences while encouraging consistent participation.

- **Exams (30% + 30%)**

  There will be two midterm exams and a final exam. The final exam will be cumulative with more emphasis on later material. All exams are timed and closed-book: no notes, books, or unnecessary electronic devices can be used. Currently, the exams are scheduled to be in-person. If exams must be given remotely, more details will be provided. Makeup midterms and final exams will be given only in extreme situations. You must notify the instructor at least two weeks before the midterm if you have a conflict or have a valid excuse verified by the Office of Undergraduate Education (OUE).

Grading Scale

		B+:	[87,90)	C+:	[77,80)	D+:	[67,70)		
A:	[93,100]	B:	[83,87)	C:	[73,77)	D:	[60,67)	F:	[0,60]
A-:	[90,93)	B-:	[80,83)	C-:	[70,73)				

COURSE POLICIES

Expectations Students are expected to participate actively during lectures and lab sessions, engaging with the material, asking questions, and contributing to discussions. In addition, you should learn from independent work, particularly from reading the textbook. Although all topics will be covered in class, it is not possible to cover them in the same detail as the textbook.

Communication

Canvas is the preferred way of communication for this course. Relevant course announcements and material will be shared through Canvas. Students should subscribe to those announcements. Students are encouraged to pose general questions on the Ask the Professor and other discussion boards. This policy aims at reducing response times (since other students can reply, too), and answers are useful to other students. Personal questions/comments/concerns should be emailed to the instructor and will be answered within one business day (if not, please assume your initial email was not received and send a follow-up).

Academic Integrity

The Honor Code is in effect throughout the semester. By taking this course, you affirm that it is a violation of the code to cheat on exams, to plagiarize, to deviate from the teacher's instructions about collaboration on work that is submitted for grades, to give false information to a faculty member, and to undertake any other form of academic misconduct. You agree that the instructor is entitled to move you to another seat during examinations, without explanation. You also affirm that if you witness others violating the code you have a duty to report them to the honor council.

Academic Integrity & Copyrights

Direct copying of solutions or parts of solutions from any source is a violation of the honor code, as is sharing your solutions with others. All exams are to be done without any assistance from anyone else. Your work is at all times governed by Emory's Undergraduate Honor System. Failure to follow these restrictions and giving or receiving unauthorized aid or assistance on any course assignment are Emory University Honor System violations. If you are unsure what online resources you are permitted to use, ask your instructor.

I take plagiarism and other forms of academic dishonesty seriously. Should I suspect that you engage in academic dishonesty in this course, I will refer the case to Emory's Honor Council. You may also receive an F on the assignment(s) in question.

[Here is the link to the Honor Council resource for faculty]

COURSE REQUIREMENTS AND SUGGESTIONS

Participation

The aim of this course is to offer a meaningful, rigorous, and rewarding experience to every student; you will build that rich experience by devoting your strongest available effort to this class. You will be challenged and supported. Please be prepared to take an active, patient, and generous role in your own learning and that of your classmates.

Code of Conduct and Attendance

Fostering an active and welcoming learning environment is crucial. Attendance is not required but strongly encouraged. If you miss a class, get a copy of the notes from one of your classmates or ask your instructor about the covered subjects. If you come to class, please do not disturb your fellow students and avoid using phones or leaving in the middle of a lecture.

STUDENT SUCCESS RESOURCES

Accommodation

You have a right to receive accommodations for a disability (e.g. mental health, attention, learning, vision, hearing, physical or systemic). If you have a disability and anticipate barriers related to the format or requirements of this course, we encourage you to contact the Department of Accessibility Services (DAS) to learn more about the registration process and steps for requesting accommodations. DAS can be found at:
https://accessibility.emory.edu to the Honor Council resource for faculty. Please notify DAS immediately if you are currently registered with DAS and have not received a copy of your accommodation notification letter within the first week of class.

Students who have accommodations in place are encouraged to communicate their specific needs to the instructor during the first week of the semester.

All discussions with DAS and faculty concerning the nature of your disability remain confidential.

Course-related material

All course-related material and announcements will be posted on the Canvas site. Check this site regularly for announcements and materials posted in the resources folder (this includes checking your course emails on regular bases). You are not permitted to make posted lecture notes, solutions to homework problems or exams available to anyone not enrolled in this course. Violating this policy is an honor code violation.

Diversity and Inclusion

Emory University strives to provide a welcoming, diverse, and inclusive campus as an essential part of a community of academic excellence. Dimensions of diversity include sex, race, age, national origin, ethnicity, gender identity and expression, intellectual and physical ability, sexual orientation, income, faith and non-faith perspectives, socio-economic class, political ideology, education, primary language, family status, military experience, cognitive style, and communication style. Please make a personal effort to respect and include all members of our community. See https://www.emory.edu/home/explore/life/diversity-inclusion.html for more information and resources.

Stress Management and Mental Health

As a student, you may find that personal and academic stressors in your life, including those related to remote study, economic instability, and/or racial injustice, are creating barriers to learning this semester. Many students face personal and environmental challenges that can interfere with their academic success and overall well-being. If you are struggling with this class, please visit me during office hours or contact me via email at `jimena.martin@emory.edu`. If you are feeling overwhelmed and think you might benefit from additional support, please know that there are people who care and offices to support you at Emory. These services – including confidential resources – are provided by staff who are respectful of students' diverse backgrounds. For an extensive list of well-being resources on campus, please go to: http://campuslife.emory.edu/support/index.html. And keep in mind that Emory offers free, 24/7 emotional, mental health, and medical support resources via TimelyCare: https://timelycare.com/emory.

Other Emory resources include:

- Counseling & Psychological Services
- Office of Spiritual & Religious Life
- Student Case Management and Interventions Services
- Student Health Services Psychiatry
- Emory Anytime Student Health Services

COURSE SCHEDULE/LOGISTICS

Tentative Schedule

Please note that our schedule may change as the semester progresses. You will be informed of such changes in class and via the course website.

Tue		Thu
Aug 26th	**1**	28th Introduction to Python (first class)
Sep 2nd Understanding Error	**2**	4th Understanding Error Problem Set 1: Python (out)
9th Understanding Error	**3**	11th Direct Methods for Linear Systems Problem Set 2: Numerical Errors (out) Problem Set 1 (due)

Tue	Thu
16th **4** Direct Methods for Linear Systems	18th Direct Methods for Linear Systems Problem Set 2 (due)
23rd **5** Direct Methods for Linear Systems	25th Direct Methods for Linear Systems Problem Set 3: Linear Systems (in-class activity)
30th **6** Curve Fitting	Oct 2nd **Midterm 1: Covers Weeks 1–5** Problem Set 4 (out)
7th **7** Curve Fitting	9th Curve Fitting Problem Set 4 (due)

Tue		Thu
14th **Fall Break — No class**	**8**	16th Curve Fitting
21st Curve Fitting	**9**	23rd Curve Fitting Problem Set 5 (in-class activity)
28th Differentiation and Integration	**10**	30th **Midterm 2: Covers Weeks 6–10** Problem Set 6 (out)
Nov 4th Differentiation and Integration	**11**	6th Root Finding Problem Set 6 (due)

Tue		Thu
11th Root Finding	**12**	13th Root Finding Problem Set 8 (out) Problem Set 7 (in-class activity)
18th Univariate Minimization	**13**	20th Univariate Minimization Problem Set 9 (out) Problem Set 8 (due)
25th Univariate Minimization	**14**	27th **Thanksgiving — No class**
Dec 2nd REVIEW	**15**	4th REVIEW Problem Set 9 (due)

Tue	Thu
9th **16**	11th **Final Exam: 11:30 AM–2:00 AM**