MA 402/CHE352: Spring 2026 **Numerical Analysis applied to Chemical Engineering**

Mathematics *Albert Nerken School of Engineering at The Cooper Union*

Course Description:	Techniques for the solutions of ordinary and partial differential equations, the classical problems of linear algebra, integration and systems of nonlinear equations. Error analysis, convergence and stability theory. Course assignments will include use of computing facilities and applications in chemical engineering. *3 credits. Prerequisite: Ma 223 and Ma 240*
Instructor:	Mili Shah (mili.shah@cooper.edu) 41 Cooper Room 311
Lectures:	Tuesdays 11:00AM-11:50AM, 41 Cooper Room 504 Wednesdays 11:00AM-12:50PM, 41 Cooper Room 504
Office Hours:	Wednesdays 10:00AM-11:00AM
Participation:	Please contribute to the classroom environment by asking questions and participating in discussions. Your interaction will be considered when assigning borderline grades, as will improving performance throughout the course of the semester.
Exams:	Two exams (25% each) and one final exam (30%) will be given during the semester. Each exam will be one hour and the final will be two hours. You may not use outside resources: calculators, other students, other books, etc.
Homework:	You will be assigned to a group of 3-4 students in order to complete a homework set due roughly every other week. You should plan to work **individually** on the assignments before meeting with your group to compare ideas and putting together a **single** complete assignment to turn in on the due date. Please note any borrowed code must be cited. Homework will typically be due Tuesdays at 5pm and should be submitted electronically through email using an online platform such as Google Colab `https://colab.research.google.com/`
Grading:	Homework: Due Tuesdays at 5pm (20% of final grade) Exam 1: Tuesday, March 3 (25% of final grade) Exam 2: Tuesday, April 7 (25% of final grade) Final Exam: Wednesday, May 13 (30% of final grade) *Note: I reserve the right to adapt exam dates.*
Late policy:	No work will be accepted late without prior arrangement or a written excuse. Neither exam or final may be made up without prior arrangement or a written excuse.
Required Text:	Fundamentals of Numerical Computation by Tobin A. Driscoll and Richard J. Braun `https://fncbook.com/`
Suggested Texts:	Greenbaum and Chartier, *Numerical Methods*, ISBN-13: 978-0691151229 Moler, *Numerical Computing with Matlab*, ISBN-13: 978-0-89871-660-3 Trefethen and Bau, *Numerical Linear Algebra*, ISBN-13: 978-0898713619
Disabilities:	If you believe you are entitled to an accommodation on assessments through the Americans with Disabilities Act, you must self-identify to the Office of the Dean of Students and meet with me during the first week of the term to discuss arrangements for meeting your accommodation.

Timeline

Please note that this schedule is tentative and will likely be adjusted as the semester progresses.

Week	Schedule
1/19/2026	Introduction (Chapter 1)
1/26/2026	Linear Equations (Chapter 2)
2/2/2026	Overdetermined Linear Systems (Chapter 3)
2/9/2026	Optimization
2/16/2026	Matrix Analysis (Chapter 7)
2/23/2026	Krylov Methods (Chapter 8)
3/2/2026	**Exam 1 on Tuesday March 3**
3/9/2026	Nonlinear Equations (Chapter 4)
3/16/2026	**Spring Break**
3/23/2026	Interpolation (Chapter 5)
3/30/2026	Global Function Approximation (Chapter 9)
4/6/2026	**Exam 2 on Tuesday April 7**
4/13/2026	Ordinary Differential Equations (Chapter 6)
4/20/2026	Boundary Value Problems (Chapter 10)
4/27/2026	Diffusion Equations (Chapter 11)
5/4/2026	Advections Equations (Chapter 12)
5/11/2026	**Final Exam on Wednesday May 13**