MATH 614: Numerical Methods I
Spring 2025 Course Syllabus

NJIT Academic Integrity Code: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. There must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is the instructor's obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

COURSE INFORMATION

Course Description: **Course Description**: Theory and techniques of scientific computation, with more emphasis on accuracy and rigor than Math 611. Machine arithmetic. Interpolation and quadrature. Iterative solution of nonlinear systems. Numerical solution of initial- and boundary-value problems for systems of ODEs. Computation of eigenvalues and eigenvectors. Numerical solution of a linear system. Applications. The class includes examples requiring student use of a computer.

Number of Credits: 3

Prerequisites: Math 222, Math 337, Math 340, and proficiency in a computer language (MATLAB, FORTRAN, C, or C++), or departmental approval.

Course-Section and Instructors:

Course-Section	Instructor
Math 614-002	Professor X. Zhao

Office Hours for All Math Instructors: Spring 2025 Office Hours and Emails

Required Textbook:

Title	*An Introduction to Numerical Analysis*
Author	Atkinson

Edition	2nd
Publisher	John Wiley & Sons, Inc.
ISBN #	978-0-471-62489-9

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 7, 2025**. It will be strictly enforced.

COURSE GOALS

Course Objectives

Students will gain experience in developing, analyzing, and implementing common numerical methods for a range of mathematical problems.

Course Outcomes

- Students should gain an understanding of common numerical methods.
- Students should know how to apply numerical methods to various mathematical problems.
- Students should have an improved ability to derive and program numerical methods.

Course Assessment: Outcomes are assessed through homework assignments, a midterm exam, and a comprehensive final exam.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework	35%
Midterm Exam	30%
Final Exam	35%

Your final letter grade will be based on the following tentative curve.

A	90 - 100	**C +**	67 - 74
B+	82 - 89	**C**	60 - 66
B	75 - 81	**F**	0 - 59

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and

fully understand the Math Department's Attendance Policy.

Religious Observance: NJIT is committed to supporting students observing religious holidays. Students must notify their instructors in writing of any conflicts between course requirements and religious observances, ideally by the end of the second week of classes and no later than two weeks before the anticipated absence.

Homework: Homework assignments/projects will be given frequently; some will involve writing computer programs in a computer language such as MATLAB, C, Julia or Python. The course material will include examples written in MATLAB, so this will be the default. **The purpose of homework is not simply to "get the right answer" or write a working computer program. It is also to learn how to communicate results clearly. *I can only grade your work based on the communication of results*. I do not demand work typed up in LaTeX or MathType, but readability is important. Finally, the results of computer programs must be displayed in meaningful and well-formatted graphs and tables.**

Assignments will be posted, turned in, and graded on the course Canvas page.

Exams: There will be one midterm exam held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	March 12, 2025
Final Exam Period	May 10 - May 16, 2025

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

Generative AI: This course expects students to work without artificial intelligence (AI) assistance in order to better develop their skills in this content area. As such, AI usage is not permitted for any assignment or exam throughout this course under any circumstance.

ADDITIONAL RESOURCES

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please If you need an accommodation due to a disability please contact the Office of Accessibility Resources and Services at oars@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/accessibility/

Important Dates (See:Spring 2025 Academic Calendar, Registrar)

Date	Day	Event
January 21, 2025	Tuesday	First Day of Classes
January 27, 2025	Monday	Last Day to Add/Drop Classes
March 16, 2025	Sunday	Spring Recess Begins
March 22, 2025	Saturday	Spring Recess Ends
April 3, 2025	Thursday	Wellness day
April 7, 2025	Monday	Last Day to Withdraw
April 18, 2025	Friday	Good Friday - No Classes
April 20, 2025	Sunday	Easter Sunday - No Classes Scheduled
May 6, 2025	Tuesday	Thursday Classes Meet
May 7, 2025	Wednesday	Friday Classes Meet
May 7, 2025	Wednesday	Last Day of Classes
May 8, 2025	Thursday	Reading Day 1
May 9, 2025	Friday	Reading Day 2
May 10 - May 16, 2025	Friday to Thursday	Final Exam Period

Course Outline

Week	Topics	Sections
1/20-1/24	Review: Taylor series and the binary number system Computer double precision (IEEE 754); Round-off errors	Chapter 1
1/27-1/31	Error propagation Root-Finding	Chapter 1 Chapter 2
2/3-2/7	Root-Finding Function interpolation	Chapter 2 Chapter 3

2/10–2/14	Function interpolation Function approximation	Chapter 3 Chapter 4
2/17—2/21	Function approximation	Chapter 4
2/24–2/28	Numerical Integration	Chapter 5
3/3–3/7	Numerical Integration	Chapter 5
3/10–3/14	Review for the Midterm Exam; MIDTERM (March 12)	
3/17-3/21	Spring Recess	
3/24–3/28	Numerical Methods for ODEs	Chapter 6
3/31-4/4	Numerical Methods for ODEs	Chapter 6
4/7–4/11	Numerical Methods for ODEs	Chapter 6
4/14–4/18	Review of Linear Algebra Iterative Methods for Linear Systems	Chapter 7 Chapter 8
4/21–4/25	Iterative Methods for Linear Systems	Chapter 8
4/28-5/2	Iterative Methods for Linear Systems	Chapter 8
5/5-5/9	Iterative Methods for Linear Systems; Review for the Final Exam	Chapter 8

Updated by Professor X. Zhao - 2025
Department of Mathematical Sciences Course Syllabus, Spring 2025