MATH 614: Numerical Methods I
Spring 2024 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that 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. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

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 V. Matveev

Office Hours for All Math Instructors: Spring 2024 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 1, 2024**. 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.

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 7, 2024
Final Exam Period	May 3 - May 9, 2024

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.

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 2024 Academic Calendar, Registrar)

Date	Day	Event
January 16, 2024	Tuesday	First Day of Classes
January 22, 2024	Monday	Last Day to Add/Drop Classes
March 10, 2024	Sunday	Spring Recess Begins
March 16, 2024	Saturday	Spring Recess Ends
March 29, 2024	Friday	Good Friday - No Classes

April 1, 2024	Monday	Last Day to Withdraw
April 30, 2024	Tuesday	Friday Classes Meet
April 30, 2024	Tuesday	Last Day of Classes
May 1, 2024	Wednesday	Reading Day 1
May 2, 2024	Thursday	Reading Day 2
May 3 - May 9, 2024	Friday to Thursday	Final Exam Period

Course Outline

Week	Topics	Sections
1/16-1/18	Review: Taylor series and the binary number system Computer double precision (IEEE 754); Round-off errors	Chapter 1
1/22-1/27	Error propagation Root-Finding	Chapter 1 Chapter 2
1/29-2/1	Root-Finding Function interpolation	Chapter 2 Chapter 3
2/5-2/9	Function interpolation Function approximation	Chapter 3 Chapter 4
2/12—2/15	Function approximation	Chapter 4
2/19-2/22	Numerical Integration	Chapter 5
2/26-3/1	Numerical Integration	Chapter 5
3/4-3/8	Review for the Midterm Exam; MIDTERM (MARCH 7)	
***	Spring Recess	
3/18-3/22	Numerical Methods for ODEs	Chapter 6
3/25-3/29	Numerical Methods for ODEs	Chapter 6
4/1-4/5	Numerical Methods for ODEs	Chapter 6
4/8-4/12	Review of Linear Algebra Iterative Methods for Linear Systems	Chapter 7 Chapter 8
4/15-4/19	Iterative Methods for Linear Systems	Chapter 8
4/23	Iterative Methods for Linear Systems	Chapter 8
4/25	Review for the Final Exam	