NJIT New Jersey's Science & Technology University

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 614: Numerical Methods I
Spring 2021 Graduate 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: Theory and techniques of scientific computation, with more emphasis on accuracy and rigor than Math 611. Machine arithmetic. Numerical solution of a linear system and pivoting. Interpolation and quadrature. Iterative solution of nonlinear systems. Computation of eigenvalues and eigenvectors. Numerical solution of initial- and boundary-value problems for systems of ODEs. 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 S. Afkhami

Office Hours for All Math Instructors: Spring 2021 Office Hours and Emails

Required Textbooks:

Title	*An Introduction to Numerical Analysis*
Author	Atkinson
Edition	2nd
Publisher	John Wiley & Sons, Inc.
ISBN #	0-471-62489-6
Recommended Textbooks	1- A First Course in the Numerical Analysis of Differential Equations (2nd edition), by Arieh Iserles, University of Cambridge ISBN 9780511995569 2- Numerical Analysis, L. Ridgway Scott, Princeton University

	Press, 2011 ISBN 9780691146867

University-wide Withdrawal Date:The last day to withdraw with a **W** is **Monday, April 5, 2021**. 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	40%
Midterm Exam	30%
Final Exam	30%

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

A	90 - 100	**C+**	76 - 79
B+	86 - 89	**C**	70 - 75
B	80 - 85	**F**	0 - 69

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. This policy will be strictly enforced.

Homework Policy: Homework assignments/projects will be given frequently; some will involve writing computer programs in a computer language such as C, FORTRAN, or Matlab. Each assignment must be handed in at the beginning of class. Late assignments are NOT accepted. Assignments will be graded for correctness, completion, and clarity.

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 10, 2021
Final Exam	May 7 - 13, 2021

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: To properly report your absence from a midterm or final exam, please review and follow the required steps under the DMS Examination Policy found here:

- http://math.njit.edu/students/policies_exam.php

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

ADDITIONAL RESOURCES

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 contact Chantonette Lyles, Associate Director of Office of Accessibility Resources and Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services 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/studentsuccess/accessibility/

Important Dates (See: Spring 2021 Academic Calendar, Registrar)

Date	Day	Event
January 19, 2021	T	First Day of Classes
January 23, 2021	S	Saturday Classes Begin
January 25, 2021	M	Last Day to Add/Drop Classes
March 14 - March 21, 2021	Su - Su	Spring Recess - No Classes
April, 2, 2021	F	Good Friday - No Classes
April 5, 2021	M	Last Day to Witdraw
May 4, 2021	T	Friday Classes Meet
May 4, 2021	T	Last Day of Classes
May 5 & May 6, 2021	W & R	Reading Days
May 7 - May 13, 2021	F - R	Final Exam Period

Course Outline

Week	Topics
1	Intro
2	Errors
3	Root-finding
4	Function approximation and interpolation
5	Function approximation and interpolation

6	Function approximation and interpolation
7	Numerical integration
8	**MIDTERM (MARCH 10)**
--	Spring Recess
9	Numerical integration
10	Numerical ODE
11	Numerical ODE
12	Numerical ODE
13	Iterative methods for linear systems
14	Iterative methods for linear systems
15	Iterative methods for linear systems