

MATH 707: ST: Numerical Linear Algebra *Spring 2023 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.

Please be sure you read and fully understand our [DMS Online Exam Policy](#).

COURSE INFORMATION

Course Description: Algorithms and analysis for the fundamental numerical methods of linear algebra. QR factorizations, least squares problems, conditioning, stability, eigenvalue computations, and iterative methods will be covered.

Number of Credits: 3

Prerequisites: [Math 662](#) and [Math 665](#) or Departmental approval.

Course-Section and Instructors:

Course-Section	Instructor
Math 707	Professor T. Askham

Office Hours for All Math Instructors: [Spring 2023 Office Hours and Emails](#)

Required Textbook:

Title	<i>Numerical Linear Algebra</i>
Author	Lloyd N. Trefethen and David Bau III
Edition	1st
Publisher	SIAM
ISBN #	978-0898713619

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 3, 2023**. It will be strictly enforced.

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	30%
Project	30%

Your final letter grade will be based on the following tentative curve. Note: The grading scale is tentative and serves only as a guide. The actual grades will be based on curved scores.

A	90 - 100	C+	60 - 69
B+	80 - 89	C	50 - 59
B	70 - 79	F	0 - 49

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](#). Class attendance and participation can contribute up to 5% of the grade at the instructor's discretion.

Homework: No late homework will be accepted. Homework will be graded by peer review.

Discussing homework with classmates and the instructor is allowed. However, all homework is to be completed individually.

Project: for your final project, you will read a research article (or more than one) on a topic in numerical linear algebra. The article(s) should discuss either an algorithm or analysis of an existing algorithm for an important computation in linear algebra. You must discuss with me (in person or by email) your choice of article by a date TBD. You should prepare a report of 2-4 pages on the article and implement the method presented in that article in the programming language of your choice and attempt to reproduce some of the figures (as appropriate). You must provide instructions for running your software on some minimal example (with a run time of a maximum of 5 minutes on a standard computer) and I must be able to run this software with minimal effort on my own machine.

Exams: There will be one exam during the semester:

Midterm Exam	March 6th
Final Exam Period	May 5 - May 11, 2023

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 contact Scott Janz, Associate Director of Disability Support Services at [973-596-5417](tel:973-596-5417) or via email at scott.p.janz@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 2023 Academic Calendar](#), [Registrar](#))

Date	Day	Event
January 17, 2023	Tuesday	First Day of Classes
January 23, 2023	Monday	Last Day to Add/Drop Classes
March 13, 2023	Monday	Spring Recess Begins
March 18, 2023	Saturday	Spring Recess Ends
April 3, 2023	Monday	Last Day to Withdraw
April 7, 2023	Friday	Good Friday - No Classes
May 2, 2023	Tuesday	Friday Classes Meet
May 2, 2023	Tuesday	Last Day of Classes
May 3 - May 4, 2023	Wednesday and Thursday	Reading Days
May 5 - May 11, 2023	Friday to Thursday	Final Exam Period

Course Outline

Week #	Section #	Subject Topic
1	6-8	<i>Projectors and QR Factorization, Gram Schmidt</i>
2	9-11	<i>MATLAB and Householder triangularization and least squares problems</i>
3	12-13	<i>Conditioning and floating point</i>
4	14-15	<i>Stability</i>
5	16-17	<i>Stability of Householder triangularization and back substitution</i>
6	18-19	<i>Conditioning and stability of least squares problems</i>
7	24-26	<i>Start on eigenvalue problems. Reduction to Hessenberg</i>
8	Midterm, 27	<i>Midterm on Tuesday (covers 6-19), Rayleigh iteration</i>
9	28-29	<i>QR Algorithm for eigenvalue decomposition</i>
10	32-33	<i>Iterative methods and Arnoldi iteration (only Tuesday this week)</i>
11	34-35	<i>More on Arnoldi and GMRES</i>
12	36-37	<i>Lanczos iteration</i>
13-15		<i>Topics TBD. This is only 5 lectures because the 15th week only has one on Tuesday.</i>

*Updated by Professor T. Askham - 1/5/2023
Department of Mathematical Sciences Course Syllabus, Spring 2023*