# MATH 391: Numerical Linear Algebra
## *Fall 2018 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**: This course provides an introduction to computational linear algebra. Topics include direct solution of linear systems, iterative methods for linear systems, fast Fourier transforms, least squares problems, singular value decomposition and eigenvalue/eigenvector problems.

**Number of Credits**: 3

**Prerequisites**: MATH 337 with a grade of C or better and CS 113 with a grade of C or better or CS 115 with a grade of C or better or CS 101with a grade of C or better or CS 100 with a grade of C or better.

**Course-Section and Instructors**

| Course-Section | Instructor |
|---|---|
| Math 391-001 | Professor C. Frederick |

**Office Hours for All Math Instructors**: Fall 2018 Office Hours and Emails

**Required Textbook**:

| Title | *Numerical Linear Algebra and Applications* |
|---|---|
| Author | Datta |
| Edition | 2nd |
| Publisher | SIAM |
| ISBN # | 978-0898716856 |
| Recommended Textbook | *Numerical Linear Algebra* by Bornemann and Folkmar **ISBN: 978-3319742229** |

**University-wide Withdrawal Date**: The last day to withdraw with a **W** is **Monday, November 12, 2018**. 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 | 15% |
|---|---|
| Quizzes | 20% |
| Midterm Exam | 30% |
| Final Exam | 35% |

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

| A | 90 - 100 | C | 65 - 74 |
|---|---|---|---|
| B+ | 85 - 89 | D | 55 - 64 |
| B | 80 - 84 | F | 0 - 54 |
| C+ | 75 - 79 | | |

**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/ Quiz Policy**: There will be regular homework assignments from the text and computing assignments using MATLAB. Students are advised to do as many homework problems in the textbook as possible. Quizzes will be held at least biweekly. It is advisable that students familiarize themselves with MATLAB as early as possible. Several MATLAB resources are listed on p. 78 of the text. There will be MATLAB TAs who can assist with assignments. Times for MATLAB help will be announced shortly after the beginning of the semester.

**Exams**: There will be one midterm exam held in class during the semester and one comprehensive final exam. The final exam will be held during the following week:

| Midterm Exam | October 19, 2018 |
|---|---|
| Final Exam Period | December 15 - 21, 2018 |

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

**Math Tutoring Center**: Located in Cullimore, Room 214 (See: Fall 2018 Hours)

**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

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

**Accommodation of Disabilities**: Disability Support Services (DSS) 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 Disability Support Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Disability Support 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 Disability Support Services (DSS) website at:

- http://www5.njit.edu/studentsuccess/disability-support-services/

**Important Dates** (See: Fall 2018 Academic Calendar, Registrar)

| Date | Day | Event |
|------|-----|-------|
| September 4, 2018 | T | First Day of Classes |
| September 10, 2018 | M | Last Day to Add/Drop Classes |
| November 12, 2018 | M | Last Day to Withdraw |
| November 20, 2018 | T | Thursday Classes Meet |
| November 21, 2018 | W | Friday Classes Meet |
| November 22 - 25, 2018 | R - Su | Thanksgiving Recess |
| December 12, 2018 | W | Last Day of Classes |
| December 13 & 14, 2018 | R & F | Reading Days |
| December 15 - 21, 2018 | Sa - F | Final Exam Period |

# Course Outline

| Lecture | Sections | Topic |
|---------|----------|-------|
| 1 - 2 | 2.1-2.5 | Linear Algebra Review |
| 3 - 4 | 3.1-3.8 | Floating Point Numbers – Computation Errors |
| 5 - 6 | 4.1-4.3, 4.6-4.7 | Efficiency; Stability – Perturbation Analysis for Linear Systems |
| 7 - 9 | 5.1-5.4 | Solving Linear Systems with Gaussian Elimination; LU Factorization |
| 10 - 12 | 6.1-6.8, 6.11-6.12 | Linear Systems – Numerical Solutions |
| 13 - 14 | | **REVIEW AND MIDTERM: OCTOBER 19, 2018** |
| 15 - 18 | 7.1-7.8 | Decompositions: QR, SVD; Projections |
| 19 - 22 | 8.2-8.8 | Solving Systems with Least Squares |
| 23 - 25 | 9.1-9.2, 9.4-9.6 | Calculating Eigenvalues and Eigenvectors |
| 26 - 27 | 12.1-12.2 | Iterative Methods for Large and Sparse Problems |

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