Numerical Linear Algebra
CSC 352/652 and MTH 326/626
Course Syllabus

Spring 2025

Professor: Dr. Grey Ballard
Email: ballard@wfu.edu
Office: Manchester 237
Office Hours: TBD, or by drop-in or appointment
Class: 9:30–10:45 WF, Manchester 229
Text: *Numerical Linear Algebra* by Trefethen and Bau (SIAM 1997); see `https://people.maths.ox.ac.uk/trefethen/text.html`
Course Schedule: `https://users.wfu.edu/ballard/teaching/CSC352/`

1 Course Description

Numerical methods for solving matrix and related problems in science and engineering. Topics will include systems of linear equations, least squares methods, and eigenvalue and singular value computations.

This class is cross-listed as a math and a computer science class; thus, there will be both proofs as well as programming in MATLAB. Familiarity with elementary linear algebra is required for this course; experience with MATLAB is helpful but not required. The graduate version of this class will be more demanding than the undergraduate version, and it will include a project.

2 Learning Outcomes

By the end of this course, students should be able to:

1. write scripts and functions in Matlab,
2. use Matlab built-in functions to solve standard matrix problems including solving linear systems and least squares problems, and computing eigenvalue and singular value decompositions,
3. identify where matrix computations arise in scientific applications,

4. reason about the accuracy and stability of numerical algorithms,
5. evaluate the efficiency of numerical algorithms, and
6. identify efficient software (LAPACK subroutines) for solving standard matrix problems.

3 Assessment

There will be at least four quizzes, at least four problem sets, a midterm, a final exam, and a project. The project is optional for undergraduates and required for graduate students.

Problem sets can be done collaboratively, but all code and proofs must be written by each individual (see Academic Integrity below). Include the names of those with whom you've worked on each completed problem set. Problem sets will be turned in electronically through the class Canvas site.

Quizzes will be in-class and last 10 minutes. They will be announced about a week in advance. The lowest quiz score will be dropped.

The midterm and final exam are both cumulative. Make-up tests and quizzes will be administered only if excused in advance.

There are two project options: teaching a lecture from a relevant textbook or presenting your own research. Completing a project includes writing a report ($\sim$5 pages), possibly writing MATLAB code, and presenting your work to the class ($\sim$15 minute presentation). Projects are required for graduate students and optional for undergraduate students, and they can be done individually or with a partner. The presentation will be at the end of the semester, and the written report is due on the last day of class.

4 Academic Integrity

All tests and quizzes are to be done independently and without outside resources. Problem sets may be discussed with other students (this is encouraged!), however the work submitted must be your own work and reflect your understanding of the material. If you find helpful resources online (including generative AI) or in print and use ideas that are not your own, you must cite your sources. You should have a sufficient command of your solutions and code to be able to explain them orally to me or someone else. Copying of work from other students or from online resources is not acceptable and will be dealt with through the Honor System.

5 Grading

Course grades are determined using the following weightings. Undergraduates who choose to do a project can use the better of the two weightings.

With project:	**No project:**
5% quizzes	6% quizzes
30% problems sets	33% problem sets
25% midterm	27% midterm
30% final	34% final
10% project	

Letter grades for undergraduate sections are assigned based on the following categorization:

A	93 or above	**C**	73–76.99
A$^-$	90–92.99	**C**$^-$	70–72.99
B$^+$	87–89.99	**D**$^+$	67–69.99
B	83–86.99	**D**	63–66.99
B$^-$	80–82.99	**D**$^-$	60–62.99
C$^+$	77–79.99	**F**	below 60

Letter grades for graduate sections are assigned based on the following categorization:

A	93 or above	**B**$^-$	80–82.99
A$^-$	90–92.99	**C**$^+$	77–79.99
B$^+$	87–89.99	**C**	70–76.99
B	83–86.99	**F**	below 70

6 Contacting Me

In general, email is the best way to reach me, and I'm happy to take questions over email. The easiest way to find me in person is to stop by my office during office hours, though please feel free to drop by any time. If you want to be sure to find me then you can also email ahead to schedule a time; it helps to propose a few times that work for you so that I can choose one that works for me too.

7 Center for Learning, Access, Student Success

Wake Forest University provides reasonable accommodations to students with disabilities. If you are in need of an accommodation, then please contact me privately as early in the term as possible. Retroactive accommodations will not be provided. Students requiring accommodations must also consult the Center for Learning, Access, and Student Success (118 Reynolda Hall, 336-758-5929, `class.wfu.edu`).

8 Supporting Fellow Students in Distress

As members of the Wake Forest community, we have a personal responsibility to ensure that this classroom and the campus as a whole remains a healthy

and safe environment for learning. Occasionally, you may come across a fellow classmate whose personal behavior concerns or worries you, either for the classmate's wellbeing or yours. If this should occur, you are encouraged to send your concern to the Wake Forest CARE Team at `http://careteam.wfu.edu/how-to-make-a-report/`. By utilizing your insights and observations, we can work together to help individuals get connected to appropriate resources and keep our community safe.

9 Emergency Preparedness Policy

In the event of a major disruption of normal university activities (such as might result from a health emergency or other disaster), a course continuation contingency plan will be enacted in order to allow completion of the course. During this time, we will convert to a remote learning environment, and students should continue with the reading and other assignments listed on the syllabus and monitor email, Canvas, and the WFU website for information. If students have questions or are in doubt about how to proceed, they should contact the instructor by email if available, otherwise they should contact by phone.

10 Grievance Procedure

For complaints in the academic (i.e., classroom) setting, the student should talk personally with or send a written complaint explaining the concern directly to the instructor. Should the student and instructor be unable to resolve the conflict, the student may then turn to the chair of the involved department (in the Wake Forest School of Business, this would be the dean) for assistance. The chair (or dean) will communicate with both parties, seek to understand their individual perspectives, and within a reasonable time, reach a conclusion and share it with both parties. If the student's complaint is not resolved by these procedures, the student should consult with the Office of Academic Advising for assistance. The Associate Dean for Academic Advising will consult with the parties to obtain a resolution. Finally, a student may appeal to the Committee on Academic Affairs which will study the matter, taking input from all parties, and reach a final decision concerning resolution. `https://bulletin.wfu.edu/undergraduate/wake-forest-college/student-complaints/`