Introduction to Numerical Methods
CSC 355/655 and MTH 355/655
Course Syllabus

Spring 2024

Instructor: Dr. Grey Ballard
Email: ballard@wfu.edu
Office: Manchester 237
Office Hours: W 12:30-2 and F 2:30-4, or by drop-in or appointment
Class: 11–12:15 WF, Manchester 229
Texts: *Numerical Analysis* by Burden & Faires (10th Ed[1]) and *Numerical Computing with MATLAB* by Moler[2]
Course Schedule: `http://users.wfu.edu/ballard/teaching/CSC355/`
MSC Study Session: 7-9pm Thurs, Kirby 101

1 Course Description

Numerical computations on modern computer architectures; floating point arithmetic and round-off error. Programming in a scientific/engineering language such as MATLAB, C, or FORTRAN. Algorithms and computer techniques for the solution of problems such as roots of functions, approximation, integration, systems of linear equations and least squares methods.

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 calculus and elementary linear algebra are 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] The much cheaper 8th and 9th editions are okay too.
[2] Available online for free: `https://www.mathworks.com/moler/index_ncm.html`.

1. write scripts and functions in MATLAB,
2. numerically solve equations of a single variable,
3. use polynomials to approximate and interpolate functions,
4. numerically differentiate and integrate functions,
5. reason about the accuracy and stability of numerical algorithms, and
6. evaluate the efficiency of numerical algorithms.

3 Assessment

There will be 4-5 quizzes, 4-5 problem sets, a midterm, a final exam, and a project.

Problem sets can be done collaboratively, but all code and proofs must be written by each individual. This means you can discuss problems with classmates, but you may not copy classmates' work or share code. Include the names of those with whom you've worked on each completed problem set.

The midterm and final exam are both cumulative and are to be done individually.

There are two project options: teaching a lecture from one of the textbooks or presenting your own research. Completing a project includes writing a report (∼5 pages), possibly writing MATLAB code, and presenting your work to the class (∼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 Grading

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

No project:

- 10% quizzes
- 40% problem sets
- 20% midterm
- 30% final

With project:

- 9% quizzes
- 36% problem sets
- 18% midterm
- 27% 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

5 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. Please contact me as soon as possible if you know you will miss class due to a university-sponsored activity, such as athletics.

6 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. Copying of work from other students or from online resources is not acceptable and will be dealt with through the Honor System. I recommend that you retain drafts of your homework assignments and programs until the end of the semester in case a question arises as to authorship.

7 Center for Learning, Access, and 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/