

Math 6610: Analysis of Numerical Methods I

Instructor: Yekaterina Epshteyn

Lectures: MWF 11:50am - 12:40pm, AEB 360

Students are encouraged to attend lectures. Students are encouraged to wear masks during in-person lectures and to get vaccinated against COVID-19.

Office Hours either via zoom or in-person (will be discussed in class and zoom link will be provided)

(tentative at this point, it may be some changes and different times may be selected)

M 1:00pm-1:50pm, F 1:00pm-1:50pm, or by appointment

E-mail: epshteyn@math.utah.edu

Office: LCB 337

Textbook and References

Main Textbook: Trefethen and Bau, Numerical Linear Algebra, SIAM, 1997

References:

Golub and Van Loan, Matrix Computations, 3rd Ed, 1996;

E. Suli and D. Mayers, An Introduction to Numerical Analysis, Cambridge 2003

The course

Numerical Analysis and Scientific Computing are essential fields of modern Applied Mathematics, Data Science, and have broad applicability to different areas of Science and Engineering.

Math 6610 is the first semester of a two semester graduate-level sequence in numerical analysis. The first semester focuses primarily on numerical linear algebra.

The second semester focuses primary on numerical methods for solving differential equations.

Prerequisites

"C" or better in MATH 2270 AND (MATH 3210 AND MATH 3220)/OR MATH 5610. Prior knowledge of the numerical methods is a plus but it is not required for the class. To discuss more details about the class and how to register (including to obtain permission code to override the course prerequisite), please contact the instructor.

Homework

Homework will be assigned (approximately once in two weeks or so, and there will be about 5 assignments total during the semester) and collected, and will include theoretical analysis and computational assignments. The computational part for this class should be done using MATLAB, software produced by The MathWorks. The Matlab language provides extensive library of mathematical and scientific function calls entirely built-in. Matlab is available on Unix and Windows. The full set of manuals is on the web in [html \(Links to an external site.\)](#) format. The "Getting Started" manual is a good place to begin and is available in [Adobe PDF \(Links to an external site.\)](#) format.

6610 Overview of Some Topics (can change based on the class progress):

i) Some familiar fundamentals, ii) SVD, iii) Projections, iv) QR factorization, v) Application of QR to Least Squares problem, vi) Finite-precision arithmetic, stability of algorithms, and sensitivity of problems (conditioning), vii) Gaussian elimination and its variants for solving a linear system, viii) Eigenvalue problems and algorithms, ix) Iterative methods for linear systems: classical methods (Jacobi, Gauss-Seidel, Successive Overrelaxation (SOR)); Conjugate Gradient;

Grading: Homework 65% and one Final Written Exam (December 14 2021, 10:30am-12:30pm during final's week) 35%

Final Grade:

Final course letter grades will be determined as follows: If X is your course percentage weighted according to the above, then $X \geq 92\%$ -> A, $X \geq 90\%$ -> A-, $X \geq 87\%$ -> B+, $X \geq 83\%$ -> B, $X \geq 80\%$ -> B-, $X \geq 77\%$ -> C+, $X \geq 73\%$ -> C, $X \geq 70\%$ -> C-, $X \geq 67\%$ -> D+, $X \geq 63\%$ -> D, $X \geq 60\%$ -> D-, $X < 60\%$ -> E.

The instructor retains the right to modify this grading scheme during the course of the semester; students will, of course, be well notified of any adjustments.

Qual related information: Math 6610 is a qual class. Please remember that it is considered that

A is a High-Pass, and B+ or A- is a Pass

Homework due dates will be announced and posted in Canvas

Note: Assignments and updates will be posted on class website. Students are responsible for checking it regularly.

Safety Statement

The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu. Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran status or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, including sexual orientation or gender identity/expression, you are encouraged to report it to the University Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or to the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to police, contact the Department of Public Safety, 801-585-2677(COPS).

COVID-19 Considerations

All lecture activities will take place in person.

University leadership has urged all faculty, students, and staff to model the vaccination, testing, and masking behaviors we want to see in our campus community.

These include:

- **Vaccination**

- Masking indoors
- If unvaccinated, getting weekly asymptomatic coronavirus testing

Vaccination

- Get a COVID-19 vaccination if you have not already done so. Vaccination is proving highly effective in preventing severe COVID-19 symptoms, hospitalization and death from coronavirus. Vaccination is the single best way to stop this COVID resurgence in its tracks.
- Many in the campus community already have gotten vaccinated:
 - o More than 80% of U.employees
 - o Over70% of U.students
- Visit <http://mychart.med.utah.edu/>, <http://alert.utah.edu/covid/vaccine>, or <http://vaccines.gov/> to schedule your vaccination.

Masking

- While masks are no longer required outside of Health Sciences facilities, UTA buses and campus shuttles, CDC guidelines now call for everyone to wear face masks indoors.

o Check the CDC website periodically for masking updates—

<https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html>

o Treat masks like seasonal clothing (i.e.during community surges in COVID transmission, masks are strongly encouraged indoors and in close groups outside).

Testing

- If you are not yet vaccinated, get weekly asymptomatic coronavirus tests. This is a helpful way to protect yourself and those around you because asymptomatic individuals can unknowingly spread the coronavirus to others.

- o Asymptomatic testing centers are open and convenient: Online scheduling

Saliva test (no nasal swabs)

Free to all students returning to campus (required for students in University housing)

Results often within 24 hours

Visit alert.utah.edu/covid/testing

- Remember: Students must self-report if they test positive for COVID-19 via this website: <https://coronavirus.utah.edu/>.

Accommodation Statement

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services (CDS), 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and me to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to CDS.

Addressing Sexual Misconduct

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, office for equal opportunity and affirmative action including sexual orientation or gender identity/expression, you are encouraged to report it to the University's Title IX Coordinator; Director, Office

of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, <https://oeo.utah.edu/contact-us/index.php> or to the Office of the Dean of Students, 270 Union Building, 801-581-7066, <https://deanofstudents.utah.edu/>. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to police, contact the Department of Public Safety, 801-585-2677(COPS), <https://police.utah.edu/>.

University Counseling Center

The UCC staff is committed to supporting the mental health needs of our campus community. Their phone number is 801-581-6826. Their hours are Monday-Friday, 8:00am-5:00pm. For after-hours emergencies, contact the 24/7 Crisis Line: 801-587-3000. More information is at <https://counselingcenter.utah.edu/> .

Office of the Dean of Students

The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. To contact the Office of the Dean of Students, please email deanofstudents@utah.edu or call 801-581-7066. There is more information at <https://deanofstudents.utah.edu/> .