

University of Tennessee
MATH/COSC 472 Numerical Algebra
Meets: TR 1:10 PM - 2:25 PM
through zoom <https://tennessee.zoom.us/j/8217664472>
or at Ayres Hall 121

Syllabus Spring 2021

Welcome to Our Numerical Algebra Class

Prerequisites: Matrix Algebra (Math 200, 251 or 257), and Math 371.

Instructor: Dr. Wenbo Li

Office Hours and Location: Office hours are hosted on zoom on Monday 3-4 pm, Thursday 4:05-5:20 pm, and other times by appointments. Face-to-face discussions are also possible by appointments.

Ways to contact: wli50@utk.edu, or messages on canvas.

Course Communications: I will post course materials (homework, quizzes, exams, video records of class meetings), grades, and class announcements on Canvas. You are always welcome to contact me through email or canvas.

Key Dates - Spring 2021: [UT Calendar](#)

Student Learning Outcomes: Upon completion of Math 472, students will be able to

- Approximate the solution of equations numerically
- Solve linear equations through different numerical methods
- Compute eigenvalues of a given matrix numerically

Materials: I will upload my own notes for this class on canvas. The textbook (recommended) for this class is: An Introduction to Numerical Analysis, 1st Edition, Endre Suli and David Mayers, Cambridge University Press. I plan to cover chapters 1-5. Another reference (definitely no need to buy) is the book Numerical Analysis: Mathematics of Scientific Computing by David

R. Kincaid and E. Ward Cheney. Parts of chapters 3, 4, 5 from this book are related to our class.

Learning Environment and Classroom Expectations/Etiquette:

Everyone is expected to maintain an atmosphere that fosters a positive learning environment.

- Recommended to attend the class online through zoom or face to face at the classroom. I will upload the recorded videos to canvas, so if you cannot make it to the class, you may watch the recordings.
- Questions are welcomed

Assessment and Evaluations Methods (NO EXTRA POINTS):

Computational Homework (10%) + Quizzes (24%) + Midterm exams (36%) + Final (30%)

Computational Homework: this requires **coding**, and I highly recommend you to use **MATLAB although C/C++ or Python or Fortran is also allowed**. You need to write a short report including numbers or pictures asked by the assignments, together with your explanations. You are allowed to use the existing code from books or the internet, but you are definitely not allowed to ask other people to do the homework for you. You may discuss the assignments with other students, but copying and pasting other people's answers are not permitted.

Theoretical Homework: I will upload theoretical homework on canvas, but will not collect your solutions. Most of the problems come from two textbooks mentioned before. The homework would be helpful for your preparation of the quizzes and exams.

Quizzes: there will be 5 quizzes in total. The quizzes are take-home, you will have 24 hours to complete each quiz.

Midterms: there will be two take-home midterm exams. You will have 24 hours to complete each exam.

Final: a comprehensive take-home exam will be given at the end of the semester. You will have 48 hours to complete the final exam.

Letter grades will be based on the following scale:

Grade	A	B+	B	C+	C	D+	D	F
%-Score	90+	87-89	80-86	77-79	70-76	67-69	60-66	0-59

I reserve the right to change this scale, provided the change benefits all students. All grades will be made available online.

Notice that all the homework, quizzes and exams are given online, so you are not required to attend the class physically throughout the semester.

Calculators: The use of a calculator as an auxiliary tool is allowed in this class.

Make Up Policies: Late submission is not acceptable unless for a valid reason. Make ups will be given only if a student can present evidence that an absence was caused by serious illness, a death in the immediate family, religious observance, or participation in University activities at the request of University authorities. For an illness, you should present a signed statement from a doctor that your illness was sufficiently serious to make you miss class. A note saying only that you visited the doctor or the Health Center may not Suffice. Furthermore, **please let me know before the deadline if you cannot make it for a valid reason.**

[Campus Syllabus:](#)

STUDENTS WITH DISABILITIES -- <http://sds.utk.edu>

Any student who feels they may need an accommodation based on the impact of a disability should contact Student Disabilities Services in Dunford Hall, at 865-974-6087, or by video relay at, 865-622-6566, to coordinate reasonable academic accommodations.

ACADEMIC INTEGRITY

Each student is responsible for his/her personal integrity in academic life and for adhering to UT's Honor Statement. The Honor Statement reads: "An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

SOCIAL DISTANCING & COVID-19 PROCEDURES

Students are required to wear face masks at all times and maintain social distancing (6 feet between individuals in traditional classrooms, or, in instructional laboratories and similar settings, only a few minutes in closer proximity when absolutely necessary to achieve learning objectives). Students who are feeling ill or experiencing symptoms such as sneezing, coughing, or a higher than normal temperature will be excused from class and should stay at home.

Instructors have the right to ask those who are not complying with these requirements to leave class in the interest of everyone's health and safety. In the event that a student refuses to comply with these requirements, the instructor has the right to cancel class.

Additionally, following other simple practices will promote good health in and out of the classroom, such as frequent and thorough hand washing, wiping down desks and seats with disinfectant wipes whenever possible, not sharing personal items such as pens and cell phones, and avoiding crowded hallways and other enclosed spaces.

The Volunteer Creed reminds us that we bear the torch in order to give light to others. As Volunteers, we commit to caring for one another and for the members of the communities in which we live, work, and learn. This semester, the University asks that we all demonstrate the Volunteer spirit by following these and other health guidelines and requirements.

How to be Successful in this Course:

- Take notes and ask questions.
- Think, work smarter and discuss with classmates.
- Review and rework problems that you got wrong.
- Start preparing for exams early.

If the instructor finds it necessary to make informational changes (e.g. office hours, schedule adjustments) due to students' needs or unforeseen circumstances, students will be notified in writing/email of any such changes.

Math 472 Projected Schedule Spring 2020

	Section	Homework and Quiz Information (Details Will be Updated Later)
1/21	Ch. 1. The end point tests and Brouwer's Fixed Point.	
1/26	Ch. 1. Simple Iteration and Contraction Mapping Theorem.	Homework 1
1/28	Ch. 1. Convergence to the fixed point.	
2/2	Ch. 1. Stable and unstable fixed points. Rate of convergence.	Homework 2
2/4	Ch. 1. Newton's method	
2/9	Ch. 1. Convergence of Newton's method and Secant method.	Quiz 1 (covering HW 1 and 2) Homework 3
2/11	Ch. 1. Bisection.	Computational HW 1 for Ch 1
2/16	Ch. 2. Linear systems of equations.	Homework 4
2/18	Ch. 2. Gaussian elimination	
2/23	Ch. 2. $A = LU$ factorization.	Homework 5
2/25	Ch. 2. More LU factorization and Pivoting strategies.	Quiz 2 (covering HW 3 and 4)
3/2	Ch. 2. The $PA = LU$ factorization.	Homework 6
3/4	Exam 1 (take-home)	24 hours to finish the exam
3/9	Ch. 2. Vector and matrix norms.	

3/11	Ch. 2. More Vector and matrix norms.	Homework 7
3/16	Ch. 2. Condition number and stability.	
3/18	Ch. 2. More Condition number and stability..	Homework 8
3/23	Ch. 2. Linear Least Squares.	
3/25	Ch. 2. QR factorization.	Quiz 3 (covering HW 7 and 8) Homework 9 Computational HW 2 for Ch 2
3/30	Ch. 3. Positive Definite matrices. The Cholesky factorization.	
4/1	Ch. 3. Tridiagonal and diagonally dominant matrices.	Homework 10
4/6	Ch. 3. Tridiagonal and diagonally dominant matrices and Gaussian Elimination.	
4/8	Ch. 4. Fixed point iteration in higher dimensions.	Quiz 4 (covering HW 9 and 10) Homework 11
4/13	Ch. 4. Newton's method in higher dimensions.	
4/15	Exam 2 (take-home)	24 hours to finish the exam
4/20	Ch. 5. Eigenvalue problem. Power method and inverse power method.	Homework 12
4/22	Ch 5. Power method and inverse power method. Jacobi's method.	Computational HW 3 for Ch 3, 4, 5
4/27	Ch 5. Jacobi's method. Brief introduction of QR algorithm.	Quiz 5 (covering HW 11 and 12) Homework 13
TBD	Final Exam (Take-Home)	Comprehensive Exam