The University of Chicago
CAAM/Stat 31430/1
Applied Linear Algebra
Autumn 2022

## Course Overview

Course description: This course will provide a review and development of topics in linear algebra aimed toward preparing students for further graduate coursework in Computational and Applied Mathematics. Topics will include discussion of matrix factorizations (including diagonalization, the spectral theorem for normal matrices, the singular value decomposition, and the Schur and polar decompositions), and an overview of classical direct and iterative approaches to numerical methods for problems formulated in the language of linear algebra (including the conjugate gradient method). Additional topics will be included depending on student interests.

Prerequisites: STAT 24300 or MATH 20250 or Graduate Student in Physical Sciences Division

**Textbook**:
G. Allaire and S. M. Kaber, Numerical Linear Algebra, Springer 2008 (transl. by K. Trabelsi),
(available online via UChicago library; https://catalog.lib.uchicago.edu/vufind/Record/11957385).

## Learning Objectives

After successfully completing the course, students will be familiar with and able to reason about basic facts and notions related to numerical linear algebra and its relation with applied mathematics. Students will also develop their skills in developing and expressing their arguments in writing.

## Selected bibliography/additional references (not required)

In addition to our assigned textbook, there are many good texts which cover the topics we will be discussing at a variety of levels. A short selection is listed below. Many of them are available in Eckhart Library (some may also be available as online texts through the UChicago library catalog).

- G. Strang, Linear algebra and its applications,
- D. Watkins, Fundamentals of Matrix Computations, 2nd or 3rd ed.,
  (available online through the UChicago library; https://catalog.lib.uchicago.edu/vufind/Record/4706797).
- J. Golan, The Linear Algebra a beginning graduate student ought to know, 3rd ed., Springer, 2012.
  (available online through the UChicago library; https://catalog.lib.uchicago.edu/vufind/Record/8873803).
- H. Dym, Linear Algebra in Action, Amer. Math. Soc. 2007.

From time to time, we may draw on portions of material from the above references (as well as others) in preparing the lecture and problem sets.

## Grading

Students are expected to attend and participate in classes, complete assignments and take exams. Your final grade in this course will consist of one midterm exam, one cumulative final, and homework assignments. The breakdown of points will be as follows:

Homework (40%):
        (The lowest homework score will be dropped.)
Midterm Exam (30%)
Final Exam (30%): Comprehensive.
        Date and Location: To be determined by registrar's office.