

COURSE DESCRIPTION
NUMERICAL LINEAR ALGEBRA
MA660 -1F, SPRING 2021 REMOTE

DEPARTMENT OF MATHEMATICS
UNIVERSITY OF ALABAMA AT BIRMINGHAM

Course Instructor: Professor Ian Knowles

E-mail: iknowles@uab.edu

Meeting times: MWF 1:25 – 2:15pm.

Meeting location: Online via Zoom.

Office Hours: MWF after class; email for a private Zoom session.

Prerequisite: Grade of B or better in MA 631 (Linear Algebra) .

Credits: 3 semester hours.

Class Lecture Notes: Download from Canvas (see below).

Class Management via Canvas: Files for homework assignments, MATLAB codes, exams, class lecture notes, and other course materials will be posted in the “Files” Course Navigation Link in Canvas. Homework assignments and exams will only be collected via uploading into the “Assignments” Course Navigation Link in Canvas.

Homework and Exam Files: For each homework assignment and exam (including the final) you are required to submit a **single pdf file** in Canvas on or before the due time. Submitted files of size in excess of 15MB have been known to cause problems in Canvas. A tablet computer is convenient, but certainly not mandatory; homework/exam printouts and worksheets can for example be scanned to a single pdf file using a mobile scanning app such as Adobe Scan.

MATLAB: We need this software for both class and homework assignment usage. It is freely available to all current UAB students from the (clickable) MathWorks website link <https://www.mathworks.com/academia/tah-portal/university-of-alabama-at-birmingham-678600.html> You just log in using your UAB BlazerID credentials to effect the download. In your initial download you should opt for all of the “toolboxes” (optional MATLAB packages) that your computer can comfortably handle. The alternative is to install a minimal MATLAB and then download the appropriate toolbox from MathWorks later if you find that you are missing some needed functions.

Reference Texts.

- (1) L. N. Trefethen and D. Bau, III, Numerical Linear Algebra, SIAM, 1997.

Date: January 19, 2021.

- (2) G. H. Golub and C. F. Van Loan, Matrix Computations, Johns Hopkins University Press, 4th Edition, 2013.
- (3) D. S. Watkins, Fundamentals of Matrix Computations, Wiley, John & Sons., 2nd Edition, 2002.
- (4) R. A. Horn and C. R. Johnson, Matrix Analysis, Cambridge University Press, 2nd Edition, 2013.

Important dates:

First day of classes: Tuesday January 19, 2021.

Mid-term Exam: Friday March 5, 2021; tentative.

Last day of classes: Friday April 23, 2021.

Exam Week: April 26 – April 30, 2021.

Final exam: 10:45am–1:15pm Friday April 30, 2021; Zoom.

Course policies.

- Please make sure that you are able to receive e-mail through your Blazer-ID account. Official course announcements will be sent to that address.
- The two lowest weekly homework grades will be dropped to account for any missed assignments due to illness or any other circumstance.

Course content.

- Vector and matrix norms.
- Direct methods for linear systems
- Stability, condition numbers, and error analysis.
- QR factorization and least squares problems.
- Singular value decomposition.
- Computation of eigenvalues and eigenvectors.
- Iterative methods.

Assessment procedures. Student achievement will be assessed by the following measures:

- **Weekly graded homework.** Written homework will normally be assigned on Monday of each week and due on the following Monday, except for first week of class and the midterm exam week. Homework contributes 50% to the course average.
- **Mid-term examination.** Contributes 20% to the course average.
- **Final examination.** The final is comprehensive and contributes 30% to the course average.

Your course performance is your course average, which is a number between 0 and 100 obtained by adding the scores, weighted as above, from the homework, mid-term and final. Your final grade may be determined from the following table:

Course Average:	88-100	75-87	62-74	50-61	below 50
Final Grade:	A	B	C	D	F

JPE Exams and Past JPE Problems. This course covers the material for the Applied Linear Algebra part of the Joint Program Exam in Linear Algebra. The past JPE exams are posted at the active (clickable) web link: <https://www.uab.edu/cas/mathematics/graduate/phd/qualifying-exams-testbank>.

Extra meetings are anticipated for interested students to work on selected past JPE problems in a group environment on Zoom. Problems from past JPE exams will appear in homework assignments.

Class Schedule.

Week	Monday	Wednesday	Friday
01/19 – 01/22		First Class	
01/25 – 01/29		HW 1 due in Canvas	
02/01 – 02/05	HW 2 due in Canvas		
02/08 – 02/12	HW 3 due in Canvas		
02/15 – 02/19	HW 4 due in Canvas		
02/22 – 02/26	HW 5 due in Canvas		
03/01 – 03/05			Mid-term Exam
03/08 – 03/12	HW 6 due in Canvas		
03/15 – 03/19	HW 7 due in Canvas		
03/22 – 03/26	HW 8 due in Canvas		
03/29 – 04/02	HW 9 due in Canvas		
04/05 – 04/09	HW 10 due in Canvas		
04/12 – 04/16	HW 11 due in Canvas		
04/19 – 04/23	HW 12 due in Canvas		Last Class
04/26 – 04/30			Final Exam

UAB DSS Accessibility Statement. The University is committed to providing an accessible learning experience for all students. If you are a student with a disability that qualifies under the ADA and Section 504 of the Rehabilitation Act, and you require accommodations, please contact Disability Support Services for information on accommodations, registration and procedures. Requests for reasonable accommodations involve an interactive process and consist of a collaborative effort among the student, DSS, faculty and staff. If you are registered with DSS, please contact DSS to discuss accommodations that may be necessary in this course. If you have a disability but have not contacted Disability Support Services, call (205) 934-4205, visit their website, or their office in Hill Student Center Suite 409.

UAB Title IX Statement. The University is committed to providing an environment that is free from sexual misconduct, which includes gender-based assault, harassment, exploitation, dating and domestic violence, stalking, as well as discrimination based on sex, sexual orientation, gender identity, and gender expression. If you have experienced any of the aforementioned conduct we encourage you to report the incident. UAB provides several avenues for reporting. For more information about Title IX, policy, reporting, protections, resources and supports, please visit UAB Title IX web page for UAB’s Title IX, UAB’s Equal Opportunity, Anti-Harassment, Duty to Report, and Non-Retaliation policies.