Course Syllabus
MATH 2270, Section 001, Summer 2021
Linear Algebra

Instructor: Trung Chau
Pronouns: He/him/his
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Office hours: Mondays and Wednesdays 11-12 a.m on Zoom (Zoom ID: 378 971 1816) **or by appointments**

Text: *Linear Algebra and its Applications*, 5th edition, by David D. Lay. ISBN: 032198238X

Technology: Calculators will not be allowed on exams. They may be used on homework, but you should still write out the details of your computation. It is in your best interest not to become too dependent on your calculator since they will not be allowed on exams. Students are not expected to have prior programming experience, but will be required to run portions of code that will be provided in lecture and lab. The code will use in the program MATLAB. It is a great resource to check homework assignments prior to submitting them for evaluation. I encourage you to review your work before instructor evaluation.

Prerequisites: First year calculus, Math 1210-1220 or 1250-1260 or 1270-1280. Although not a prerequisite, 2270 students would benefit from having taken multivariable calculus, 2210. This would provide motivation for the implications of the spectral theorem for multivariable max-min theory based on the Hessian, as well as connecting the multivariable derivative as a linear map

Course details:

- **Course type:** IVC
- **Location and Meeting time:** Mon-Thu 10-11 a.m, on Zoom **(Zoom ID: 960 0032 0340)**
- **Attendance and Punctuality:** There will be 12 possible participation points. One participation point will be awarded for each online class a student attends and verbally responds to questions. Participation points are not awarded for taking exams. If you miss a class then you will miss the participation point for that class. If you have a serious illness which prevents you from being online, a doctor's note will be required. Concepts will be thoroughly explained and reviewed in class.
- **Technical requirements:**
  - The whole course will be conducted online. You should have access to a sufficiently strong internet connection to support this video conference.
  - Quizzes and Exams will be taken with Zoom proctoring. For this, you will need in addition to the steady internet connection a connected camera (on a smartphone or laptop).
  - Homework, quizzes and exams will be submitted digitally, so some form of digitizing technology will be needed. This could be a scanner, but there are excellent alternative scanning apps for smartphones. Quizzes and exams must be submitted as single PDF files. There are many scanning apps available for Android and IOS, some examples are:
    https://play.google.com/store/apps/details?id=com.adobe.scan.android&hl=en_US
    https://apps.apple.com/us/app/adobe-scan-digital-pdf-scanner/id1199564834
- **Syllabus subject to change:** This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas.

Course description: The course covers chapters 1 through 7 of the text. Some sections are optional and can be covered as time permits and at the instructors discretion. The optional sections are 1.10, 2.6-7, 4.9-10, 5.6-8, 6.6-8, and 7.5. All other sections should be considered required. This covers the standard material of a sophomore level linear algebra course: systems of linear equations; the geometry and algebra of vectors in Euclidean n-space; matrix algebra; determinants; the theory of vector spaces and linear transformations; eigenvalues and eigenvectors; orthogonality; diagonalization of symmetric matrices and quadratic forms.

Course expected learning outcome: Upon successful completion of this course, a student should be able to:

- Understand the mathematical notation and geometric interpretation of linear systems, and make connections between the two.
  - Understand the connection between Ax and a linear combination of vectors.
  - View Ax as linear transformations, and classify it as onto or one-to-one.
  - Understand the properties of vector spaces, in particular $\mathbb{R}^n$.
- Perform matrix computations and understand them as examples of abstract mathematical concepts.
  - Perform row reductions and put matrices into echelon forms. Relate echelon form to span, linear independence, determinant, invertibility, and rank.
  - Calculate matrix-vector and matrix-matrix products and think about these processes in the context of linear transformations.
  - Find determinants, eigenvectors, and eigenvalues and link these concepts to existence and uniqueness of solutions.
  - Use eigenvalues and eigenvectors to find properties of transformations.
  - Compute dimension and bases of vector spaces.
  - Handle change of coordinate systems for linear transformations.
- Recognize applications and interpretations of linear algebra concepts.
  - Develop approximations using orthogonal projection and Gram-Schmidt orthogonalization.
  - Do singular value decomposition in image processing and eigenvectors in the Google page rank algorithm.
- Gain professionalism.
  - Collaborate, analyze and address mathematical problems with colleagues.
  - Articulate and discuss mathematical ideas via written and oral expression.
  - Engage in diverse problem-solving with other classmates.

Grading: All assignments will be posted on Canvas and need to be submitted on Gradescope. Details about the content of each assignment type, and how much they count towards your final grade are as follows:

- Homework (20%): There will be one homework assignment each week. I understand that sometimes homework cannot be completed on time due to circumstances beyond your control, hence you can ask for an extension for each assignment. You do not need to tell me the reason why your homework assignment is late. Homework will be a mixture of problems from the text and custom problems, and will vary from computational practice to conceptual questions, and will include applications that may sometimes require technology to complete.

- Quizzes (10%): At the end of most Thursday classes, a short 1-2 problem quiz will be given, taking roughly 10 minutes to do. The quiz will cover relevant topics from the week's lectures, homework, and food for thought work. The lowest quiz score will be dropped. There are no makeup quizzes. You will be allowed and encouraged to work together on these quizzes.
- Midterm exams (60%): Three class-length midterm exams will be given.
- Final exam (10%): A comprehensive exam will be given at the end of the semester. The final may replace the lowest midterm if it's higher. The date and time for Summer 2021 is Thursday August 5th through Friday, August 6th.

Grades (Evaluation and criteria): Final letter grades will be determined by overall percentage as follows:

A: 93% – 100%	B-: 80% – 82.9%	D+: 68% – 69.9%
A-: 90% – 92.9%	C+: 78% – 79.9%	D: 63% – 67.9%
B+: 88% – 89.9%	C: 73% – 77.9%	D-: 60% – 62.9%
B: 83% – 87.9%	C-: 70% – 72.9%	E: <60%

Important dates:

- Midterm 1: Thursday June 10th
- Midterm 2: Thursday July 8th
- Midterm 3: Thurday July 29th
- Final: Thursday August 5th or Friday August 6th (TBD)
- Drop deadline: Wednesday, May 26
- Withdraw deadline: Friday, June 25
- Classes end: Wednesday, August 4

Communication:

- All course materials, such as lecture slides, assignments, solutions, grades, etc. will be posted on the Course Canvas site. Class announcements will be done via Canvas. You will be responsible for any information contained in them as well as the information announced in class.
- It is also your responsibility to check your Canvas messages regularly. There will be occasions during the semester that we may need to reach out to you individually (e.g. regarding a grade or assignment) and it is in your best interest to respond promptly.
- Feel free to contact me by email or Canvas message. I will do my best to answer emails promptly. I would like to encourage you to email me only if it is something personal that requires individual attention, if instead you have questions about logistics of the class, course material and assignments, and anything else your classmates may wonder as well, please post a question on the Discussions Board instead. This way the information is shared quickly to the entire class, and each of you can benefit from seeing other classmates' questions.

- I will always do my best to ensure the communication relevant to the course is clear and transparent, it is your responsibility as well to keep yourself updated by regularly checking: the announcements on Canvas, your Umail, the posts on the Discussions Board, and pay attention to the announcements given in class and Discussion Section.
- Students are expected to log in and check canvas every day for posted announcements and assignments. Students are also strongly advised to set up notifications for canvas so they do not miss any important notifications.
- Students can loan a laptop from Marriott Library https://lib.utah.edu/coronavirus/checkoutequipment.php.

ADA 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 and Access, 200 S. Central Campus Dr., Rm. 162. CDA will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability and Access.

Veterans' Center: If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class for any reason.

Nondiscrimination and Accessibility Statement: The University of Utah does not discriminate on the basis of race, color, religion, national origin, sex, age, status as a disabled individual, sexual orientation, gender identity/expression, genetic information or protected veteran?s status, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Additionally, the University endeavors to provide reasonable accommodations and to ensure equal access to qualified persons with disabilities. Inquiries concerning perceived discrimination or requests for disability accommodations may be referred to the University?s Title IX/ADA/Section 504 Coordinator at the Office of Equal Opportunity and Affirmative Action, 801-581-8365 Student Wellness: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu

Student responsibilities: All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, indicated in the Student Handbook. You have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies prescribed conduct (Article XI) that involves cheating on tests, collusion, fraud, theft, etc. Students should read the Code carefully and understand you are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee. http://regulations.utah.edu/academics/6- 400.php

Classroom Social Equity: I strive to be kind, ethical, fair, inclusive and respectful in my classroom and expect students to behave likewise. In this regard, I have these requests of you, as my students:

- Please inform me of whichever pronouns you prefer me to use for you. I will put great effort into honoring your request and ask that you correct me if I happen to make a mistake.
- Please tell me, discreetly, if you have any sort of anxiety disorder, TBI, PTSD, or any other challenge that would cause psychological harm to you by me calling on you in class. I want students to feel stretched and challenged during class, while working on problems as a large group, but I do not want to cause harm to any human being. Please let me know if that is the case for you and I will confidentially accommodate your request.

- If your preferred name is different than your legal first name (the preferred name you chose does indeed show up in CIS on my roll sheet, but not yet in Canvas), please log into Canvas and go to Account (on far left) $\rightarrow$ Settings and change your Display Name to be the name you prefer to be addressed by. This will help me to address you correctly.

Class policies:

- I reserve the right to modify the class structure and syllabus at any time but I will notify you if and when any changes are made.
- If an emergency arises that prevents you from making it to an exam or turning in a homework it is your responsibility to communicate that information to me as soon as possible. I will do my best to accommodate any situation that comes up. In general, I allow exams to be taken early, but not late.
- If you are struggling with a concept please come talk to me or visit the tutoring center as soon as possible. I am more than happy to meet with you outside of my office hours if my schedule permits it.
- I encourage you to work with others on the homework but anything that you turn in must be your own work. Again, cheating is student misconduct and will be dealt with seriously. If you cheat on any homework, quiz, lab, or exam, I will automatically give you a zero for that grade. Depending on the severity of the cheating, I may decide to fail you from the class. Please note that the use (or even just pulling it out of your pocket) of a cell phone or any other electronic device during any in-class exam is considered cheating and cause for receiving an automatic zero.
- Regrade requests can be made on Gradescope after the homework/quiz/exam was returned with an explanation why more credit is due.