**Matrix Theory**

Math 4450.001/5500.001, Spring 2026, TR 11:00-12:20, Curry 210

**Professor:** Conley, GAB 419, conley@unt.edu

**Website:** www.math.unt.edu/∼conley

**Note regarding Canvas:** there will be no Canvas page for this course; practice problems and announcements will be posted at the course page on my website.

**Office Hours:** Tuesdays and Thursdays 12:30-2:30, and by appointment

**Text:** *Introduction to Linear Algebra*, $6^{\text{th}}$ ed., Gilbert Strang

**Prerequisite:** Linear Algebra (Math 2700)

**Exams:** There will be two 100 point midterms and a comprehensive 200 point final (see over for dates). There will be no make-up exams.

**Homework:** There will be 13 in-class quizzes, one every non-exam Thursday, worth 10 points each. The quiz problems will be similar to the practice problems posted on the course website, so the best way to prepare for the quizzes is to do all of the practice problems. There will be no make-up quizzes, but your lowest three quiz scores will be dropped.

**Grading:** There are a total of 500 points possible. The letter grade point cut-offs vary from year to year, but are normally no stricter than 80% for an $A$, 60% for a $B$, 50% for a $C$, and 40% for a $D$. After each exam I will post the letter grade cut-offs for the exam and course so far.

**Policies:**

- Attendance is required. You have 3 free absences. Further unexcused absences may cost 5 points each.
- Phone/laptop use is not permitted in lecture. You may use tablets which lay flat, but only for taking notes. Violations may cost 2 points.
- Exams & quizzes are pen/pencil/paper only. Use of other materials may incur a penalty of up to a zero on the exam/quiz.

**Disabled Students:** Please let me know of your disability.

**Topics:** The theme of the course will be matrix decompositions. We will relate each to its applications. Several decompositions are summarized in Appendix 2 of the text. Here are some of them:

- $LU$, $PLU$, $LPU$: solving linear equations via row/column reduction
- $X\Lambda X^{-1}$: eigenvectors, eigenvalues, diagonalization
- $X\Gamma X^{-1}$: generalized eigenspaces, block diagonalization, Jordan form
- $QR$, $KAN$: the Gram-Schmidt process and the Iwasawa decomposition
- $C^TC$: the Cholesky decomposition of positive definite symmetric matrices
- $Q\Lambda Q^{-1}$: diagonalization of symmetric matrices by orthogonal matrices
- $QS$: the polar decomposition
- $U\Sigma V^T$: the singular value decomposition
- $A^+ = V\Sigma^+U^T$: the pseudo-inverse

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| MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY |
|---|---|---|---|---|
| 1/12 | 1/13<br>First lecture | 1/14 | 1/15<br>Quiz 1 | 1/16 |
| 1/19<br>MLK Day | 1/20 | 1/21 | 1/22<br>Quiz 2 | 1/23 |
| 1/26 | 1/27 | 1/28 | 1/29<br>Quiz 3 | 1/30 |
| 2/2 | 2/3 | 2/4 | 2/5<br>Quiz 4 | 2/6 |
| 2/9 | 2/10 | 2/11 | 2/12<br>Quiz 5 | 2/13 |
| 2/16 | 2/17 | 2/18 | 2/19<br>EXAM 1 | 2/20 |
| 2/23 | 2/24 | 2/25 | 2/26<br>Quiz 6 | 2/27 |
| 3/2 | 3/3 | 3/4 | 3/5<br>Quiz 7 | 3/6 |
| 3/9<br>Spring Break | 3/10 | 3/11 | 3/12 | 3/13 |
| 3/16 | 3/17 | 3/18 | 3/19<br>Quiz 8 | 3/20 |
| 3/23 | 3/24 | 3/25 | 3/26<br>Quiz 9 | 3/27 |
| 3/30 | 3/31 | 4/1 | 4/2<br>EXAM 2 | 4/3 |
| 4/6 | 4/7 | 4/8 | 4/9<br>Quiz 10 | 4/10 |
| 4/13 | 4/14 | 4/15 | 4/16<br>Quiz 11 | 4/17 |
| 4/20 | 4/21 | 4/22 | 4/23<br>Quiz 12 | 4/24 |
| 4/27 | 4/28 | 4/29 | 4/30<br>Quiz 13 | 5/1<br>Reading Day |
| 5/4 | 5/5<br>Final Exam: 10-12 | 5/6 | 5/7 | 5/8 |