

**MATH 647-01: LINEAR ALGEBRA AND MATRIX THEORY
FALL 2015**

Course number: MAT 647-01

Course title: Linear Algebra and Matrix Theory

Credits: 3

Meetings: TR 9:30–10:45 PM, Stone 215

Prerequisites: Grade of C or better in at least C in MAT 310 and 311 or equivalent

Instructor information:

Instructor: Dr. Dan Yasaki d_yasaki@uncg.edu

Homepage: http://www.uncg.edu/math/faculty/d_yasaki/teaching.html

Office Hours (146 Petty): TR 10:50–noon

For whom planned: First and second year graduate students

Catalog description: Vector spaces. Linear operators and similarity. The eigenvalue problem and a spectral decomposition theorem. Normal forms: Smith form for matrices, rational and Jordan forms. Spectral resolution of matrix functions. Special topics.

Student learning outcomes: Upon successful completion of this course students shall be able to

SLO 1: define basic terms associated with linear algebra, such as vector space, linear operator, eigenvalues/eigenvectors, normal forms;

SLO 2: give examples of spaces, linear maps or matrices exhibiting properties outlined in SLO 1 in addition to examples of applications of linear algebra;

SLO 3: explain and give complete, careful statements of definitions and important theorems; and

SLO 4: construct and **defend** coherent mathematical proofs of statements in linear algebra.

Teaching methods and assignments for achieving learning outcomes:

Reading: Reading the sections we discuss before class is essential if you wish to get the most out of lectures. This allows you to form questions before you see me present the material so that you can focus on the confusing aspects of the topics we discuss. (SLO 1)

Lectures: This is the primary method of content delivery. I plan to follow the book closely, but I will supplement the book's material with some of my own when questions arise or when I feel it is appropriate. (SLO 1–3)

Tests: Tests serve as the primary gauge of evaluation. (SLO 1–4)

Homework: Homework will be assigned often. Not all homework exercises will be collected. Homework is the most important way to actually “learn” mathematics. This is the same sort of practice that is used to learn to play tennis or learn to play the piano. One cannot learn these things by watching them on television or reading about them

in a book no more than one can learn mathematics by watching a lecture or reading a mathematics book. (SLO1–4)

Evaluation and grading: A grade of A, B+, B, B-, C+, C, or F will be awarded based on performance on assignments as described below.

Homework: All collected assignments are weighted equally. Homework counts for 30% of your grade.

Tests: Test 1 (9/29) and Test 2 (11/3) count 20% of your grade each. The final exam (12/3 at 8:00 am) is cumulative and counts for 30% of your grade.

Required text:

Friedberg, Insel, and Spence, *Linear Algebra*, 4th ed., Prentice Hall, 2003. ISBN 13: 0-13-008451-4.

Academic Integrity Policy: Each student is required to sign the Academic Integrity Policy on all major work submitted for the course.

I have abided by the UNCG Academic Integrity Policy on this assignment.

Signature _____ Date _____

More information can be found at

<http://sa.uncg.edu/handbook/academic-integrity-policy/>.

Additional information:

- (1) UNCG seeks to comply fully with the Americans with Disabilities Act (ADA). Students requesting accommodations based on a disability must be registered with the Office of Accessibility Resources and Services (OARS) in 215 Elliott University Center, 334-5440, <http://oars.uncg.edu>.
- (2) Assignments Policy: Assignments are due at the beginning of class. Late assignments will not be accepted.
- (3) Absence Policy: You are responsible for all missed material. Any missed assignment, test, or final exam will result in a score of 0. Make-up tests and final exam will be given only if you receive prior approval for a valid excuse by contacting me at least one week in advance.
- (4) Copyright Policy: Selling or purchasing notes from classes for commercial gain is a violation of the UNCG Copyright Policy.

<http://policy.uncg.edu/copyright/>

Any student who sells notes taken in class for commercial gain, or who purchases notes taken by another student for commercial gain, is in violation of this policy and, by extension, is committing a violation of the Student Code of Conduct.

<http://sa.uncg.edu/handbook/student-code-of-conduct/>

- (5) Email Policy: All email correspondence should be made using your UNCG email account. You must check your email regularly for updates and announcements.
- (6) There will be homework exercises that may require the use of computer software.

Tentative schedule Fall:

- Week 1: Fields, Vector spaces
Readings: Appendix C, 1.1–1.2
- Week 2: Subspaces, Linear combinations
Readings: 1.3–1.4
- Week 3: Bases, Dimension
Readings: 1.5–1.6
- Week 4: Linear transformations
Readings: 2.1–2.2
- Week 5: Composition of linear transformations, Invertibility and isomorphisms
Readings: 2.3–2.4
- Week 6: Change of coordinate matrix, Dual spaces
Readings: 2.5–2.6
- Week 7: **Test 1**, Elementary matrices
Readings: 3.1 Note: Test 1 on Tue 9/29 in class
- Week 8: Rank, Systems of linear equations (theoretical and computational aspects)
Readings: 3.2–3.4
- Week 9: —, Determinants
Readings: 4.1–4.4 Note: Fall break (no class Tuesday)
- Week 10: Eigenvalues and eigenvectors, Diagonalizability
Readings: 5.1–5.2
- Week 11: Invariant subspaces and the Cayley-Hamilton Theorem
Readings: Appendix E, 5.4
- Week 12: **Test 2**, Jordan form I
Readings: 7.1 Note: Test 2 is on Tue 11/3 in class
- Week 13: Jordan form II, Minimal polynomial
Readings: 7.2–7.3
- Week 14: Rational canonical form
Readings: Appendix E, 7.4
- Week 15: Review, —
Readings: — Note: Thanksgiving (no class Thursday)
- Week 16: —, **Final exam**
Readings: — Note: Final exam is on Thu 12/3 at 8:00 am