



Math 21

Linear Algebra

Tu-Th, 9:00am - 12:30pm, Social Sciences 2 071

Gabriel Martins

gmartins(at)ucsc(dot)edu

people.ucsc.edu/~gmartins

Office: McHenry 4112

Office Hours: Tu-Th 1:30pm to 3:00pm (at McHenry 1270)

I might make slight updates to the syllabus during the course.
You can always find an updated version on the class website.

Course Description: Systems of linear equations matrices, determinants. Introduces abstract vector spaces, linear transformation, inner products, the geometry of Euclidean space, and eigenvalues. Students cannot receive credit for this course and Applied Mathematics and Statistics 10 or 10A.

Prerequisite(s): Mathematics 11A or 19A or 20A or Applied Mathematics and Statistics 11A or 15A.

Credits: 5 units

Text: *Elementary Linear Algebra*

Author: Bruce Cooperstein

ISBN-13: 978-0-9885572-0-8

Course Objectives:

At the completion of this course, students will:

1. Have a firm grasp on the concept of vectors spaces, specially \mathbb{R}^n
2. Understand linear transformations and how they relate to matrices
3. Solve linear systems of equations

Grade Distribution:

Assignments	30%
Midterm Exam	30%
Final Exam	40%

Homework: Every week a problem set will be assigned and collected at the beginning of lecture, there will be four assignments in total, due on the following days: 06/28, 07/07, 07/14 and 07/21. The homework score will be computed from the best three scores out of four.

Midterm Exam: There will be a single midterm exam on Tuesday July 7.

Final: A cumulative final exam will be held on the last day of class, Thursday July 21.

Section: Mo-We, 10:00-11:30am

Room: McHenry 1270

TA: Jonathan Chi

Email: [jbchi\(at\)ucsc\(dot\)edu](mailto:jbchi@ucsc.edu)

Office: McHenry 4112

Important Summer Session 1 Dates:

Thursday June 23: Enrollment period ends.
Monday June 27: Drop period ends.
Friday July 1: Deadline to change grade option.
Friday July 8: Withdrawal period ends.
Saturday July 30: Grades posted.

Students with Disabilities: If you qualify for classroom accommodations because of a disability, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me as soon as possible, preferably within the first week of classes. Contact DRC by phone at 831-459-2089 or by email at [drc\[at\]ucsc\[dot\]edu](mailto:drc@ucsc.edu) for more information.

Tutoring: If you would like to hire a tutor for this class and you're not sure how to find one, you are welcome to ask me for recommendations and I will put you in contact with good tutors I know. Additionally, a list of tutors is supplied by the Math Department at:

<http://www.math.ucsc.edu/undergraduate/tutor-list.html>.

Late Policy: I do not accept late homework in any circumstances.

Local Discounts: Check this website for a list of discounts available to summer session students in the Santa Cruz area: <http://summer.ucsc.edu/resources/local-discounts.html>

Tentative Course Outline:

The topic coverage might change as it depends on the progress of the class.

Date	Topics covered
Tue 06/21	<ul style="list-style-type: none">• What are vector spaces?• The plane \mathbb{R}^2• The n-dimensional space \mathbb{R}^n• Abstract vector spaces• Space of polynomials• Subspaces
Thu 06/23	<ul style="list-style-type: none">• What are inner products?• The dot product in \mathbb{R}^n• Angles and distances• Orthogonal projections• Equations of lines and planes
Tue 06/28	<ul style="list-style-type: none">• Linear independence and bases• Coordinates induced by a basis• Matrices and matrix multiplication• Change of basis matrix
Thu 06/30	<ul style="list-style-type: none">• Linear transformations• Matrix representation• Injectivity and linear independence• Projections on subspaces• Isometries of \mathbb{R}^n
Tue 07/05	<ul style="list-style-type: none">• Review
Thu 07/07	<ul style="list-style-type: none">• Midterm• Geometric description of solutions to $T(\vec{v}) = \vec{w}$• Rank-Nullity theorem
Tue 07/12	<ul style="list-style-type: none">• Systems of linear equations• Gauss elimination• Injectivity and Surjectivity of linear transformations
Thu 07/14	<ul style="list-style-type: none">• Computing inverses• The determinant in \mathbb{R}^n• The determinant of a linear operator• Eigenvalues and eigenvectors• The characteristic polynomial of an operator• The spectral theorem
Tue 07/19	<ul style="list-style-type: none">• Review
Thu 07/21	<ul style="list-style-type: none">• Final Exam