


Math 4A: Introduction to Linear Algebra

Winter 2018

INSTRUCTOR	Paul J. Atzberger http://atzberger.org/teaching Office Hours: TR 4:15pm – 5:45pm	Department of Mathematics Office: 6712 South Hall Office Hours Locations: T: 6712 South Hall; R: ONDAS Center (Kerr Hall 1150)							
CLASS TIMES	TR 8:00am – 9:15am. Isla Vista Theater								
DESCRIPTION	Linear algebra is a fundamental topic in mathematics with many applications. This class will cover core topics on both the theoretical foundations of linear algebra and practical aspects of how to solve applied problems. More information can be found below and on the course website.								
PREREQUISITES	See the department of mathematics website for current policies.								
TEXTBOOKS	<i>Linear Algebra and Its Applications (5th Edition)</i> , D. C. Lay, S. R. Lay, J. J. McDonald.								
GRADING	<table><tr><td>Homework</td><td>30%</td></tr><tr><td>Midterm</td><td>30%</td></tr><tr><td>Final Exam</td><td>40%</td></tr></table>			Homework	30%	Midterm	30%	Final Exam	40%
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POLICIES	<p>Assignments will be posted on the course website. Prompt submission of all homework will be required. While no late homework will be accepted, two missed homework will be allowed without penalty. While it is permissible for you to discuss materials with classmates, the submitted homework must be your own work.</p> <p>Given the large class size, if an exam is missed because of illness or some other emergency, you need to contact the instructor within one week with proper documentation or else a 0 grade may be recorded.</p> <p>There is a policy of no video or pictures to be taken during lectures. Instead one should take notes or pay particular attention. There is also a policy of no texting, e-mailing, or social media during the class. It is hoped one is avoiding such distractions to make the most of the lectures.</p>								
EXAMS	Midterm Exam: Tuesday, February 13 th , 8:00am – 9:15am. Final Exam: Thursday, March 22 nd , 8:00am – 11:00am.								
TOPICS	<ul style="list-style-type: none">• Introduction to Linear Algebra and Motivations<ul style="list-style-type: none">○ Systems of Linear Equations○ Row Reduction and Echelon Forms○ Vector Equations○ The Matrix Equation $Ax = b$								

- Solution Sets of Linear Systems
- Applications of Linear Systems
- Linear Independence
- Introduction to Linear Transformations
- The Matrix of a Linear Transformation
- Applications in Business, Science, and Engineering

- Matrix Algebra
 - Motivations and Applications
 - Matrix Operation
 - The Inverse of a Matrix
 - Characterizations of Invertible Matrices
 - Applications to Computer Graphics
 - Subspaces of \mathbb{R}^n
 - Dimension and Rank

- Determinants
 - Motivations and Applications
 - Introduction to Determinants
 - Properties of Determinants
 - Cramer's Rule, Volume, and Linear Transformations

- Vector Spaces
 - Motivations and Applications
 - Vector Spaces and Subspaces
 - Null Spaces, Column Spaces, and Linear Transformations
 - Linearly Independent Sets; Bases
 - Coordinate Systems
 - The Dimension of a Vector Space
 - Rank
 - Change of Basis
 - Applications to Difference Equations
 - Applications to Markov Chains

- Eigenvalues and Eigenvectors
 - Motivations and Applications
 - Eigenvectors and Eigenvalues
 - The Characteristic Equation
 - Discrete Dynamical Systems

- Orthogonality and Least Squares
 - Motivations and Applications
 - Inner Product, Length, and Orthogonality
 - Orthogonal Sets
 - Orthogonal Projections
 - Least-Squares Problems

WEBSITE

<http://atzberger.org/teaching>