Linear Algebra and Differential Equations is an introduction to linear algebra, including systems of linear equations, linear transformations, determinants, eigenvectors, eigenvalues, inner products and linear spaces. The course introduces discrete dynamical systems and gives a solid introduction to differential equations, Fourier series as well as some partial differential equations. Other highlights include applications in statistics like Markov chains and data fitting with arbitrary functions.

More details: [http://www.math.harvard.edu/sectioning](http://www.math.harvard.edu/sectioning)
Day to Day

Syllabus

0. Week: Introduction
   Lect 1 1/26  1.1 introduction to linear systems

1. Week: Systems of Linear Equations
   Lect 2 1/29  1.2 matrices and Gauss-Jordan elimination
   Lect 3 1/31  1.3 on solutions of linear systems
   Lect 4 2/2  2.1 linear transformations and inverses

2. Week: Linear Transformations
   Lect 5 2/5    2.2 linear transformations in geometry
   Lect 6 2/7    2.3-4 matrix product and inverse
   Lect 7 2/9    3.1 image and kernel

3. Week: Linear Subspaces
   Lect 8 2/12  3.2 bases and linear independence
   Lect 9 2/14  3.3 dimension
   Lect 10 2/16  3.4 coordinates

4. Week: Dimension and Linear spaces
   2/19 Presidents day, no class
   Lect 11 2/21  4.1 linear spaces
   Lect 12 2/23  5.1 orthonormal bases projections

5. Week: Orthogonality
   Lect 13 2/26  review for first midterm
   Lect 14 2/28  5.2 Gram-Schmidt and QR factorization
   Lect 15 3/2  5.3 orthogonal transformations

6. Week: Datafitting
   Lect 16 3/5  5.4 least squares and data fitting
   Lect 17 3/7  6.1 determinants 1
   Lect 18 3/9  6.2 determinants 2

7. Week: Eigenvalues/Eigenvectors
   Lect 19 3/19  7.1-2 eigenvalues
   Lect 20 3/21  7.3 eigenvectors
   Lect 21 3/23  7.4 diagonalization

8. Week: Stability and Symmetric Matrices
   Lect 22 3/26  7.5 complex eigenvalues
   Lect 23 3/28  7.6 stability
   Lect 24 3/30  8.1 symmetric matrices

9. Week: Differential Equations
   Lect 25 4/2    review for second midterm
   Lect 26 4/4  9.1 differential equations I
   Lect 27 4/6  9.2 differential equations II

10. Week: Nonlinear systems/Function spaces
    Lect 28 4/9  9.4 nonlinear systems
    Lect 29 4/11  4.2 linear trafos on function spaces
    Lect 30 4/13  9.3 linear differential operators

11. Week: Fourier Series
    Lect 31 4/16  5.5 inner product spaces
    Lect 32 4/18  5.5 Fourier series
    Lect 33 4/20  5.5 Parseval

12. Week: Partial Differential Equations
    Lect 34 4/23  Partial differential equations
    Lect 35 4/25  Overview

Reading period

Calendar

Intro Meeting
Classes start

Spring break 3/11-3/18

Reading period