

COURSE SCHEDULE

List of topics and sections is definitive. Indications of semester **weeks** per topic is tentative.

Section 1: Linear equations and linear maps

- 1.1 Systems of Linear Equations (Week 1)
- 1.2 Row reduction and echelon form
- 1.3 Vector equations and vector arithmetic
- 1.4 Matrix-vector equations (Week 2)
- 1.5 The structure of the solution space
- 1.6 Linear combinations and linear independence
- 1.7 Matrices and linear maps (Week 3)

Section 2: Matrix algebra

- 2.1 Matrix operations (Week 4)
- 2.2 The inverse of a matrix
- 2.3 Characterizations of invertible matrices (Week 5)

Section 3: The determinant

- 3.1 Definition of the determinant (Week 5)
- 3.2 Properties of the determinant
- 3.3 Computation of the determinant (Week 6)
- 3.4 Determinants and volume

Section 4: Vector spaces

- 4.1 Definition and properties of vector spaces (Week 6)
- 4.2 Kernel and Range (Week 7)
- 4.3 Linearly independent sets and bases
- 4.4 Coordinate systems (Week 8)
- 4.5 The dimension of a vector space
- 4.6 Subspaces of finite dimensional spaces (Week 9)
- 4.7 Change of basis

Section 5: Eigenvalues and eigenvectors

- 5.1 Introduction to complex numbers (Week 10)
- 5.2 Eigenvalues and eigenvectors
- 5.3 Diagonalization (Week 11)

Section 6: Orthogonality and least squares

- 6.1 The Euclidean inner product (Week 11)
- 6.2 Orthogonal sets of vectors
- 6.3 Orthogonal projections (Week 12)
- 6.4 The Gram-Schmidt process (and QR-factorization)
- 6.5 Least squares (Week 13)
- 6.6 Application to linear models

Section 7: Symmetric matrices and SVD

- 7.1 Symmetric matrices (Week 13)
- 7.2 Singular value decomposition (SVD)
- 7.3 The matrix $\exp(At)$ and systems of linear ODEs (Week 14)