Class schedule: Math 8530, Fall 2020

Week 1: 8/19–8/21. Course overview (all Wednesday). One lecture.

- Lecture 1.1: Vector spaces and linearity
- Lecture 1.2: Spanning, independence, and bases (0:00–18:02)

Week 2: 8/24–8/28. HW 1 due Wednesday (extended to Friday). Three lectures.

- Lecture 1.2: Spanning, independence, and bases (18:03–39:25).
- Lecture 1.3: Direct sums and products
- Lecture 1.4: Quotient spaces
- Lecture 1.5: Dual vector spaces (0:00–17:52)

Week 3: 8/31–9/4. HW 2 due Wednesday. Three lectures.

- Lecture 1.5: Dual vector spaces (17:52–23:36)
- Lecture 1.6: Annihilators
- Lecture 2.1: Rank and nullity
- Lecture 2.2: Applications of the rank-nullity theorem (0:00–22:27)

Week 4: 9/7–9/11. HW 3 due Wednesday. Three lectures.

- Lecture 2.2: Applications of the rank-nullity theorem (22:28–38:40)
- Lecture 2.3: Algebra of linear maps
- Lecture 2.4: The four subspaces
- Lecture 2.5: The transpose of a linear map (0:00–4:53)

Week 5: 9/14–9/18. HW 4 due Wednesday. Three lectures.

- Lecture 2.5: The transpose of a linear map (4:54–41:06)
- Lecture 2.6: Matrices
- Lecture 2.7: Change of basis
- Lecture 3.1: Determinant prerequesites
- Lecture 3.2: Symmetric and skew-symmetric multilinear forms (0:00–6:41)

Week 6: 9/21–9/25. HW 5 due Wednesday (extended to Thursday). Three lectures.

- Lecture 3.2: Symmetric and skew-symmetric multilinear forms (6:42–30:51)
- Lecture 3.3: Alternating multilinear forms
- Lecture 3.4: Determinants of linear maps
- Lecture 3.5: The determinant and trace of a matrix (0:00–23:15)
- Lecture 3.6: Minors and cofactors (0:00–25:06)

Week 7: 9/28–10/2. HW 6 due Wednesday (extended to Friday). Three lectures.

- Lecture 3.5: The determinant and trace of a matrix (23:16–33:37)
- Lecture 3.6: Minors and cofactors (25:07–31:33)
- Lecture 3.7: Tensors
- Lecture 4.1: Eigenvalues and eigenvectors
- Lecture 4.2: The Cayley-Hamilton theorem (00:00–6:04).

Week 8: 10/5–10/9. HW 7 due Friday. Two lectures. Midterm 1 Friday.

- Lecture 4.2: The Cayley-Hamilton theorem (6:05–49:19)
- Lecture 4.3: Generalized eigenvectors
- Lecture 4.4: Invariant subspaces (0:00–8:10).

Week 9: 10/12–10/16. HW 8 due Wednesday. Three lectures.

- Lecture 4.4: Invariant subspaces (8:11–41:30)
- Lecture 4.5: The spectral theorem
- Lecture 4.6: Generalized eigenspaces
- Lecture 4.7: Jordan canonical form (0:00–19:47)

Week 10: 10/19–10/23. HW 9 due Friday. Three lectures.

- Lecture 4.7: Jordan canonical form (19:48–31:49)
- Lecture 4.8: Generalized eigenvectors of differential operators
- Lecture 5.1: Inner products and Euclidean space
- Lecture 5.2: Orthogonality (0:00–20:07)
- Lecture 5.3: Gram-Schmidt and orthogonal projection

Week 11: 10/26–10/30. Three lectures.

- Lecture 5.2: Orthogonality (20:08–48:13)
- Lecture 5.3: Gram-Schmidt and orthogonal projection
- Lecture 5.4: Adjoints

Week 12: 11/2–11/6. Fall break Mon–Tues. HW 10 due Wednesday. Two lectures.

- Lecture 5.5: Isometries
- Lecture 5.6: The norm of a linear map
- Lecture 5.8: Complex inner product spaces (just for 5 minutes)

Week 13: 11/9–11/13. HW 11 due Friday. Three lectures.

- Lecture 5.7: Sequences and convergence
- Lecture 5.8: Complex inner product spaces
- Lecture 6.1: Quadratic forms
- Lecture 6.2: Spectral resolutions (through Theorem 6.1)

Week 14: 11/16–11/20. Two lectures. Midterm 2 Friday.

- Lecture 6.2: Spectral resolutions
- Lecture 6.3: Normal linear maps