

Tentative schedule for CAAM 453/553, Fall 2009

*We will deviate from this schedule throughout the semester,  
but this gives a good impression of our general focus.*

1. 24 Aug: Overview; motivating examples from quadrature and celestial mechanics
2. 26 Aug: Linear algebra: norms, orthogonal matrices; projectors
3. 28 Aug: Linear algebra: Householder reflectors, QR decomposition
4. 31 Sep: Linear algebra: QR decomposition
5. 2 Sep: Linear algebra: Gram–Schmidt orthogonalization
6. 4 Sep: Linear algebra: solving linear systems via QR, conditioning of  $Ax = b$   
7 Sep: *Labor Day*, no classes
7. 9 Sep: IEEE floating point number systems
8. 11 Sep: IEEE floating point number systems
9. 14 Sep: Interpolation: monomial basis, Vandermonde matrices; conditioning
10. 16 Sep: Interpolation: Newton form, Lagrange form
11. 18 Sep: Interpolation: convergence of interpolants, Runge’s example
12. 21 Sep: Interpolation: Hermite interpolation, piecewise polynomials, splines
13. 23 Sep: Interpolation: matrix formulation of splines
14. 25 Sep: Approximation Theory: solving discrete least squares problems via QR
15. 28 Sep: Approximation Theory: SVD: definition, derivation
16. 30 Sep: Approximation Theory: SVD: fundamental subspaces, low-rank approximation
17. 2 Oct: Approximation Theory: continuous  $L^2$  approximation
18. 5 Oct: Approximation Theory: orthogonal polynomials
19. 7 Oct: Approximation Theory:  $L^\infty$  (minimax) approximation
20. 9 Oct: Approximation Theory: Chebyshev polynomials  
12 Oct: *Midterm Recess*, no classes
21. 14 Oct: Quadrature: Newton–Cotes quadrature, adaptive quadrature
22. 16 Oct: Quadrature: Peano kernel analysis
23. 19 Oct: Quadrature: Richardson extrapolation, Romberg integration
24. 21 Oct: Quadrature: Gaussian quadrature
25. 23 Oct: Quadrature: Gaussian quadrature
26. 26 Oct: NSODEs: introduction, Euler’s method
27. 28 Oct: NSODEs: one-step methods, Runge–Kutta, truncation error
28. 30 Oct: NSODEs: one-step methods: global error analysis
29. 2 Nov: NSODEs: multistep methods: truncation error
30. 4 Nov: NSODEs: multistep methods: zero stability
31. 6 Nov: NSODEs: multistep methods: absolute stability
32. 9 Nov: NSODEs: stiff equations; backward difference methods
33. 11 Nov: NSODEs: geometric integration; matrix exponential
34. 13 Nov: NSODEs: linear ODEs and the matrix exponential
35. 16 Nov: NSODEs: boundary value problems
36. 18 Nov: Linear algebra: LU decomposition for solving  $Ax = b$ , pivoting
37. 20 Nov: Linear algebra: Cholesky decomposition for Hermitian matrices
38. 23 Nov: Linear algebra: power method; QR algorithm for matrix eigenvalues
39. 25 Nov: Linear algebra: Practical QR algorithm; convergence sketch  
27 Nov: *Thanksgiving break*, no classes
40. 30 Nov: Root finding: bisection, regula falsi
41. 2 Dec: Root finding: Newton’s method, secant method
42. 4 Dec: Root finding: convergence analysis, minimization