MATH/CS 5466: NUMERICAL ANALYSIS

Tentative Schedule

The pace of the course and topics covered will be adjusted as the semester progresses, but the schedule below gives a rough impression of the territory we seek to cover.

				subject	*topic*
January	20	W	1.	Interpolation	interpolants in the monomial basis
	22	F	2.	Interpolation	Newton, Lagrange bases; barycentric form
	25	M	3.	Interpolation	classical error bound
	27	W	4.	Interpolation	application to finite differences
	29	F	5.	Interpolation	Hermite interpolation
February	1	M	6.	Interpolation	trigonometric interpolation
	3	W	7.	Interpolation	piecewise polynomial interpolation
	5	F	8.	Interpolation	B-splines
	8	M	9.	Interpolation	matrix formulation of splines
	10	W	10.	Interpolation	theoretical properties of splines
	12	F	11.	Approximation	L_2: general theory
	15	M	12.	Approximation	projectors; connection to discrete least squares
	17	W	13.	Approximation	orthogonal polynomials, orthogonalization
	19	F	14.	Approximation	L_∞: general theory
	22	M	15.	Approximation	Oscillation Theorem
	24	W	16.	Approximation	Remez exchange algorithm
	26	F	17.	Approximation	Chebyshev polynomials
	29	M	18.	midterm review	
March	2	W	19.	Interpolation	interpolation operators; Lebesgue constants
	4	F	20.	Approximation	Padé approximation
	7	M		*Spring Break*	
	9	W		*Spring Break*	
	11	F		*Spring Break*	
	14	M	21.	Approximation	L_1: general overview
	16	W	22.	Quadrature	interpolatory quadrature; composite rules
	18	F	23.	Quadrature	Peano kernel analysis
	21	M	24.	Quadrature	Clenshaw–Curtis quadrature
	23	W	25.	Quadrature	Gaussian quadrature
	25	F	26.	Quadrature	Gaussian quadrature
	28	M	27.	Differentiation	finite differences
	30	W	28.	Differentiation	Richardson extrapolation; Romberg integration
April	1	F	29.	Nonlinear equations	bisection, *regula falsi*
	4	M	30.	Nonlinear equations	Newton's method
	6	W	31.	Nonlinear equations	secant method
	8	F	32.	Nonlinear equations	quasi-Newton methods (higher dimensions)
	11	M	33.	Nonlinear equations	quasi-Newton methods (higher dimensions)
	13	W	34.	ODEs	overview of ODE existence theory
	15	F	35.	ODEs	one-step methods; truncation error
	18	M	36.	ODEs	global convergence of one-step methods
	20	W	37.	ODEs	derivation of Runge–Kutta methods
	22	F	38.	ODEs	multistep methods: derivation
	25	M	39.	ODEs	multistep methods: truncation error
	27	W	40.	ODEs	multistep methods: zero stability
	29	F	41.	ODEs	multistep methods: absolute stability
May	2	M	42.	ODEs	two-point boundary value problems
	4	W	43.	recap; review for final	