

SYLLABUS

SM365 Numerical Computing

Fall Semester 2012

Textbook: *A Friendly Introduction to Numerical Analysis* ☺, Brian Bradie

Module	Day/Date			Reading Assignment	PROBLEMS	NOTES	
Introduction to Algorithms	1	Mon	8/22	1.1 Algorithms Part 1			
	2	Tue	8/23	1.1 Algorithms Part 2	1, 2, 4(a), 5		
	3	Wed	8/24	1.1 Review of MATLAB Part 1			
	4	Fri	8/26	1.1 Review of MATLAB Part 2			
	5	Mon	8/27	1.2 Rate of Convergence, (pp 20-22)	1ab, 2ab, 3, 4		
	6	Tue	8/30	1.2 Order of Convergence (pp 23-27)	7, 10, 12, 18		
	7	Wed	8/31	1.3 Floating Point Number Systems	1c, 2, 4ab, 6c, 13, 16		
	8	Fri	9/2	1.4 Floating Point Arithmetic	1c, 2, 7, 9		
	H	Mon	9/5	Labor Day			
	MATLAB/ Linear Algebra Review	9	Tue	9/6	2.1 The Bisection Method Part 1: <i>Algorithm</i>	Write code	Add Deadline
		10	Wed	9/7	2.1 The Bisection Method Part 2: <i>Analysis</i>	1c, 4, 6, 11	
		11	Fri	9/9	2.3 Fixed Point Iteration Schemes	5, 6	
		12	Mon	9/12	2.4 Newton's Method Part 1: <i>Algorithm</i>	Write code	
		13	Tue	9/13	2.4 Newton's Method Part 2: <i>Analysis</i>	1ac, 2, 3, 11	
		14	Wed	9/14	3.0 Linear Algebra Review	1, 4, 7, 10, 16	
		15	Fri	9/16	3.1 Gaussian Elimination	7, 13, 14	
		16	Mon	9/19	Review		
		17	Tue	9/20	Test 1		
18		Wed	9/21	Solutions to Exam 1			
Linear Systems	19	Fri	9/23	3.2 Pivoting Strategy Part 1: <i>Partial Pivoting</i>	1cd, 3, 14	Academic Reserve	
	20	Mon	9/26	3.2 Pivoting Strategy Part 2: <i>Scaled Partial Pivoting</i>			
	21	Tue	9/27	3.3 Vector Norms (up to p. 174)	1, 2b, 3ac		
	22	Wed	9/28	3.3 Matrix Norms	4, 5bd, 6ac		
	23	Fri	9/30	3.4 Error Estimates/Condition Number Part 1 <i>Up to and including example 3.12</i>	1, 2, 7ac		
	24	Mon	10/3	3.4 Error Estimates and Condition Number Part 2	8ac, 11		
	25	Tue	10/4	3.5 LU Decomposition <i>Skip pages 200/201</i>	3, 4ab 14 (for b1, b2 only)	Grades	
	26	Wed	10/5	3.8 Iterative Techniques for Linear Systems Part 1 <i>Up to the middle of page 226</i>			
	27	Fri	10/7	3.8 Iterative Techniques for Linear Systems Part 2 <i>Jacobi Method with pseudocode</i>	3(Jacobi only), 5ad, Code	MAPRs	
	H	Mon	10/10	Columbus Day			
	28	Tue	10/11	3.8 Iterative Techniques for Linear Systems Part 3 <i>Gauss-Seidel Method with pseudocode</i>	3(GS only), 7, Code		
	29	Wed	10/12	3.8 Iterative Techniques for Linear Systems Part 4 <i>SOR with pseudocode, Convergence Properties</i>	12(for Prob. 7 only), Code		
	30	Fri	10/14	Review			
	31	Mon	10/17	Test 2			
32	Tue	10/18	Solutions to Exam 2				

Module	Day/Date			Reading Assignment	PROBLEMS	NOTES
Interpolation	33	Wed	10/19	5.0 Overview of Interpolation		
	34	Fri	10/21	5.1 Lagrange Form Part 1 <i>Linear and higher-degree polynomials</i>	2, 4ab, 12	
	35	Mon	10/24	5.1 Lagrange Form Part 2 <i>Uniqueness and error of interpolation</i>	4cd, 7, 9	
	36	Tue	10/25	5.3 Newton Form Part 1 <i>Divided Differences & Examples</i>	3, 8	
	37	Wed	10/26	5.3 Newton Form Part 2 <i>Examples & Interpolation Error</i>	Code , 13	
	38	Fri	10/28	5.4 Optimal Points for Interpolation Part 1 <i>Function norms & Chebyshev Polynomials</i>	1ac	
	39	Mon	10/31	5.4 Optimal Points for Interpolation Part 2 <i>Chebyshev Polynomials Cont'd</i>	3, 6ac -norm only	Academic Reserve
	40	Tue	11/1	5.4 Optimal Points for Interpolation Part 3 <i>Legendre Polynomials</i>	5, 9	
	41	Wed	11/2	5.5 Piecewise Linear Interpolation	2, 4, 7	
	42	Fri	11/4	5.6 Cubic Spline Interpolation Part 1 <i>Interpolant and Not-a-Knot B.C.</i>	1, 2	
	43	Mon	11/7	5.6 Cubic Spline Interpolation Part 2 <i>Clamped B.C. & Error Analysis</i>	10, 11	Grades
	44	Tue	11/8	Review		MAPRs
	45	Wed	11/9	Test 3		EarlySched
	H	Fri	11/11	Veterans Day		DropDeadline
46	Mon	11/14	Solutions to Exam 3			
Numerical Diff/Int	47	Tue	11/15	Linear Regression	2, 4, 7	
	48	Wed	11/16	Numerical Differentiation Part II	6, 8, 10	
	49	Fri	11/18	Richardson Extrapolation	1, 5, 7	
	50	Mon	11/21	Newton-Cotes Quadrature Part I		
	51	Tue	11/22	Newton-Cotes Quadrature Part II	1c, 2c, 6, 9	
	52	Wed	11/23	Gaussian Quadrature		
	H	Fri	11/25	Thanksgiving		
	53	Mon	11/28	Romberg Integration		
	54	Tue	11/29	IVPs for ODEs		
	55	Wed	11/30	Eulers method		
	56	Fri	12/2	Runge-Kutta methods		
57	Mon	12/5	Multi-step methods			
Final	58	Tue	12/6	REVIEW FOR FINAL EXAM		
	59	Wed	12/7	REVIEW FOR FINAL EXAM		
	60	Fri	12/9	REVIEW FOR FINAL EXAM		
	R	Mon	12/12	Reading Day		
	E	TBD	TBD			