MATH 655 Elementary Numerical Analysis I

Required of CS

Catalog Description: (3) I, II, S. Error analysis, root finding, interpolation, approximation of functions, numerical integration and differentiation, systems of linear equations.

Prerequisites: MATH 221, a computer language, and either MATH 515 or 551.

Textbook: *Elementary Numerical Analysis*, Kendall Atkinson, Weimin Han, 2004, 3rd Edition

Course Objectives: Master basic numerical analysis and scientific computing. Now updated and revised, this significant revision features reorganized and rewritten content, as well as some new additional examples and problems.

Sessions: Three 50 minute lecture/recitations/labs per week.

Chapter	Topics	Sessions
1	The Taylor Polynomial	2
	The Error in Taylor's Polynomials	1
2	Floating-Point Numbers	1
	Errors	1
	Sources, Propagation	1
3	The Bisection Method	2
	Newton's Method	2
	Secant Method	2
	Fixed Point Iteration	2
	Ill-Behaved Rootfinding Problems	1
4	Polynomial Interpolation	1
	Divided Differences, Error	1
	Interpolation Using Spline Functions	1
	The Best Approximation Problem	1
	Chebyshev Polynomials, A Near Minimax Approximation Method	2
5	The Trapezoidal and Simpson Rules	2
	Error Formulas	1
	Gaussian Numerical Integration	2
	Numerical Differentiation	1
6	Gaussion Elimination	2
	Matrix Arithmetic	2
	The *LU* Factorization	2
	Error in Solving Linear Systems	2
7	Least Squares Data Fitting	2
	The Eigenvalue Problem	1
	Iteration Methods	2
	Nonlinear Systems	1
Reviews and Exams		5
Total		46