School of Mathematics

Course 261 — Numerical Analysis (SF Mathematics, JS Mathematics, JS & SS Two Subject Moderatorship)

Lecturer: Dr. Sinéad Ryan

Requirements/prerequisites: None

Duration: 24 Weeks

Number of lectures per week: 3

Assessment: Examination and Homework assignments

End-of-year Examination: One 3-hour examination; counts 90%; homework counts 10%

Description:

More detailed information, problems sheets and problem sheet solutions can be found at http://www.maths.tcd.ie/~ryan/teaching261.html.

Numerical Linear Algebra: Gaussian elimination and Gauss-Jordan elimination; LU decomposition; Condition number of a matrix; SVD and sparse matrix methods; Stability and error analysis; Iterative solutions and convergence including Krylov subspace techniques.

Numerical Integration: Integration of functions, ODEs and PDEs;

Evaluation of Functions: Series and convergence; Polynomial and rational functions; Chebyshev and Padé approximations.

Interpolation and Extrapolation: Polynomial and rational interpolation and extrapolation; Cubic spline interpolation; Interpolating in more than two dimensions. The point-wise error in Lagrange interpolation.

Statistical description and Modeling of Data: Moments of a distribution - mean, variance etc; Comparing two distributions; Correlations in datasets; Fitting data to a straight line; Fitting data with errors in x and y coordinates; Bootstrapping and Monte Carlo Methods.

March 24, 2003

2002-03