School of Mathematics

Course 261 — Numerical Analysis 1998-99
(optional for SF Mathematics, JS TSM)

Lecturer: Prof. J. J. H. Miller

Requirements/prerequisites:

Duration: 24 weeks

Number of lectures per week: 3

Assessment: Examination and Projects (some years)

End-of-year Examination: One 3-hour examination

Description:
Interpolation
Lagrange interpolation
First order Hermite interpolation
Functionals
Interpolation in finite dimensional spaces
General Hermite interpolation
Divided differences
Newton's representation of the interpolant
Neville and Aitken algorithms
Pointwise error in Lagrange interpolation - Cauchy and Peano error estimates

Numerical Integration
Errors in numerical intergration - Peano error estimate
Piecewise polynomial spaces
Gerschgorin theorem
Diagonal dominance
Newton-Cotes integration rules
Gaussian integration rules
Quadrature rules involving values of derivatives
Gaussian rules with some preassigned nodes
Chebyshev rules
Quadrature rules for periodic functions
Repeated quadrature rules
Richardson extrapolation
Romberg interpolation

Numerical Linear Algebra
Triangular systems
Gaussian elimination
LU decomposition

Gauss-Jordan algorithm
Conditioning and stability
Pivoting
Condition number of a matrix
LDU decomposition
Jacobi method
Gauss-Siedel method
Convergence of iterative methods
Direct method for tridiagonal matrices
Block tridiagonal matrices

Nonlinear Systems
Contraction mapping
Method of successive substitution

June 10, 1998