

MA3457/CS4033 – Numerical Methods for Calculus & Differential Equations

Vadim V. Yakovlev

Syllabus & Schedule of Events:

Week 1: *Interpolation:* Polynomial interpolation (Lagrange & Newton polynomials). Sources of errors. MATLAB computation.

Week 2: *Interpolation(cont'd):* Spline interpolation. Numerical differentiation, including Richardson scheme. *Approximation:* Method of least squares.

Week 3: *Approximation (cont'd):* Orthogonal systems. MATLAB computation. *Numerical integration:* The definite integral.

Week 4: *Numerical integration (cont'd):* Trapezoidal rule. Romberg algorithm. Adaptive Simpson scheme.

Week 5: *Numerical integration (cont'd):* MATLAB computation. *Initial value problem (IVP):* Analytical and numerical techniques. Taylor series.

Week 6: *IVP (cont'd):* Runge-Kutta method. MATLAB computation. *Boundary value problem (BVP):* Shooting method.

Week 7: *BVP (cont'd):* Finite-difference discretization. MATLAB computation.