

**Sewell, Granville**  
**The numerical solution of ordinary and partial differential equations**

This is a 3rd edition of a text on numerical solutions of ordinary and partial differential equations.

The book is dedicated to finite difference (chapters 1-4) and finite elements methods (chapter 5), with special emphasis in the construction of the numerical solutions. It contains FORTRAN programs inside of the text and MATLAB programs in Appendix C. It also includes a widely used finite element program PDE2D in Appendix A. It emphasizes the practical aspects involved in implementing the methods. It is for senior level undergraduate or level graduate students.

In chapters 0-5 is treated the following:

- (0) an introduction on solving linear systems;
- (1) initial value problems for ordinary differential equations, with the classical methods (Euler, Adams, Backward Difference methods, and Runge-Kutta). It includes the error analysis: truncation error, stability and convergence of a method;
- (2) initial value problem for linear parabolic equations with diffusion and convection terms, including explicit and implicit methods, 1D and 2D linear problems, and a non-linear example. Fourier stability method is developed in Appendix B, and applied here;
- (3) initial value problem for transport and wave equations, including explicit method for both equations with a discussion on its stability, and the method of characteristics for a semilinear transport problem;
- (4) boundary value problems (finite difference method, shooting method, relaxation, conjugate gradient method, inverse power method);
- (5) the finite element method (with examples, using piecewise linear functions, cubic Hermite functions, linear triangulation, time-dependent problems etc.)

Reviewed by *R. Pardo*