



# Computational Differential Equations

*K. Eriksson, D. Estep, P. Hansbo, C. Johnson*

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**Computational Differential Equations** K. Eriksson, D. Estep, P. Hansbo, C. Johnson

This is a two volume introduction to the computational solution of differential equations using a unified approach organized around the adaptive finite element method. It presents a synthesis of mathematical modeling, analysis, and computation. The goal is to provide the student with theoretical and practical tools useful for addressing the basic questions of computational mathematical modeling in science and engineering: How can we model physical phenomena using differential equations? What are the properties of solutions of differential equations? How do we compute solutions in practice? How do we estimate and control the accuracy of computed solutions? The first volume begins by developing the basic issues at an elementary level in the context of a set of model problems in ordinary differential equations. The authors then widen the scope to cover the basic classes of linear partial differential equations modeling elasticity, heat flow, wave propagation and convection-diffusion-absorption problems. The book concludes with a chapter on the abstract framework of the finite element method for differential equations. Volume 2, to be published in early 1997, extends the scope to nonlinear differential equations and systems of equations modeling a variety of phenomena such as reaction-diffusion, fluid flow, many-body dynamics and reaches the frontiers of research. It also addresses practical implementation issues in detail. These volumes are ideal for undergraduates studying numerical analysis or differential equations. This is a new edition of a 1988 text of 275 pages by C. Johnson.

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