Finite Element Methods for Navier-Stokes Equations: Theory and Algorithms (Springer Series in Computational Mathematics)

By Vivette Girault, Pierre-Arnaud Raviart

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The material covered by this book has been taught by one of the authors in a post-graduate course on Numerical Analysis at the University Pierre et Marie Curie of Paris. It is an extended version of a previous text (cf. Girault & Raviart [32J) published in 1979 by Springer-Verlag in its series: Lecture Notes in Mathematics. In the last decade, many engineers and mathematicians have concentrated their efforts on the finite element solution of the Navier-Stokes equations for incompressible flows. The purpose of this book is to provide a fairly comprehen sive treatment of the most recent developments in that field. To stay within reasonable bounds, we have restricted ourselves to the case of stationary prob lems although the time-dependent problems are of fundamental importance. This topic is currently evolving rapidly and we feel that it deserves to be covered by another specialized monograph. We have tried, to the best of our ability, to present a fairly exhaustive treatment of the finite element methods for inner flows. On the other hand however, we have entirely left out the subject of exterior problems which involve radically different techniques, both from a theoretical and from a practical point of view. Also, we have neither discussed the implemen tation of the finite element methods presented by this book, nor given any explicit numerical result. This field is extensively covered by Peyret & Taylor [64J and Thomasset [82].

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