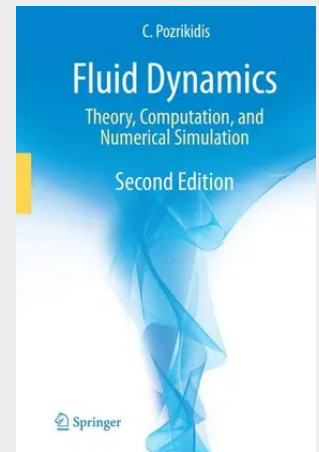


Fluid Dynamics

Theory, Computation, and Numerical Simulation

Ready access to computers has defined a new era in teaching and learning. The opportunity to extend the subject matter of traditional science and engineering curricula into the realm of scientific computing has become not only desirable, but also necessary. Thanks to portability and low overhead and operating cost, experimentation by numerical simulation has become a viable substitute, and occasionally the only alternative, to physical experimentation. The new framework has necessitated the writing of texts and monographs from a modern perspective that incorporates numerical and computer programming aspects as an integral part of the discourse. Under this modern directive, methods, concepts, and ideas are presented in a unified fashion that motivates and underlines the urgency of the new elements, but neither compromises nor oversimplifies the rigor of the classical approach. Interfacing fundamental concepts and practical methods of scientific computing can be implemented on different levels. In one approach, theory and implementation are kept complementary and presented in a sequential fashion. In another approach, the coupling involves deriving computational methods and simulation algorithms, and translating equations into computer code - instructions immediately following problem formulations. Seamlessly interjecting methods of scientific computing in the traditional discourse offers a powerful venue for developing analytical skills and obtaining physical insight.

Fluid Dynamics: Theory, Computation, and Numerical Simulation is the only available book that extends the classical field of fluid dynamics into the realm of scientific computing in a way that is both comprehensive and accessible to the beginner. The theory of fluid dynamics, and the implementation of solution procedures into numerical algorithms, are discussed hand-in-hand and with reference to computer programming. This book is an accessible introduction to theoretical and computational fluid dynamics (CFD), written from a modern perspective that unifies theory and numerical practice. There are several additions and subject expansions in the Second Edition of Fluid Dynamics, including new Matlab and FORTRAN codes. Two distinguishing features of the discourse are: solution procedures and algorithms are developed immediately after problem formulations are presented, and numerical methods are introduced on a need-to-know basis and in increasing order of difficulty. Matlab codes are presented and discussed for a broad range of topics; from interfacial shapes in hydrostatics, to vortex dynamics, to Stokes flow, to turbulent flow. A supplement to this book is the FORTRAN software library FDLIB, freely available through the Internet, whose programs explicitly illustrate how computational algorithms translate into computer code instructions. The codes of FDLIB range from introductory to advanced, and the problems considered span a broad range of applications; from laminar channel flows, to vortex flows, to flows in aerodynamics. Selected computer problems at the end of each section ask the student to run the programs for various flow conditions, and thereby study the effect of the various parameters determining each flow. FDLIB offers an extensive range of Fortran 77 and Matlab programs that demonstrate the implementation of elementary and advanced algorithms and provide an invaluable resource for research, classroom instruction, and self-study. This text is a must for practitioners and students in all fields of engineering, computational physics, scientific computing, and applied mathematics. It can be used as a text in both undergraduate and graduate courses in fluid mechanics, aerodynamics, and computational fluid dynamics. The audience includes not only advanced undergraduate and entry-level graduate students, but also a broad class of scientists and engineers with a general interest in scientific computing.



117,69 €

109,99 € (zzgl. MwSt.)

Nicht mehr lieferbar

Artikelnummer: 9780387958699

Medium: Buch

ISBN: 978-0-387-95869-9

Verlag: Springer Netherlands

Erscheinungstermin: 26.05.2009

Sprache(n): Englisch

Auflage: 2. Auflage 2009

Produktform: Gebunden

Gewicht: 1453 g

Seiten: 774

Format (B x H): 155 x 235 mm

