

Turbulence Modeling for CFD (Third Edition)

David C. Wilcox

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As in the first and second editions, the book revolves around the fact that turbulence modeling is one of three key elements in CFD. Very precise mathematical theories have evolved for the other two, viz., grid generation and algorithm development. By its nature, i.e., creating a mathematical model that approximates the physical behavior of turbulent flows, far less precision has been achieved in turbulence modeling. This text addresses the problem of selecting/devising such models. The fundamental premise is, in the spirit of G. I. Taylor, an ideal model should introduce the minimum amount of complexity while capturing the essence of the relevant physics.

The text begins with the simplest models and charts a course leading to some of the most complex models that have been applied to a nontrivial flow. Along the way, a systematic methodology is presented for developing and analyzing turbulence models. The methodology makes use of tensor calculus, similarity solutions, singular perturbation methods, and numerical procedures. The text stresses the need to achieve a balance amongst the physics of turbulence, mathematical tools required to solve turbulence-model equations, and common numerical problems attending their use (i.e., what good is a model if it makes your program crash?). Several user friendly programs and detailed user's guides are provided on the Compact Disk that accompanies the text.

Many of the applications are used throughout the text to permit comparison of complicated models with simpler models. A completely objective point of view is taken in assessing the merits of models and their range of applicability. The text includes an extensive Bibliography, a detailed Index and well thought out homework problems of varying degrees of difficulty.



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