



The Application of the Chebyshev-Spectral Method in Transport Phenomena (Lecture Notes in Applied and Computational Mechanics)

Weidong Guo, Gérard Labrosse, Ranga Narayanan

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Transport phenomena problems that occur in engineering and physics are often multi-dimensional and multi-phase in character. When taking recourse to numerical methods the spectral method is particularly useful and efficient.

The book is meant principally to train students and non-specialists to use the spectral method for solving problems that model fluid flow in closed geometries with heat or mass transfer. To this aim the reader should bring a working knowledge of fluid mechanics and heat transfer and should be readily conversant with simple concepts of linear algebra including spectral decomposition of matrices as well as solvability conditions for inhomogeneous problems.

The book is neither meant to supply a ready-to-use program that is all-purpose nor to go through all manners of mathematical proofs. The focus in this tutorial is on the use of the spectral methods for space discretization, because this is where most of the difficulty lies. While time dependent problems are also of great interest, time marching procedures are dealt with by briefly introducing and providing a simple, direct, and efficient method.

Many examples are provided in the text as well as numerous exercises for each chapter. Several of the examples are attended by subtle points which the reader will face while working them out. Some of these points are deliberated upon in endnotes to the various chapters, others are touched upon in the book itself.

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