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Nota di contenuto	Optimal Modified Continuous Galerkin CFD; Contents; Preface; About the Author; Notations; 1 Introduction; 1.1 About This Book; 1.2 The Navier-Stokes Conservation Principles System; 1.3 Navier-Stokes PDE System Manipulations; 1.4 Weak Form Overview; 1.5 A Brief History of Finite Element CFD; 1.6 A Brief Summary; References; 2 Concepts, terminology, methodology; 2.1 Overview; 2.2 Steady DE Weak Form Completion; 2.3 Steady DE GWSN Discrete FE Implementation; 2.4 PDE Solutions, Classical Concepts; 2.5 The Sturm-Liouville Equation, Orthogonality, Completeness; 2.6 Classical Variational Calculus 2.7 Variational Calculus, Weak Form Duality 2.8 Quadratic Forms, Norms, Error Estimation; 2.9 Theory Illustrations for Non-Smooth, Nonlinear Data; 2.10 Matrix Algebra, Notation; 2.11 Equation Solving, Linear Algebra; 2.12 Krylov Sparse Matrix Solver Methodology; 2.13 Summary; Exercises; References; 3 Aerodynamics I: Potential flow, GWSh theory exposition, transonic flow mPDE shock capturing; 3.1 Aerodynamics, Weak Interaction; 3.2 Navier-Stokes Manipulations for Aerodynamics; 3.3 Steady Potential Flow GWS; 3.4 Accuracy, Convergence, Mathematical Preliminaries

3.5 Accuracy, Galerkin Weak Form Optimality 3.6 Accuracy, GWSh Error Bound; 3.7 Accuracy, GWSh Asymptotic Convergence; 3.8 GWSh Natural Coordinate FE Basis Matrices; 3.9 GWSh Tensor Product FE Basis Matrices; 3.10 GWSh Comparison with Laplacian FD and FV Stencils; 3.11 Post-Processing Pressure Distributions; 3.12 Transonic Potential Flow, Shock Capturing; 3.13 Summary; Exercises; References; 4 Aerodynamics II: boundary layers, turbulence closure modeling, parabolic Navier-Stokes; 4.1 Aerodynamics, Weak Interaction Reprise; 4.2 Navier-Stokes PDE System Reynolds Ordered
4.3 GWSh, n= 2 Laminar-Thermal Boundary Layer 4.4 GWSh + TS BL Matrix Iteration Algorithm; 4.5 Accuracy, Convergence, Optimal Mesh Solutions; 4.6 GWSh + TS Solution Optimality, Data Influence; 4.7 Time Averaged NS, Turbulent BL Formulation; 4.8 Turbulent BL GWSh + TS, Accuracy, Convergence; 4.9 GWSh + TS BL Algorithm, TKE Closure Models; 4.10 The Parabolic Navier-Stokes PDE System; 4.11 GWSh + TS Algorithm for PNS PDE System; 4.12 GWSh + TS k =1 NC Basis PNS Algorithm; 4.13 Weak Interaction PNS Algorithm Validation; 4.14 Square Duct PNS Algorithm Validation; 4.15 Summary; Exercises References 5 The Navier-Stokes Equations: theoretical fundamentals; constraint, spectral analyses, mPDE theory, optimal Galerkin weak forms; 5.1 The Incompressible Navier-Stokes PDE System; 5.2 Continuity Constraint, Exact Enforcement; 5.3 Continuity Constraint, Inexact Enforcement; 5.4 The CCM Pressure Projection Algorithm; 5.5 Convective Transport, Phase Velocity; 5.6 Convection-Diffusion, Phase Speed Characterization; 5.7 Theory for Optimal mGWSh + TS Phase Accuracy; 5.8 Optimally Phase Accurate mGWSh + TS in n Dimensions; 5.9 Theory for Optimal mGWSh Asymptotic Convergence
5.10 The Optimal mGWSh + TS k = 1 Basis NS Algorithm

Sommario/riassunto

"Covers the theory and applications of using weak form theory in incompressible fluid-thermal sciences Giving you a solid foundation on the Galerkin finite-element method (FEM), this book promotes the use of optimal modified continuous Galerkin weak form theory to generate discrete approximate solutions to incompressible-thermal Navier-Stokes equations. The book covers the topic comprehensively by introducing formulations, theory and implementation of FEM and various flow formulations.The author first introduces concepts, terminology and methodology related to the topic before covering topics including aerodynamics; the Navier-Stokes Equations; vector field theory implementations and large eddy simulation formulations. Introduces and addresses many different flow models (Navier-Stokes, full-potential, potential, compressible/incompressible) from a unified perspective Focuses on Galerkin methods for CFD beneficial for engineering graduate students and engineering professionals Accompanied by a website with sample applications of the algorithms and example problems and solutions This approach is useful for graduate students in various engineering fields and as well as professional engineers"--
"This book promotes the use of optimal modified continuous Galerkin weak form theory to generate discrete approximate solutions to incompressible-thermal Navier-Stokes equations"--