The Finite Element Method in Heat Transfer and Fluid Dynamics (Computational Mechanics and Applied Analysis)

J. N. Reddy, D.K. Gartling

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Designed for those interested in using finite element methods in the study of fluid mechanics and heat transfer, The Finite Element Method in Heat Transfer and Fluid Dynamics presents this useful methodology tailored for a limited but significant class of problems dealing with heat conduction, incompressible viscous flows, and convection heat transfer.

The authors' approach consists of a series of incremental steps of increasing complexity. The text is divided into 8 chapters. Chapter 1 describes in detail the continuum boundary value problems that form the central focus of the book. Chapters 2 and 3 introduce and extend the finite element method by application to a simplified, two- and three-dimensional heat conduction problems. Chapters 4 and 5 describe isothermal viscous fluid mechanics formulations and the solution of nonlinear equations developed from the flow problem. Chapter 6 covers inelastic non-Newtonian flows and free surface problems. Chapter 7 surveys the complex topic of viscoelastic flow simulation, while Chapter 8 discusses several advanced topics, including turbulence modeling. Each chapter includes example problems ranging from simple benchmarks to practical engineering solutions.

In The Finite Element Method in Heat Transfer and Fluid Dynamics, readers will find a pragmatic treatment that views numerical computation as a means to and end and does not dwell on theory or proof. Mastering its contents brings a firm understanding of the basic methodology, the competence to use existing simulation software, and the ability to develop some simpler, special purpose computer codes.

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