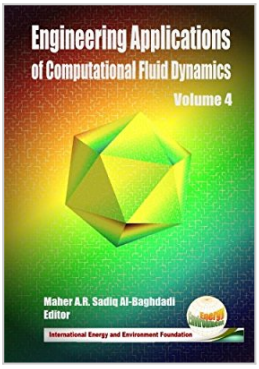

Engineering Applications of Computational Fluid Dynamics: Volume 4

By Maher A.R. Sadiq Al-Baghdadi

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Computational Fluid Dynamics (CFD) is the science of predicting fluid flow, heat transfer, mass transfer, phase change, chemical reaction, mechanical movement, stress or deformation of related solid structures, and related phenomena by solving the mathematical equations that govern these processes using a numerical algorithm on a computer. The results of CFD analyses are relevant in: conceptual studies of new designs, detailed product development, troubleshooting, and redesign. CFD analysis complements testing and experimentation, by reduces the total effort required in the experiment design and data acquisition. CFD complements physical modelling and other experimental techniques by providing a detailed look into our fluid flow problems, including complex physical processes such as turbulence, chemical reactions, heat and mass transfer, and multiphase flows. In many cases, we can build and analyze virtual models at a fraction of the time and cost of physical modelling. This allows us to investigate more design options and "what if" scenarios than ever before. Moreover, flow modelling provides insights into our fluid flow problems that would be too costly or simply prohibitive by experimental techniques alone. The added insight and understanding gained from flow modelling gives us confidence in our design proposals, avoiding the added costs of over-sizing and over-specification, while reducing risk. The use of Computational Fluid Dynamics to simulate engineering phenomena continues to grow throughout many engineering disciplines. On the back of ever more powerful computers and graphical user interfaces CFD provides engineers with a reliable tool to assist in the design of industrial equipment often reducing or eliminating the need for performing trial-and-error experimentation. In summary, much progress has been made in engineering applications of CFD. The chapters in this book testify to the vitality of engineering CFD research and demonstrate the considerable potential for use of these techniques in the future. The book is intended to serve as a reference for both researchers and postgraduate students. I thank the work and commitment of all of the authors who submitted chapters according to our requests and dealt with our numerous comments. CONTENTS Chapter 1: Theoretical and Numerical Investigation of Vibration and Buckling Analysis Beam with Crack Depth, Location and Orientation Effect. Muhannad Al-Waily Chapter 2: Numerical Simulation of Air Distribution System with Different

Supply Patterns. Hyder Mohammed Abdul Hussein Chapter 3: Reynolds-Averaged Navier-Stokes Modelling of Air Pollution at the Local Urban Scale. Desmond Adai, Martin Jaeger Chapter 4: Computational Thermo-Fluid Dynamics of Turbulent Free Surface Flow using Level Set Method. Ashraf Balabel Chapter 5: CFD Computation of the Aerodynamic Structure of Arched Roof Obstacles with Different Heights. Slah Driss, Zied Driss, Imen Kallel Kammoun Chapter 6: CFD Computation of a Water Savonius Rotor. Ibrahim Mabrouki, Zied Driss, Mohamed Salah Abid Chapter 7: CFD Investigations of LPG Engine Mixture Device - Case of Hydrogen Enriched Fuelled Engine. M. A. Jemni, S. HadjKassem, M. S. Abid

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