

1. Record Nr.	UNINA9910830262603321
Autore	Mirzaei Parham A.
Titolo	Computational fluid dynamics and energy modelling in buildings : fundamentals and applications / / Parham A. Mirzaei
Pubbl/distr/stampa	Hoboken, New Jersey ; ; Chichester, West Sussex, England : , : Wiley Blackwell, , [2023] ©2023
ISBN	9781119743538 9781119743514
Descrizione fisica	1 online resource (892 pages)
Disciplina	696
Soggetti	Buildings - Environmental engineering Computational fluid dynamics Buildings
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Intro -- Table of Contents -- Title Page -- Copyright Page -- Preface -- Emerging of Building Engineering -- Necessity of Fundamental Books for Building Engineering -- Structure of This Book -- How to Read This Book -- Acknowledgement and Dedication -- 1 An Overview of Heat and Mass Transport in Buildings -- 1.1 Introduction -- 1.2 Heat and Mass Transport in Traditional Buildings -- 1.3 Heat and Mass Transports in Modern Buildings -- 1.4 Modelling of Heat and Mass Transport in Buildings -- 1.5 Modelling Approaches -- References -- 2 An Overview on Fundamentals of Fluid Mechanics in Buildings -- 2 An Overview of Fluid -- 2.1 Definition of Fluid -- 2.2 Properties of Fluid -- 2.3 Pressure and State of Fluid -- 2.4 Fluid in Motion -- 2.5 Governing Equation of Fluids -- 2.6 Differential Form of Fluid Flow -- 2.7 Dimensionless Analysis -- 2.8 Internal Flow -- 2.9 External Flow -- References -- 3 Applications of Fluid Mechanics in Buildings -- 3 Applications of Fluid Mechanics in Buildings -- 3.1 Atmospheric Boundary Layer -- 3.2 Wind Profile and Directions -- 3.3 Building Aerodynamics -- 3.4 Turbulent Jet and Plume -- 3.5 Wall Effect -- 3.6 Piping and Ducting in Buildings -- 3.7 Fan and Pump in Buildings -- References -- 4 An Overview on Fundamentals of Thermodynamics in

Buildings -- 4 An Overview of Thermodynamics -- 4.1 Saturation Temperature -- 4.2 First Law of Thermodynamics -- 4.3 Second Law of Thermodynamics and Entropy -- 4.4 Mixture of Ideal Gases -- 4.5 Moisture Transport -- References -- 5 Applications of Thermodynamics in Buildings -- 5 Introduction -- 5.1 Human Thermal Comfort -- 5.2 Thermal Comfort Measures in Building -- 5.3 Thermodynamic Processes in AirConditioning Systems -- 5.4 Moist Air Transport in Buildings -- References -- 6 An Overview on Fundamentals of Heat Transfer in Buildings -- 6 An Overview of Heat Transfer.

6.1 Conduction -- 6.2 Convection -- 6.3 Radiation -- References -- 7 Applications of Heat Transfer in Buildings -- 7 Introduction -- 7.1 Conduction in Walls -- 7.2 Thermal Resistance Analogy -- 7.3 Walls with Heat Generation -- 7.4 Convective Heat Transfer Coefficient of Exterior Walls -- 7.5 Convection on Interior Walls -- 7.6 Radiations -- 7.7 Longwave Radiation on Building Surfaces -- References -- 8 Fundamental of Energy Modelling in Buildings -- 8 Introduction -- 8.1 Definition of a Zone -- 8.2 Conservation Law in Buildings -- 8.3 Governing Equations at Zones -- 8.4 Energy Balance Equation -- 8.5 Nodal Analogy of the Governing Equation -- 8.6 Walls, Windows, and Thermal Bridges -- 8.7 Mass Balance Equation -- References -- 9 Dynamic Energy Modelling in Buildings -- 9 Physics of an Energy Balance Problem in Buildings -- 9.1 Mathematical Representation of Buildings with Integrated Nodal System -- 9.2 Numerical Solution Method for Nodal System -- 9.3 Inputs -- 9.4 Solution Strategies -- 9.5 Temporal Variation of Parameters -- 9.6 Linearization of the Radiation -- 9.7 Mass Imbalance -- References -- 10 Fundamental of Computational Fluid Dynamics - A Finite Volume Approach -- 10 What Is CFD -- 10.1 Steps in CFD -- 10.2 Classification of Conservation Equations -- 10.3 Difference of Finite Difference and Finite Volume -- 10.4 Integral Form of the Conservation Equations -- 10.5 Grid (Mesh) -- 10.6 Diffusion Equation -- 10.7 Boundary Treatment -- 10.8 Expansion to Higher Dimensions -- 10.9 Discretization Methods -- 10.10 SteadyState Diffusion-Convection Equation -- 10.11 Other Approximation Methods -- 10.12 Scheme Evaluation -- 10.13 Common Schemes -- 10.14 Unsteady Diffusion Equation -- 10.15 Unsteady Diffusion-Convection Equation -- 10.16 Pressure-Velocity Coupling -- References -- 11 Solvers and Solution Analysis -- 11 Introduction.

11.1 Solvers of Algebraic Equation Systems -- 11.2 Direct Method -- 11.3 Iterative Method -- 11.4 Solution Analysis -- 11.5 Physical Uncertainty -- 11.6 Numerical Errors -- 11.7 Verification and Validation -- 11.8 Measures to Minimize Errors -- References -- 12 Application of CFD in Buildings and Built Environment -- 12.1 CFD Models in Built Environment -- 12.2 Inputs to CFD Models -- 12.3 Practical Examples -- References -- Index -- End User License Agreement.
