

1. Record Nr.	UNINA9911006511103321
Titolo	Applied mathematics and modeling for chemical engineers / / Richard G. Rice, Duong D. Do
Pubbl/distr/stampa	Hoboken, New Jersey, : Wiley, 2012
ISBN	9781523111268 1523111267 9781118343029 1118343026 9781283646093 1283646099 9781118343012 1118343018
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (397 p.)
Collana	Wiley series in chemical engineering
Classificazione	501.1 660/.284015118
Altri autori (Persone)	DoDuong D
Disciplina	660.01519 660.284015118 660/.284/015118
Soggetti	Differential equations Chemical processes - Mathematical models Chemical engineering - Mathematics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	APPLIED MATHEMATICS AND MODELING FOR CHEMICAL ENGINEERS; Contents; Preface to the Second Edition; PART I; 1 Formulation of Physicochemical Problems; 1.1 Introduction; 1.2 Illustration of the Formulation Process (Cooling of Fluids); 1.2.1 Model I: Plug Flow; 1.2.2 Model II: Parabolic Velocity; 1.3 Combining Rate and Equilibrium Concepts (Packed Bed Adsorber); 1.4 Boundary Conditions and Sign Conventions; 1.5 Models with Many Variables: Vectors and Matrices; 1.6 Matrix Definition; 1.6.1 The Matrix; 1.6.2 The Vector; 1.7 Types of Matrices; 1.7.1 Square Matrix; 1.7.2 Diagonal Matrix 1.7.3 Triangular Matrix 1.7.4 Tridiagonal Matrix; 1.7.5 Symmetric

Matrix; 1.7.6 Sparse Matrix; 1.7.7 Diagonally Dominant Matrix; 1.8 Matrix Algebra; 1.8.1 Addition and Subtraction; 1.8.2 Multiplication; 1.8.3 Inverse; 1.8.4 Matrix Decomposition or Factorization; 1.9 Useful Row Operations; 1.9.1 Scaling; 1.9.2 Pivoting; 1.9.3 Elimination; 1.10 Direct Elimination Methods; 1.10.1 Basic Procedure; 1.10.2 Augmented Matrix; 1.10.3 Pivoting; 1.10.4 Scaling; 1.10.5 Gauss Elimination; 1.10.6 Gauss-Jordan Elimination: Solving Linear Equations; 1.10.7 LU Decomposition; 1.11 Iterative Methods  
1.11.1 Jacobi Method1.11.2 Gauss-Seidel Iteration Method; 1.11.3 Successive Overrelaxation Method; 1.12 Summary of the Model Building Process; 1.13 Model Hierarchy and its Importance in Analysis; Problems; References; 2 Solution Techniques for Models Yielding Ordinary Differential Equations; 2.1 Geometric Basis and Functionality; 2.2 Classification of ODE; 2.3 First-Order Equations; 2.3.1 Exact Solutions; 2.3.2 Equations Composed of Homogeneous Functions; 2.3.3 Bernoulli's Equation; 2.3.4 Riccati's Equation; 2.3.5 Linear Coefficients; 2.3.6 First-Order Equations of Second Degree  
2.4 Solution Methods for Second-Order Nonlinear Equations2.4.1 Derivative Substitution Method; 2.4.2 Homogeneous Function Method; 2.5 Linear Equations of Higher Order; 2.5.1 Second-Order Unforced Equations: Complementary Solutions; 2.5.2 Particular Solution Methods for Forced Equations; 2.5.3 Summary of Particular Solution Methods; 2.6 Coupled Simultaneous ODE; 2.7 Eigenproblems; 2.8 Coupled Linear Differential Equations; 2.9 Summary of Solution Methods for ODE; Problems; References; 3 Series Solution Methods and Special Functions; 3.1 Introduction to Series Methods  
3.2 Properties of Infinite Series3.3 Method of Frobenius; 3.3.1 Indicial Equation and Recurrence Relation; 3.4 Summary of the Frobenius Method; 3.5 Special Functions; 3.5.1 Bessel's Equation; 3.5.2 Modified Bessel's Equation; 3.5.3 Generalized Bessel's Equation; 3.5.4 Properties of Bessel Functions; 3.5.5 Differential, Integral, and Recurrence Relations; Problems; References; 4 Integral Functions; 4.1 Introduction; 4.2 The Error Function; 4.2.1 Properties of Error Function; 4.3 The Gamma and Beta Functions; 4.3.1 The Gamma Function; 4.3.2 The Beta Function; 4.4 The Elliptic Integrals  
4.5 The Exponential and Trigonometric Integrals

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## Sommario/riassunto

This Second Edition of the go-to reference combines the classical analysis and modern applications of applied mathematics for chemical engineers. The book introduces traditional techniques for solving ordinary differential equations (ODEs), adding new material on approximate solution methods such as perturbation techniques and elementary numerical solutions. It also includes analytical methods to deal with important classes of finite-difference equations. The last half discusses numerical solution techniques and partial differential equations (PDEs). The reader will then be equipped to

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