

AN INTRODUCTION
TO NUMERICAL METHODS
FOR CHEMICAL ENGINEERS

SECOND EDITION

James B. Riggs

An Introduction To Numerical Methods For Chemical Engineers 2nd Ed

AMIYA K. JANA



An Introduction To Numerical Methods For Chemical Engineers 2nd Ed:

INTRODUCTION TO NUMERICAL METHODS IN CHEMICAL ENGINEERING, SECOND EDITION AHUJA, PRADEEP, 2019-08-01 This book is an exhaustive presentation of the applications of numerical methods in chemical engineering. Intended primarily as a textbook for B E B Tech and M Tech students of chemical engineering, the book will also be useful for research and development process professionals in the fields of chemical, biochemical, mechanical, and biomedical engineering. The book, now in its second edition, comprises three parts. Part I on General Chemical Engineering is the same as given in the first edition of the book. It explains solving linear and non-linear algebraic equations, chemical engineering thermodynamics problems, initial value problems, boundary value problems, and topics related to chemical reaction, dispersion, and diffusion, as well as steady and transient heat conduction. Whereas Part II and Part III, comprising two chapters and six chapters respectively, are newly introduced in the present edition. Besides three appendices covering computer programs, have been included. For practice, the book provides students with numerous worked-out examples and chapter-end exercises, including their answers. **NEW TO THE SECOND EDITION** Part II on Fixed Bed Catalytic Reactor consists of solving multiple gas phase reactions in a PFR, diffusion and multiple reactions in a catalytic pellet, and fixed bed catalytic reactor with multiple reactions. Part III on Multicomponent Distillation consists of solving vapour-liquid-liquid isothermal flash using NRTL model, adiabatic flash using Wilson model, bubble point method, theta method, and Naphtali Sandholm method for distillation using modified Raoult's law with Wilson activity coefficient model. **An Introduction to Numerical Methods for Chemical Engineers (2nd Ed.)** James B. Riggs, 1994-01-15 *An Introduction to Numerical Methods for Chemical Engineers* James B. Riggs, 1988. In this second edition, the author has added new problems and updated the accompanying FORTRAN computer programs. New library programs are included that perform singular value decomposition of a matrix and apply a conjugate gradient optimizer. Discussions have been added on the effect of stiffness on initial value problems and order-variable step size integration. An IBM-compatible disk is included, and an Apple and Macintosh disk, as well as a solutions manual, are available on request. Annotation copyright by Book News Inc, Portland, OR.

A Numerical Primer for the Chemical Engineer, Second Edition Edwin Zondervan, 2019-08-16. Designed as an introduction to numerical methods for students, this book combines mathematical correctness with numerical performance and concentrates on numerical methods and problem solving. It applies actual numerical solution strategies to formulated process models to help identify and solve chemical engineering problems. Second edition comes with an additional chapter on numerical integration and a section on boundary value problems in the relevant chapter. Additional material on general modelling principles, mass energy balances, and a separate section on DAEs is also included. Case study section has been extended with additional examples. **A Numerical Primer for the Chemical Engineer** Edwin Zondervan, 2014-08-12. Solve Developed Models in a Numerical Fashion. Designed as an introduction to numerical methods for students. A Numerical

Primer for the Chemical Engineer explores the role of models in chemical engineering Combining mathematical correctness model verification with numerical performance model validation this text concentrates on numerical metho *Mathematical Modelling and Simulation in Chemical Engineering* M. Chidambaram,2018-03-09 An easy to understand guide covering key principles of mathematical modelling and simulation in chemical engineering CHEMICAL PROCESS MODELLING AND COMPUTER SIMULATION AMIYA K. JANA,2011-11-05 This comprehensive and thoroughly revised text now in its second edition continues to present the fundamental concepts of how mathematical models of chemical processes are constructed and demonstrate their applications to the simulation of two of the very important chemical engineering systems the chemical reactors and distillation systems The book provides an integrated treatment of process description mathematical modelling and dynamic simulation of realistic problems using the robust process model approach and its simulation with efficient numerical techniques Theoretical background materials on activity coefficient models equation of state models reaction kinetics and numerical solution techniques needed for the development of mathematical models are also addressed in the book The topics of discussion related to tanks heat exchangers chemical reactors both continuous and batch biochemical reactors continuous and fed batch distillation columns continuous and batch equilibrium flash vaporizer and refinery debutanizer column contain several worked out examples and case studies to teach students how chemical processes can be measured and monitored using computer programming The new edition includes two more chapters Reactive Distillation Column and Vaporizing Exchangers which will further strengthen the text This book is designed for senior level undergraduate and first year postgraduate level courses in Chemical Process Modelling and Simulation The book will also be useful for students of petrochemical engineering biotechnology and biochemical engineering It can serve as a guide for research scientists and practising engineers as well Numerical Methods and Modeling for Chemical Engineers Mark E. Davis,2013-01-01 Geared toward advanced undergraduates or graduate students of chemical engineering studying applied mathematics this text introduces the quantitative treatment of differential equations arising from modeling physical phenomena in chemical engineering Coverage includes topics such as ODE IVPs placing emphasis on numerical methods and modeling implemented in commercial mathematical software available in 1985 **Chemical Engineering Dynamics** John Ingham,Irving J. Dunn,Elmar Heinzle,Jiri E. Prenosil,Jonathan B. Snape,2008-02-08 In this book the modelling of dynamic chemical engineering processes is presented in a highly understandable way using the unique combination of simplified fundamental theory and direct hands on computer simulation The mathematics is kept to a minimum and yet the nearly 100 examples supplied on www.wiley.vch.de illustrate almost every aspect of chemical engineering science Each example is described in detail including the model equations They are written in the modern user friendly simulation language Berkeley Madonna which can be run on both Windows PC and Power Macintosh computers Madonna solves models comprising many ordinary differential equations using very simple programming including arrays It is so powerful that the model parameters

may be defined as sliders which allow the effect of their change on the model behavior to be seen almost immediately Data may be included for curve fitting and sensitivity or multiple runs may be performed The results can be seen simultaneously on multiple graph windows or by using overlays The resultant learning effect of this is tremendous The examples can be varied to fit any real situation and the suggested exercises provide practical guidance The extensive experience of the authors both in university teaching and international courses is reflected in this well balanced presentation which is suitable for the teacher the student the chemist or the engineer This book provides a greater understanding of the formulation and use of mass and energy balances for chemical engineering in a most stimulating manner This book is a third edition which also includes biological environmental and food process examples

Numerical Methods for Engineers D. Vaughan Griffiths, I.M. Smith, 2006-06-22 Although pseudocodes Mathematica and MATLAB illustrate how algorithms work designers of engineering systems write the vast majority of large computer programs in the Fortran language Using Fortran 95 to solve a range of practical engineering problems Numerical Methods for Engineers Second Edition provides an introduction to numerical methods

Chemical Engineering Computation with MATLAB® Yeong Koo Yeo, 2017-08-01 Most problems encountered in chemical engineering are sophisticated and interdisciplinary Thus it is important for today's engineering students researchers and professionals to be proficient in the use of software tools for problem solving MATLAB is one such tool that is distinguished by the ability to perform calculations in vector matrix form a large library of built in functions strong structural language and a rich set of graphical visualization tools Furthermore MATLAB integrates computations visualization and programming in an intuitive user friendly environment Chemical Engineering Computation with MATLAB presents basic to advanced levels of problem solving techniques using MATLAB as the computation environment The book provides examples and problems extracted from core chemical engineering subject areas and presents a basic instruction in the use of MATLAB for problem solving It provides many examples and exercises and extensive problem solving instruction and solutions for various problems Solutions are developed using fundamental principles to construct mathematical models and an equation oriented approach is used to generate numerical results A wealth of examples demonstrate the implementation of various problem solving approaches and methodologies for problem formulation problem solving analysis and presentation as well as visualization and documentation of results This book also provides aid with advanced problems that are often encountered in graduate research and industrial operations such as nonlinear regression parameter estimation in differential systems two point boundary value problems and partial differential equations and optimization

The Chemical Engineer, 1994

Applied Mathematical Methods for Chemical Engineers, Second Edition Norman W. Loney, 2006-09-22 Focusing on the application of mathematics to chemical engineering Applied Mathematical Methods for Chemical Engineers Second Edition addresses the setup and verification of mathematical models using experimental or other independently derived data An expanded and updated version of its well respected predecessor this book uses worked

examples to illustrate several mathematical methods that are essential in successfully solving process engineering problems. The book first provides an introduction to differential equations that are common to chemical engineering followed by examples of first order and linear second order ordinary differential equations (ODEs). Later chapters examine Sturm Liouville problems, Fourier series, integrals, linear partial differential equations (PDEs) and regular perturbation. The author also focuses on examples of PDE applications as they relate to the various conservation laws practiced in chemical engineering. The book concludes with discussions of dimensional analysis and the scaling of boundary value problems and presents selected numerical methods and available software packages. New to the Second Edition: Two popular approaches to model development: shell balance and conservation law balance; One dimensional rod model and a planar model of heat conduction in one direction; Systems of first order ODEs; Numerical method of lines using MATLAB and Mathematica where appropriate. This invaluable resource provides a crucial introduction to mathematical methods for engineering and helps in choosing a suitable software package for computer based algebraic applications.

Computational Methods in Chemical Engineering Owen T. Hanna, Orville C. Sandall, 1995. Authors Owen Hanna and Orville Sandall include broad use of convergence acceleration techniques such as Padé approximation for series, Shanks transformation for series, linear and nonlinear systems of algebraic equations, systematic use of global Richardson extrapolation for integrals and ODE systems to monitor the overall error and discussion of methods for the solution of stiff ODE.

Perry's Chemical Engineers' Handbook Robert H. Perry, Don W. Green, James O. Maloney, 1997. Reference work for chemical and process engineers. Newest developments, advances, achievements and methods in various fields.

The Cumulative Book Index, 1999

CHEMICAL PROCESS MODELLING AND COMPUTER SIMULATION, THIRD EDITION JANA, AMIYA K., 2018-01-01. This comprehensive and thoroughly revised text now in its third edition continues to present the fundamental concepts of how mathematical models of chemical processes are constructed and demonstrate their applications to the simulation of three of the very important chemical engineering systems: the chemical reactors, distillation systems and vaporizing processes. The book provides an integrated treatment of process description, mathematical modelling and dynamic simulation of realistic problems using the robust process model approach and its simulation with efficient numerical techniques. Theoretical background, materials on activity coefficient models, equation of state models, reaction kinetics and numerical solution techniques needed for the development and simulation of mathematical models are also addressed in the book. The topics of discussion related to tanks, heat exchangers, chemical reactors (both continuous and batch), biochemical reactors (continuous and fed batch), distillation columns (continuous and batch), equilibrium flash, vaporizer, refinery debutanizer, column, evaporator and steam generator contain several worked out examples and case studies to teach students how chemical processes are operated, characterized and monitored using computer programming.

NEW TO THIS EDITION The inclusion of following three new chapters on Gas Absorption, Liquid Liquid Extraction, Column Once Through Steam

Generator will further strengthen the text This book is designed for senior level undergraduate and first year postgraduate level courses in Chemical Process Modelling and Simulation The book will also be useful for students of petrochemical engineering biotechnology and biochemical engineering It can serve as a guide for research scientists and practising engineers as well Applied Numerical Methods Brice Carnahan,H. A. Luther,James O. Wilkes,1990 **Numerical Methods and Computing Techniques in Chemical Engineering Practice** University of Michigan,1964 *Handbook of numerical methods and applications* Louis Grant Kelly,1967

Unveiling the Magic of Words: A Report on "**An Introduction To Numerical Methods For Chemical Engineers 2nd Ed**"

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