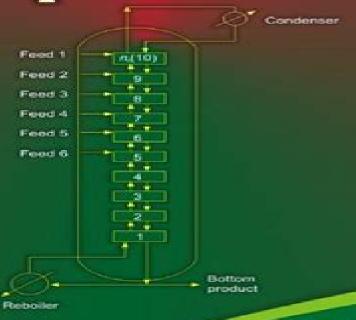
# Second Edition



# Chemical Process Modelling and Computer Simulation





AMIYA K. JANA

# **Chemical Process Modelling And Computer Simulation**

**Mark Steyvers** 

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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 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

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Computational Methods for Process Simulation W. Fred Ramirez, 1997-11-20 Process Modelling and simulation have proved to be extremely successful engineering tools for the design and optimisation of physical chemical and biochemical processes The use of simulation has expanded rapidly over the last two decades because of the availability of large high speed computers and indeed has become even more widespread with the rise of the desk top PC resources now available to nearly every engineer and student In the chemical industry large realistic non linear problems are routinely solved with the aid of computer simulation This has a number of benefits including easy assessment of the economic desirability of a project convenient investigation of the effects of changes to system variables and finally the introduction of mathematical rigour into the design process and inherent assumptions that may not have been there before Computational Methods for Process Simulation develops the methods needed for the simulation of real processes to be found in the process industries It also stresses the engineering fundamentals used in developing process models Steady state and dynamic systems are considered for both spatially lumped and spatially distributed problems It develops analytical and numerical computational techniques for algebraic ordinary and partial differential equations and makes use of computer software routines that are widely available Dedicated software examples are available via the internet Written for a compulsory course element in the US Includes examples using software used in academia and industry Software available via the Internet **Simulation of Chemical Process Systems** Navef Ghasem, 2018-11-08 In this textbook the author teaches readers how to model and simulate a unit process operation through developing mathematical model equations solving model equations manually and comparing results with those simulated through software It covers both lumped parameter systems and distributed parameter systems as well as using MATLAB and Simulink to solve the system model equations for both Simplified partial differential equations are solved using COMSOL an effective tool to solve PDE using the fine element method This book includes end of chapter problems and worked examples and summarizes reader goals at the beginning of each chapter 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

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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 Modeling and Simulation for Chemical Engineers Simant Ranjan Upreti, 2017 This book provides a rigorous treatment of the fundamental concepts and techniques involved in process modeling and simulation The book allows the reader to i Get a solid grasp of under the hood mathematical results ii Develop models of sophisticated processes iii Transform models to different geometries and domains as appropriate iv Utilize various model simplification techniques v Learn simple and effective computational methods for model simulation vi Intensify the effectiveness of their research Modeling and Simulation for Chemical Engineers Theory and Practice begins with an introduction to the terminology of process modeling and simulation Chapters 2 and 3 cover fundamental and constitutive relations while Chapter 4 on model formulation builds on these relations Chapters 5 and 6 introduce the advanced techniques of model transformation and simplification Chapter 7 deals with model simulation and the final chapter reviews important mathematical concepts Presented in a methodical systematic way this book is suitable as a self study guide or as a graduate reference and includes examples schematics and diagrams to enrich understanding End of chapter problems with solutions and computer software available online are designed to further stimulate readers to apply the newly learned concepts End of chapter problems with solutions and computer software available online are designed to further stimulate readers to apply the newly learned concepts Chemical Engineering Computation with MATLAB® Yeong Koo Yeo, 2020-12-15 Chemical Engineering Computation with MATLAB Second Edition continues to present basic to advanced levels of problem solving techniques using MATLAB as the computation environment The Second Edition provides even more examples and problems extracted from core chemical engineering subject areas and all code is updated to MATLAB version 2020 It also includes a new chapter on computational intelligence and Offers exercises and extensive problem solving instruction and solutions for various problems Features solutions developed using fundamental principles to construct mathematical models and an equation oriented approach to generate numerical results Delivers a wealth of examples to 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 Includes an appendix offering an introduction to MATLAB for readers unfamiliar with the program which will allow them to write their own MATLAB programs and follow the examples in the book 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 This essential textbook readies engineering students researchers and professionals to be proficient in the use of MATLAB to solve sophisticated real world problems within the interdisciplinary field of chemical engineering The text features a solutions manual lecture slides and MATLAB program files **Process Modelling and** Model Analysis Ian T. Cameron, Katalin Hangos, 2001-05-23 Process Modelling and Model Analysis describes the use of models in process engineering Process engineering is all about manufacturing of just about anything To manage processing and manufacturing systematically the engineer has to bring together many different techniques and analyses of the interaction between various aspects of the process For example process engineers would apply models to perform feasibility analyses of novel process designs assess environmental impact and detect potential hazards or accidents To manage complex systems and enable process design the behavior of systems is reduced to simple mathematical forms This book provides a systematic approach to the mathematical development of process models and explains how to analyze those models Additionally there is a comprehensive bibliography for further reading a question and answer section and an accompanying Web site developed by the authors with additional data and exercises Introduces a structured modeling methodology emphasizing the importance of the modeling goal and including key steps such as model verification calibration and validation Focuses on novel and advanced modeling techniques such as discrete hybrid hierarchical and empirical modeling Illustrates the notions tools and techniques of process modeling with examples and advances applications Modeling and Simulation of Chemical Process Systems Navef Ghasem, 2018-11-08 In this textbook the author teaches readers how to model and simulate a unit process operation through developing mathematical model equations solving model equations manually and comparing results with those simulated through software It covers both lumped parameter systems and distributed parameter systems as well as using MATLAB and Simulink to solve the system model equations for both Simplified partial differential equations are solved using COMSOL an effective tool to solve PDE using the fine element method This book includes end of chapter problems and worked examples and summarizes reader goals at the beginning of each chapter

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