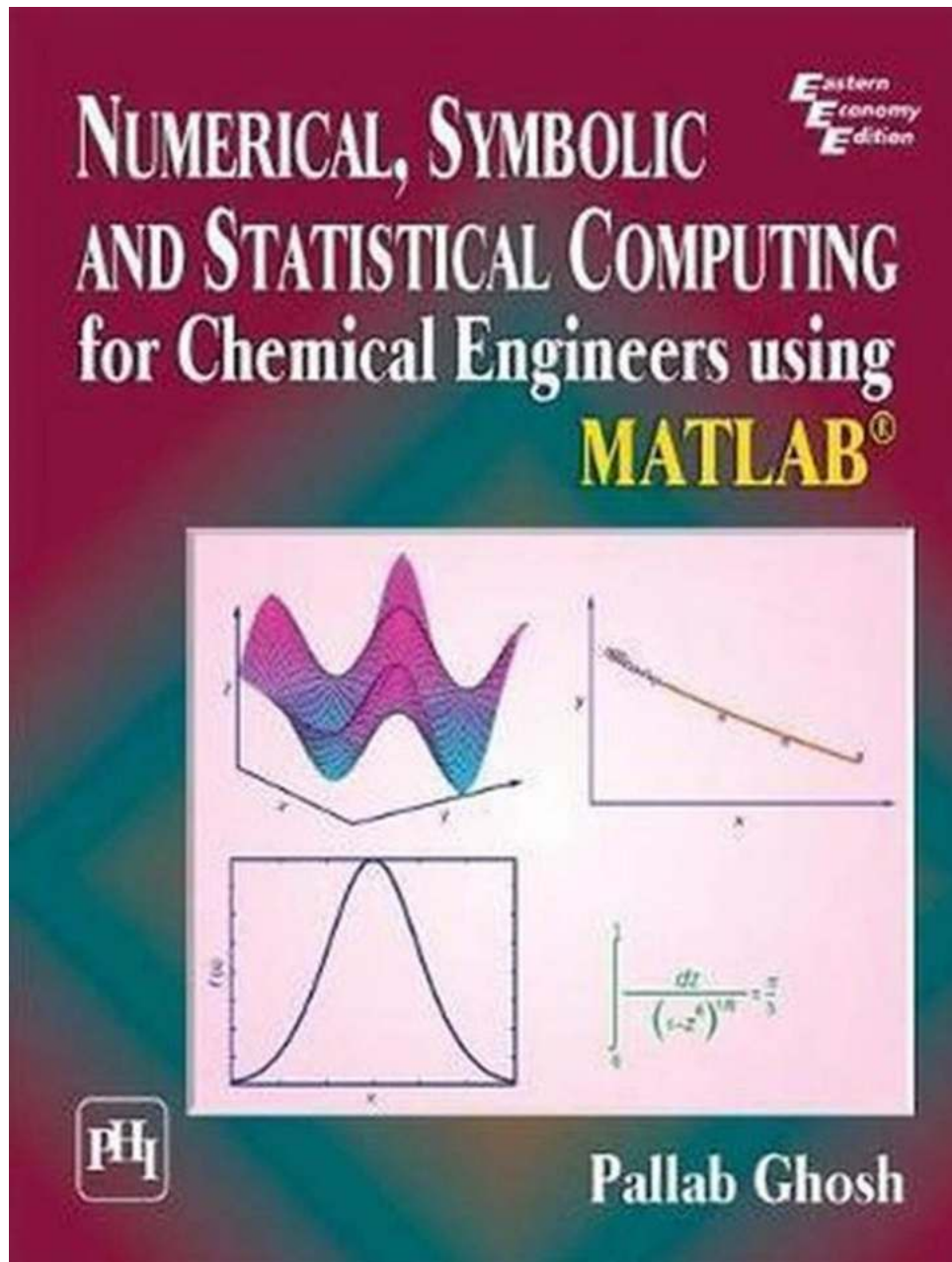


Numerical Symbolic And Statistical Computing For Chemical Engineers Using Matlab: A Comprehensive Guide

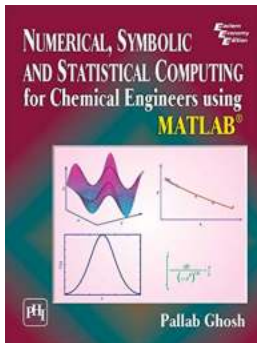


Chemical engineers play a crucial role in developing and optimizing industrial processes that involve the production of chemicals, fuels, and materials. To excel

in this field, a solid foundation in numerical, symbolic, and statistical computing is essential. One tool that has proven to be highly effective and widely used is MATLAB, which provides a powerful and convenient environment for solving complex engineering problems.

What is MATLAB?

MATLAB is a programming language and software environment that is tailored specifically for numerical computing. It is widely used in various scientific and engineering disciplines, including chemical engineering, due to its versatility and extensive range of built-in functions.



NUMERICAL, SYMBOLIC AND STATISTICAL COMPUTING FOR CHEMICAL ENGINEERS USING

MATLAB by Gerald E Marsh (Kindle Edition)

★★★★☆ 4.4 out of 5

Language : English
File size : 21544 KB
Text-to-Speech : Enabled
Screen Reader : Supported
Enhanced typesetting : Enabled
Print length : 556 pages



With MATLAB, chemical engineers can perform numerical computations, create visualizations, develop mathematical models, simulate systems, and analyze data, among other tasks. Its user-friendly interface and extensive documentation make it accessible to both beginners and experts in the field.

Why MATLAB is Essential for Chemical Engineers

MATLAB provides several key benefits that make it an indispensable tool for chemical engineers:

1. Mathematical Modeling and Simulation

Chemical engineers often need to develop mathematical models to describe and simulate chemical processes. MATLAB's mathematical modeling capabilities, combined with its efficient algorithms and libraries, enable engineers to simulate and optimize complex systems with ease. This helps in the design and analysis of chemical reactors, separation processes, heat exchangers, and other critical components.

2. Data Analysis and Visualization

Data analysis is an essential part of chemical engineering, as engineers deal with vast amounts of experimental and process data. MATLAB provides a wide range of statistical and data analysis tools, making it easier to analyze, visualize, and interpret data sets. Engineers can identify patterns, trends, and correlations in the data, leading to valuable insights and improved decision-making.

3. Process Control and Optimization

Chemical engineers are often involved in controlling and optimizing industrial processes to ensure efficiency and safety. MATLAB offers powerful control system design and optimization features, enabling engineers to design robust controllers, implement advanced control strategies, and tune parameters for optimal performance. This helps in maintaining process stability, improving product quality, and reducing operating costs.

4. Symbolic Computing

In addition to numerical computations, MATLAB also provides extensive capabilities for symbolic computation. Symbolic computing allows chemical

engineers to perform exact calculations and manipulate mathematical expressions symbolically, which is especially valuable for deriving analytical solutions to complex equations and systems.

5. Integration with Other Software

MATLAB seamlessly integrates with other software tools and languages commonly used in chemical engineering, such as Aspen Plus, COMSOL Multiphysics, and Microsoft Excel. This allows engineers to combine the strengths of different software packages and leverage their respective functionalities. MATLAB's versatility and compatibility make it an ideal choice for interdisciplinary projects and collaborations.

Getting Started with MATLAB for Chemical Engineers

If you're a chemical engineer looking to enhance your numerical, symbolic, and statistical computing skills using MATLAB, here are some essential steps to get started:

1. Learn the Basics

Start by familiarizing yourself with the MATLAB environment, its key features, and basic programming concepts. MATLAB's official documentation, online tutorials, and interactive examples are excellent resources for learning the basics.

2. Explore Chemical Engineering Applications

Once you have a good grasp of the fundamentals, delve into MATLAB's extensive capabilities for chemical engineering. Explore the different built-in functions, toolboxes, and examples that specifically target chemical engineering applications. This will help you gain insights into how MATLAB can be used to solve real-world chemical engineering problems.

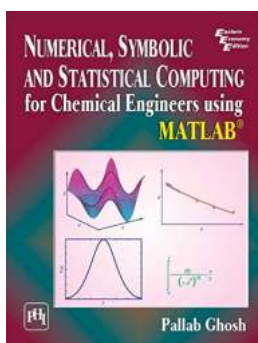
3. Practice with Hands-on Projects

Take on practical projects that allow you to apply MATLAB to solve chemical engineering problems. Start with simple exercises and gradually tackle more complex challenges. This hands-on experience will deepen your understanding of MATLAB's capabilities and enhance your problem-solving skills.

4. Connect with the MATLAB Community

Join online forums, communities, and social media groups dedicated to MATLAB and chemical engineering. Interacting with fellow engineers and enthusiasts will broaden your knowledge, provide valuable insights, and open up opportunities for collaboration.

MATLAB is a powerful tool for chemical engineers, offering vast capabilities in numerical, symbolic, and statistical computing. By leveraging MATLAB's features, chemical engineers can enhance their problem-solving skills, develop mathematical models, analyze and visualize data, optimize processes, and collaborate effectively with other disciplines. Whether you're a seasoned professional or just starting in the field, mastering MATLAB is an investment that will significantly benefit your career in chemical engineering.



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Numerical, analytical and statistical computations are routine affairs for chemical engineers. They usually prefer a single software to solve their computational problems, and at present, MATLAB has emerged as a powerful computational language, which is preferably used for this purpose, due to its built-in functions and toolboxes.

Considering the needs and convenience of the students, the author has made an attempt to write this book, which explains the various concepts of MATLAB in a systematic way and makes its readers proficient in using MATLAB for computing. It mainly focuses on the applications of MATLAB, rather than its use in programming basic numerical algorithms.

Commencing with the to MATLAB, the text covers vector and matrix computations, solution of linear and non-linear equations, differentiation and integration, and solution of ordinary and partial differential equations. Next, analytical computations using the Symbolic Math Toolbox and statistical computations using the Statistics and Machine Learning Toolbox are explained. Finally, the book describes various curve fitting techniques using the Curve Fitting Toolbox. Inclusion of all these advanced-level topics in the book stands it out from the rest.

KEY FEATURES

□ Numerous worked-out examples to enable the readers understand the steps involved in solving the chemical engineering problems

□ MATLAB codes to explain the computational techniques

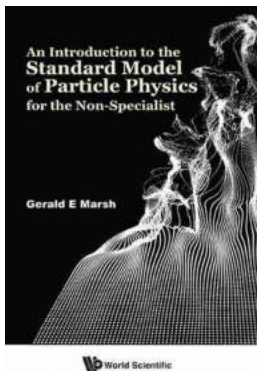
□ Several snapshots to help the readers understand the step-by-step procedures of using the toolboxes

□ Chapter-end exercises, including short-answer questions and numerical problems

□ Appendix comprising the definitions of some important and special matrices

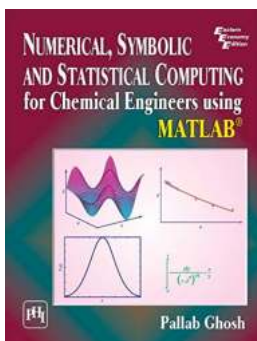
□ Supplemented with Solutions Manual containing complete detailed solutions to the unsolved analytical problems

□ Accessibility of selected colour figures (including screenshots and results/outputs of the programs) cited in the text at www.phindia.com/Pallab_Ghosh.



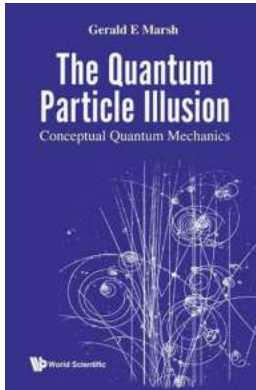
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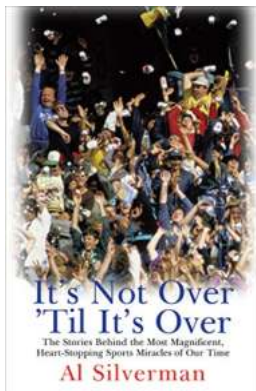
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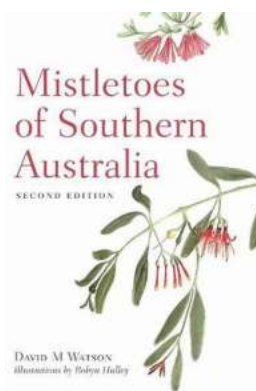
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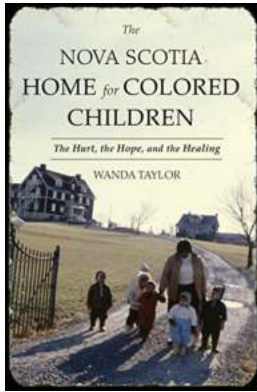
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