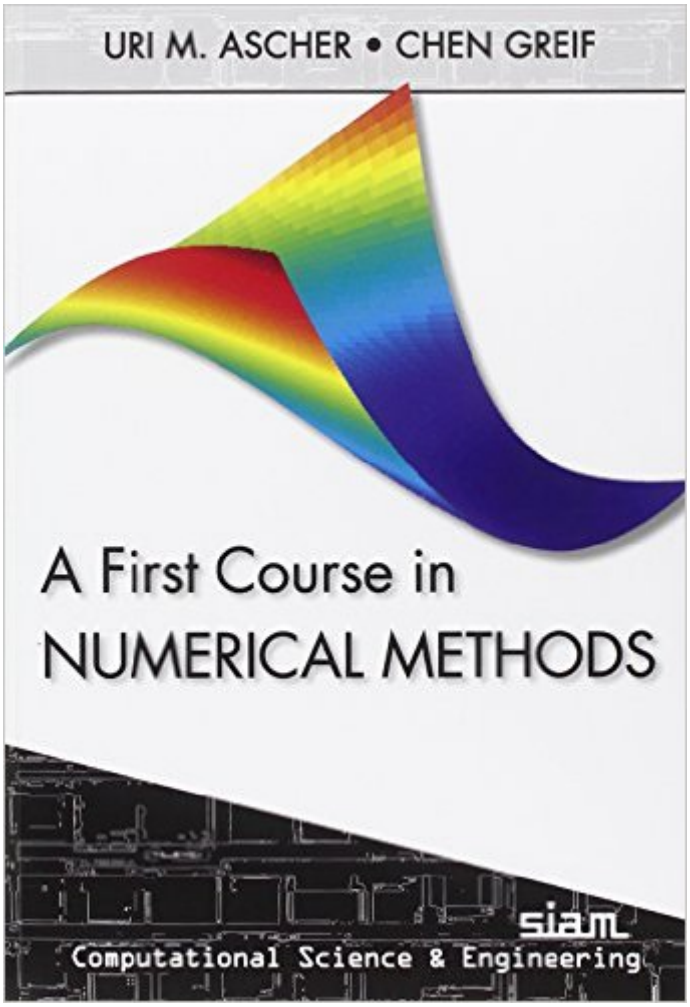
A First Course In Numerical Methods (Computational Science And Engineering)



Synopsis

A First Course in Numerical Methods is designed for students and researchers who seek practical knowledge of modern techniques in scientific computing. Avoiding encyclopedic and heavily theoretical exposition, the book provides an in-depth treatment of fundamental issues and methods, the reasons behind the success and failure of numerical software, and fresh and easy-to-follow approaches and techniques. The authors focus on current methods, issues and software while providing a comprehensive theoretical foundation, enabling those who need to apply the techniques to successfully design solutions to nonstandard problems. The book also illustrates algorithms using the programming environment of MATLAB(r), with the expectation that the reader will gradually become proficient in it while learning the material covered in the book. A variety of exercises are provided within each chapter along with review questions aimed at self-testing. The book takes an algorithmic approach, focusing on techniques that have a high level of applicability to engineering, computer science, and industrial mathematics. Audience: A First Course in Numerical Methods is aimed at undergraduate and beginning graduate students. It may also be appropriate for researchers whose main area of expertise is not scientific computing and who are interested in learning the basic concepts of the field. Contents: Chapter One: Numerical Algorithms; Chapter Two: Roundoff Errors; Chapter Three: Nonlinear Equations in One Variable; Chapter Four: Linear Algebra Background; Chapter Five: Linear Systems: Direct Methods; Chapter Six: Linear Least Squares Problems; Chapter Seven: Linear Systems: Iterative Methods; Chapter Eight: Eigenvalues and Singular Values; Chapter Nine: Nonlinear Systems and Optimization; Chapter Ten: Polynomial Interpolation; Chapter Eleven: Piecewise Polynomial Interpolation; Chapter Twelve: Best Approximation; Chapter Thirteen: Fourier Transform; Chapter Fourteen: Numerical Differentiation; Chapter Fifteen: Numerical Integration; Chapter Sixteen: Differential Equations.

Book Information

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Customer Reviews

I just finished a course which taught from this text and thought it was a pretty OK treatment of introductory topics at a high level. The style of this text is very informal -- both in language and in rigor. To me, 'Numerical Methods' implies a focus on discretization, stability analysis, and derivation. This book only flirts with these topics, and doesn't get into numerical differentialtion / integration until close to the very end. Instead, it starts with floating point math, limitations and pitfalls of roundoff error (an important topic for anyone using numerics!) and then switches to covering classical solvers (newton's method, bisection, etc), interpolation, and a quick introduction/review of Linear algebra and it's applications in numerical methods (spoiler alert: It's really important).There's not too much derivation and the focus is always on application. This can be a good thing depending on what you hope to get out of this book. Some topics are presented very matter-of-factly where you are shown how to use certain methods (interpolation, for instance) and what the pros and cons are without undue focus on their development or correctness. However, this approach can fall short when applied to more complicated topics (iterative linear solvers, linear programming), and it can leave things feeling a bit under-explained. This book is a provides a good survey of many different topics -- many of which deserve full courses in their own right -- but I suppose that's how 'first course' books go. This would be a great engineering text.To address the other reviews that this book is hard to follow, I thought it was pretty readable, but I say this coming from a math background.

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