

Martin Hermann · Masoud Saravi

A First Course in Ordinary Differential Equations

Analytical and Numerical Methods

This book presents a modern introduction to analytical and numerical techniques for solving ordinary differential equations (ODEs). Contrary to the traditional format – the theorems and proofs format – the book is focusing on analytical and numerical methods. The book supplies a variety of problems and examples, ranging from the elementary to the advanced level, to introduce and study the mathematics of ODEs. The analytical part of the book deals with solution techniques for scalar first-order and second-order linear ODEs, and systems of linear ODEs – with a special focus on the Laplace transform, operator techniques and power series solutions. In the numerical part, theoretical and practical aspects of Runge–Kutta methods for solving initial-value problems and shooting methods for linear two-point boundary-value problems are considered. The book is intended as a primary text for courses on the theory of ODEs and numerical treatment of ODEs for advanced undergraduate and early graduate students. It is assumed that the reader has a basic grasp of elementary calculus, in particular methods of integration, and of numerical analysis. Physics, chemistry, biology, computer sciences and engineers whose work involves solving ODEs will also find the book useful as a reference work and tool for independent study. The book has been prepared within the framework of a German–Iranian research project on mathematical methods for ODEs, which was started in early 2005.

Mathematics

ISBN 978-91-321-1700-8



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Martin Hermann
Masoud Saravi

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Analytical and Numerical Methods

 Springer

First Course In Ordinary Differential Equations

John David Logan



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Ordinary Differential Equations D. Somasundaram, 2001 Though ordinary differential equations is taught as a core course to students in mathematics and applied mathematics detailed coverage of the topics with sufficient examples is unique Written by a mathematics professor and intended as a textbook for third and fourth year undergraduates the five chapters of this publication give a precise account of higher order differential equations power series solutions special functions existence and uniqueness of solutions and systems of linear equations Relevant motivation for different concepts in each chapter and discussion of theory and problems without the omission of steps sets Ordinary Differential Equations A First Course apart from other texts on ODEs Full of distinguishing examples and containing exercises at the end of each chapter this lucid course book will promote self study among students

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undergraduate students and a reference book for scientists and engineers Broad coverage and clear presentation of the material indeed appeals to the readers Dr Suman K Tumuluri has been working in University of Hyderabad India for 11 years and at present he is an associate professor His research interests include applications of partial differential equations in population dynamics and fluid dynamics

A First Course in Differential Equations John David Logan, 2006 While the standard sophomore course on elementary differential equations is typically one semester in length most of the texts currently being used for these courses have evolved into calculus like presentations that include a large collection of methods and applications packaged with state of the art color graphics student solution manuals the latest fonts marginal notes and web based supplements All of this adds up to several hundred pages of text and can be very expensive Many students do not have the time or desire to read voluminous texts and explore internet supplements That's what makes the format of this differential equations book unique It is a one semester brief treatment of the basic ideas models and solution methods Its limited coverage places it somewhere between an outline and a detailed textbook The author writes concisely to the point and in plain language Many worked examples and exercises are included A student who works through this primer will have the tools to go to the next level in applying ODEs to problems in engineering science and applied mathematics It will also give instructors who want more concise coverage an alternative to existing texts This text also encourages students to use a computer algebra system to solve problems numerically It can be stated with certainty that the numerical solution of differential equations is a central activity in science and engineering and it is absolutely necessary to teach students scientific computation as early as possible Templates of MATLAB programs that solve differential equations are given in an appendix Maple and Mathematica commands are given as well The author taught this material on several occasions to students who have had a standard three semester calculus sequence It has been well received by many students who appreciated having a small definitive parcel of material to learn Moreover this text gives students the opportunity to start reading mathematics at a slightly higher level than experienced in pre calculus and calculus not every small detail is included Therefore the book can be a bridge in their progress to study more advanced material at the junior senior level where books leave a lot to the reader and are not packaged with elementary formats J David Logan is Professor of Mathematics at the University of Nebraska Lincoln He is the author of another recent undergraduate textbook *Applied Partial Differential Equations* 2nd Edition Springer 2004

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understanding of the topics covered in the text Most of the definitions and results used from subjects like real analysis linear algebra are stated clearly in the book This enables the book to be accessible to physics and engineering students also Moreover sufficient number of worked out examples are presented to illustrate every new technique introduced in this book Moreover the author elucidates the importance of various hypotheses in the results by providing counter examples Features Offers comprehensive coverage of all essential topics required for an introductory course in ODE Emphasizes on both computation of solutions to ODEs as well as the theoretical concepts like well posedness comparison results stability etc Systematic presentation of insights of the nature of the solutions to linear non linear ODEs Special attention on the study of asymptotic behavior of solutions to autonomous ODEs both for scalar case and 2 2 systems Sufficient number of examples are provided wherever a notion is introduced Contains a rich collection of problems This book serves as a text book for undergraduate students and a reference book for scientists and engineers Broad coverage and clear presentation of the material indeed appeals to the readers Dr Suman K Tumuluri has been working in University of Hyderabad India for 11 years and at present he is an associate professor His research interests include applications of partial differential equations in population dynamics and fluid dynamics

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A First Course in Differential Equations with Applications Dennis G. Zill, 1986

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In a global driven by information and connectivity, the energy of words has be much more evident than ever. They have the capacity to inspire, provoke, and ignite change. Such may be the essence of the book **First Course In Ordinary Differential Equations**, a literary masterpiece that delves deep into the significance of words and their effect on our lives. Written by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book is key themes, examine its writing style, and analyze its overall impact on readers.

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Table of Contents First Course In Ordinary Differential Equations

1. Understanding the eBook First Course In Ordinary Differential Equations
 - The Rise of Digital Reading First Course In Ordinary Differential Equations
 - Advantages of eBooks Over Traditional Books
2. Identifying First Course In Ordinary Differential Equations
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an First Course In Ordinary Differential Equations
 - User-Friendly Interface
4. Exploring eBook Recommendations from First Course In Ordinary Differential Equations
 - Personalized Recommendations
 - First Course In Ordinary Differential Equations User Reviews and Ratings

- First Course In Ordinary Differential Equations and Bestseller Lists
- 5. Accessing First Course In Ordinary Differential Equations Free and Paid eBooks
 - First Course In Ordinary Differential Equations Public Domain eBooks
 - First Course In Ordinary Differential Equations eBook Subscription Services
 - First Course In Ordinary Differential Equations Budget-Friendly Options
- 6. Navigating First Course In Ordinary Differential Equations eBook Formats
 - ePub, PDF, MOBI, and More
 - First Course In Ordinary Differential Equations Compatibility with Devices
 - First Course In Ordinary Differential Equations Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of First Course In Ordinary Differential Equations
 - Highlighting and Note-Taking First Course In Ordinary Differential Equations
 - Interactive Elements First Course In Ordinary Differential Equations
- 8. Staying Engaged with First Course In Ordinary Differential Equations
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers First Course In Ordinary Differential Equations
- 9. Balancing eBooks and Physical Books First Course In Ordinary Differential Equations
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection First Course In Ordinary Differential Equations
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine First Course In Ordinary Differential Equations
 - Setting Reading Goals First Course In Ordinary Differential Equations
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of First Course In Ordinary Differential Equations
 - Fact-Checking eBook Content of First Course In Ordinary Differential Equations
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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