

**Applied
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David Eberly**

Mathematical Problems from Combustion Theory



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Mathematical Problems From Combustion Theory Applied Mathematical Sciences V 83

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Mathematical Problems From Combustion Theory Applied Mathematical Sciences V 83:

Mathematical Problems from Combustion Theory Jerrold Bebernes, David Eberly, 2013-12-01 This monograph evolved over the past five years. It had its origin as a set of lecture notes prepared for the Ninth Summer School of Mathematical Physics held at Ravello, Italy, in 1984 and was further refined in seminars and lectures given primarily at the University of Colorado. The material presented is the product of a single mathematical question raised by Dave Kassoy over ten years ago. This question and its partial resolution led to a successful, exciting, almost unique interdisciplinary collaborative scientific effort. The mathematical models described are often times deceptively simple in appearance. But they exhibit a mathematical richness and beauty that belies that simplicity and affirms their physical significance. The mathematical tools required to resolve the various problems raised are diverse and no systematic attempt is made to give the necessary mathematical background. The unifying theme of the monograph is the set of models themselves. This monograph would never have come to fruition without the enthusiasm and drive of Dave Eberly, a former student now collaborator and coauthor, and without several significant breakthroughs in our understanding of the phenomena of blowup or thermal runaway which certain models discussed possess. A collaborator and former student who has made significant contributions throughout is Alberto Bressan. There are many other collaborators: William Troy, Watson Fulks, Andrew Lacey, Klaus Schmitt, and former students Paul Talaga and Richard Ely who must be acknowledged and thanked. Degenerate Diffusions

Wei-Ming Ni, L.A. Peletier, J.L. Vazquez, 2012-12-06 This IMA Volume in Mathematics and its Applications DEGENERATE DIFFUSIONS is based on the proceedings of a workshop which was an integral part of the 1990-91 IMA program on Phase Transitions and Free Boundaries. The aim of this workshop was to provide some focus in the study of degenerate diffusion equations and by involving scientists and engineers as well as mathematicians to keep this focus firmly linked to concrete problems. We thank Wei Ming Ni, L.A. Peletier, and J.L. Vazquez for organizing the meeting. We especially thank Wei Ming Ni for editing the proceedings. We also take this opportunity to thank those agencies whose financial support made the workshop possible: the Army Research Office, the National Science Foundation, and the Office of Naval Research. Avner Friedman, Willard Miller Jr. PREFACE This volume is the proceedings of the IMA workshop Degenerate Diffusions held at the University of Minnesota from May 13 to May 18, 1991. *Random Perturbation Methods with Applications in Science and Engineering* Anatoli V. Skorokhod, Frank C. Hoppensteadt, Habib D. Salehi, 2007-06-21 This book develops methods for describing random dynamical systems and it illustrates how the methods can be used in a variety of applications. Appeals to researchers and graduate students who require tools to investigate stochastic systems. *Recent Advances in Partial Differential Equations* Miguel Ángel Herrero, Enrique Zuazua, 1994 This is an up to date survey of current research with partial differential equations. Topics discussed include the evolution of hypersurfaces by mean curvature flow, nonlinear wave equations including harmonic maps and blow up mechanisms for semilinear parabolic equations. **Stable Solutions of**

Elliptic Partial Differential Equations Louis Dupaigne, 2011-03-15 Stable solutions are ubiquitous in differential equations. They represent meaningful solutions from a physical point of view and appear in many applications including mathematical physics, combustion, phase transition theory, and geometry of minimal surfaces. *Stable Solutions of Elliptic Partial Differential Equations* offers a self-contained presentation of the notion of stability in elliptic partial differential equations (PDEs). The central questions of regularity and classification of stable solutions are treated at length. Specialists will find a summary of the most recent developments of the theory, such as nonlocal and higher order equations. For beginners, the book walks you through the fine versions of the maximum principle, the standard regularity theory for linear elliptic equations, and the fundamental functional inequalities commonly used in this field. The text also includes two additional topics: the inverse square potential and some background material on submanifolds of Euclidean space.

Nonlinear Functional Analysis with Applications to Combustion Theory Kazuaki Taira, 2025-05-14 Explore the fascinating intersection of mathematics and combustion theory in this comprehensive monograph, inspired by the pioneering work of N. N. Semenov and D. A. Frank-Kamenetskii. Delving into the nonlinear functional analytic approach, this book examines semilinear elliptic boundary value problems governed by the Arrhenius equation and Newton's law of heat exchange. Key topics include: Detailed analysis of boundary conditions, including isothermal Dirichlet and adiabatic Neumann cases; Critical insights into ignition and extinction phenomena in stable steady temperature profiles linked to the Frank-Kamenetskii parameter; Sufficient conditions for multiple positive solutions, revealing the S-shaped bifurcation curves of these problems. Designed for researchers and advanced students, this monograph provides a deep understanding of nonlinear functional analysis and elliptic boundary value problems through their application to combustion and chemical reactor models. Featuring detailed illustrations, clearly labeled figures, and tables, this book ensures clarity and enhances comprehension of complex concepts. Whether you are exploring combustion theory, functional analysis, or applied mathematics, this text offers profound insights and a thorough mathematical foundation.

High Performance Scientific and Engineering Computing Hans-Joachim Bungartz, Franz Durst, Christoph Zenger, 2012-12-06 Since the creation of the term Scientific Computing and of its German counterpart *Wissenschaftliches Rechnen*, whoever has to be blamed for that scientists from outside the field have been confused about the somewhat strange distinction between scientific and non-scientific computations. And the insiders, i.e. those who are at least convinced of always computing in a very scientific way, are far from being happy with this summary of their daily work, even if further characterizations like High Performance or Engineering try to make things clearer, usually with very modest success. However, to increase the unfortunate confusion of terms, who knows the differences between Computational Science and Engineering as indicated in the title of the series, these proceedings were given the honour to be published in *Scientific and Engineering Computing*, as chosen for the title of our book. Actually, though, the protagonists of scientific computing persist in its independence as a scientific discipline, and rightly so, of course, the ideas behind the term diverge.

wildly Consequently the variety of answers one can get to the question What is scientific computing is really impressive and ranges from the serious nothing else but numerical analysis up to the more mocking consuming as much CPU time as possible on the most powerful number crunchers accessible

Control of Degenerate and Singular Parabolic Equations Genni Fragnelli, Dimitri Mugnai, 2021-04-06 This book collects some basic results on the null controllability for degenerate and singular parabolic problems It aims to provide postgraduate students and senior researchers with a useful text where they can find the desired statements and the related bibliography For these reasons the authors will not give all the detailed proofs of the given theorems but just some of them in order to show the underlying strategy in this area

Mathematical Reviews ,2002 [□□□□□□□□](#) ,1990 **Fossil Energy Update** ,1983 [Nonlinear Parabolic and Elliptic Equations](#) C.V. Pao, 2012-12-06 In response to the growing use of reaction diffusion problems in many fields this monograph gives a systematic treatment of a class of nonlinear parabolic and elliptic differential equations and their applications these problems It is an important reference for mathematicians and engineers as well as a practical text for graduate students

Scientific and Technical Aerospace Reports ,1986-07 **Applied mechanics reviews** ,1948 [Numerical Solution of Partial Differential Equations: Theory, Algorithms, and Their Applications](#) Oleg P. Iliev, Svetozar D. Margenov, Peter D Minev, Panayot S. Vassilevski, Ludmil T Zikatanov, 2013-06-04 One of the current main challenges in the area of scientific computing is the design and implementation of accurate numerical models for complex physical systems which are described by time dependent coupled systems of nonlinear PDEs This volume integrates the works of experts in computational mathematics and its applications with a focus on modern algorithms which are at the heart of accurate modeling adaptive finite element methods conservative finite difference methods and finite volume methods and multilevel solution techniques Fundamental theoretical results are revisited in survey articles and new techniques in numerical analysis are introduced Applications showcasing the efficiency reliability and robustness of the algorithms in porous media structural mechanics and electromagnetism are presented Researchers and graduate students in numerical analysis and numerical solutions of PDEs and their scientific computing applications will find this book useful

[Nonlinearity](#) ,2009 *Transactions of the ... Army Conference on Applied Mathematics and Computing* ,1986 **Differential and Integral Equations** ,1995 **Subject Guide to Books in Print** ,1997 **International Books in Print** ,1997

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