An Investigation of Newtonian and Viscoelastic Coating Flows

39th AIAA Aerospace Sciences Meeting and Exhibit

Hilbert Functions of Filtered Modules

In the study of mathematical models that arise in the context of concrete applications, the following two questions are of fundamental importance: (i) well-posedness of the model, including existence and uniqueness of solutions; and (ii) qualitative properties of solutions. A positive answer to the first question, being of prime interest on purely mathematical grounds, also provides an important test of the viability of the model as a description of a given physical phenomenon. An answer or insight to the second question provides a wealth of information about the model, hence about the process it describes. Of particular interest are questions related to long-time behavior of solutions. Such an evolution property cannot be verified empirically, thus any a-priori information about the long-time asymptotics can be used in predicting an ultimate long-time response and dynamical behavior of solutions. In recent years, this set of investigations has attracted a great deal of attention. Consequent efforts have then resulted in the creation and infusion of new methods and new tools that have been responsible for carrying out a successful analysis of long-time behavior of several classes of nonlinear PDEs.
Moduli of Curves

Asymptotic Behavior of Dissipative Systems

In these notes we consider two kinds of nonlinear evolution problems of von Karman type on Euclidean spaces of arbitrary even dimension. Each of these problems consists of a system that results from the coupling of two highly nonlinear partial differential equations, one hyperbolic or parabolic and the other elliptic. These systems take their name from a formal analogy with the von Karman equations in the theory of elasticity in two dimensional space. We establish local (respectively global) results for strong (resp., weak) solutions of these problems and corresponding well-posedness results in the Hadamard sense. Results are found by obtaining regularity estimates on solutions which are limits of a suitable Galerkin approximation scheme. The book is intended as a pedagogical introduction to a number of meaningful application of classical methods in nonlinear Partial Differential Equations of Evolution. The material is self-contained and most proofs are given in full detail. The interested reader will gain a deeper insight into the power of nontrivial a priori estimate methods in the qualitative study of nonlinear differential equations.

Izvestiya

Introduction to the Theory of Infinite-dimensional Dissipative Systems

Boundary Stabilization of Thin Plates

Hilbert Functions play major roles in Algebraic Geometry and Commutative Algebra, and are becoming increasingly important also in Computational Algebra. They capture many useful numerical characters associated to a projective variety or to a filtered module over a local ring. Starting from the pioneering work of D.G. Northcott and J. Sally, we aim to gather together in one place many new developments of this theory by using a unifying approach which gives self-contained and easier proofs. The extension of the theory to the case of general filtrations on a module, and its application to the study of certain graded algebras which are not associated to a filtration are two of the main features of the monograph. The material is intended for graduate students and researchers who are interested in Commutative Algebra, in particular in the theory of the Hilbert Functions and related topics.

Atmosphere-ocean Interactions

Brunello Terreni (1953-2000) was a researcher and teacher with vision and dedication. The present volume is dedicated to the memory of Brunello Terreni. His mathematical interests are reflected in 20 expository articles written by distinguished mathematicians. The unifying theme of the articles is "evolution equations and functional analysis", which is presented in various and diverse forms:

**Lectures on Elliptic and Parabolic Equations in Sobolev Spaces**

**Physical Review**

**Control of Partial Differential Equations**

**Annual Report for the Year**

**In the Wake of Tacoma**

This volume provides an overview of current developments in theoretical aspects of atmosphere-ocean interactions. These include the fundamental influence of the ocean surface on the atmospheric dynamics and also the impact of atmospheric phenomena on the upper ocean. Both large scale ocean-atmosphere dynamics, including low frequency variability, as well as shorter time-scales, such as the physics of the atmospheric and oceanic boundary layers and their interactions with surface waves and related air-sea processes important in marine storms are considered. The text also includes some recent research results.

**Reviews in Global Analysis, 1980-86 as Printed in Mathematical Reviews**

This book concentrates on the basic facts and ideas of the modern theory of linear elliptic and parabolic equations in Sobolev spaces. The main areas covered in this book are the first boundary-value problem for elliptic equations and the Cauchy problem for parabolic equations. In addition, other boundary-value problems such as the Neumann or oblique derivative problems are briefly covered. As is natural for a textbook, the main emphasis is on organizing well-known ideas in a self-contained exposition. Among the topics included that are not usually covered in a textbook are a relatively recent development concerning equations with $\mathsf{VMO}$ coefficients and the study of parabolic equations with coefficients measurable only with respect to the time variable. There are numerous exercises which help the reader better understand the material. After going through the book, the reader will have a good understanding of results available in the modern theory of partial differential equations and the technique used to obtain them. Prerequisites are basics...
of measure theory, the theory of $L_p$ spaces, and the Fourier transform.

**Scientific and Technical Aerospace Reports**

This volume is a thorough introduction to contemporary research in elasticity, and may be used as a working textbook at the graduate level for courses in pure or applied mathematics or in continuum mechanics. It provides a thorough description (with emphasis on the nonlinear aspects) of the two competing mathematical models of three-dimensional elasticity, together with a mathematical analysis of these models. The book is as self-contained as possible.

**Differential and Integral Equations**

**SIAM Journal on Scientific Computing**

**Government Reports Announcements & Index**

Providing a timely description of the present state of the art of moduli spaces of curves and their geometry, this volume is written in a way which will make it extremely useful both for young people who want to approach this important field, and also for established researchers, who will find references, problems, original expositions, new viewpoints, etc. The book collects the lecture notes of a number of leading algebraic geometers and in particular specialists in the field of moduli spaces of curves and their geometry. This is an important subject in algebraic geometry and complex analysis which has seen spectacular developments in recent decades, with important applications to other parts of mathematics such as birational geometry and enumerative geometry, and to other sciences, including physics. The themes treated are classical but with a constant look to modern developments (see Cascini, Debarre, Farkas, and Sernesi's contributions), and include very new material, such as Bridgeland stability (see Macri's lecture notes) and tropical geometry (see Chan's lecture notes).

**Von Karman Evolution Equations**

Provides a useful reference source on system structure and control. Covers, linear systems, nonlinear systems, robust control, implicit system, chaotic systems, singular and time-varying systems.

**Three-Dimensional Elasticity**
System Structure and Control

The field of variable exponent function spaces has witnessed an explosive growth in recent years. The standard reference article for basic properties is already 20 years old. Thus this self-contained monograph collecting all the basic properties of variable exponent Lebesgue and Sobolev spaces is timely and provides a much-needed accessible reference work utilizing consistent notation and terminology. Many results are also provided with new and improved proofs. The book also presents a number of applications to PDE and fluid dynamics.

Mathematical Reviews

In the Wake of Tacoma is the first comprehensive treatment of the changes that the 1940 collapse of the first Tacoma Narrows Bridge has imposed on the design of suspension bridges. Written as a historical narrative, this heavily illustrated book describes design trends before the collapse, the collapse itself, and the investigations to determine its cause. The book then examines subsequent aerodynamic and other design developments and their application in suspension bridges worldwide in the decades following the collapse. In the Wake of Tacoma is a comprehensive reference work on suspension bridges in general, examining virtually every suspension bridge of note built in the past sixty years and highlighting overall development of the state of the art today. It goes beyond the major, well-known bridges to examine many small and mid-span suspension bridges worldwide that have contributed significantly to the modern development of the form. Also covered are the engineering debates and engineers involved; discussions of bridges under construction and under design; and new design concepts and materials to conquer the huge distances envisaged for such crossings as the Messina and Gibraltar straits. Presented in easy-to-understand, nontechnical language, this book, which received the 2006 Publication Award from the Japan Association for Wind Engineering, should appeal to both engineers and nonengineers with an interest in bridges and engineering in general. About the Author Richard Scott is a waterway heritage planner for Parks Canada, where he is currently responsible for palnning along the Trent-Severn waterway. He is also the editor of History of the Modern Suspension Bridge: Solving the Dilemma between Economy and Stiffness (ASCE Press, 2010). Product Reviews An outstanding history of suspension bridges focusing on post-Tacoma spans In the Wake of Tacoma is extremely visual and written in a style that makes it accessible, exciting and interesting to both engineers and the general public. It is a masterful study- well researched, written, and illustrated. --Eric DeLony, Chief, Historic American Engineering Record, National Park Service

Hyperbolic Problems

Paper

Index to Theses with Abstracts Accepted for Higher Degrees by the Universities of Great Britain and Ireland and the Council for National Academic Awards
Advances in Turbulence 7

Government Reports Announcements

While the prediction of observations is a forward problem, the use of actual observations to infer the properties of a model is an inverse problem. Inverse problems are difficult because they may not have a unique solution. The description of uncertainties plays a central role in the theory, which is based on probability theory. This book proposes a general approach that is valid for linear as well as for nonlinear problems. The philosophy is essentially probabilistic and allows the reader to understand the basic difficulties appearing in the resolution of inverse problems. The book attempts to explain how a method of acquisition of information can be applied to actual real-world problems, and many of the arguments are heuristic.


Presents research in the area of design and analysis of feedback stabilizers for distributed parameter systems in structural dynamics.

International Aerospace Abstracts

Physics Briefs

This book considers evolution equations of hyperbolic and parabolic type. These equations are studied from a common point of view, using elementary methods, such as that of energy estimates, which prove to be quite versatile. The authors emphasize the Cauchy problem and present a unified theory for the treatment of these equations. In particular, they provide local and global existence results, as well as strong well-posedness and asymptotic behavior results for the Cauchy problem for quasi-linear equations. Solutions of linear equations are constructed explicitly, using the Galerkin method; the linear theory is then applied to quasi-linear equations, by means of a linearization and fixed-point technique. The authors also compare hyperbolic and parabolic problems, both in terms of singular perturbations, on compact time intervals, and asymptotically, in terms of the diffusion phenomenon, with new results on decay estimates for strong solutions of homogeneous quasi-linear equations of each type. This textbook presents a valuable introduction to topics in the theory of evolution equations, suitable for advanced graduate students. The exposition is largely self-contained. The initial chapter reviews the essential material from functional analysis. New ideas are introduced along with their context. Proofs are detailed and carefully presented. The book concludes with a chapter on applications of the theory to Maxwell's equations and von Karman's equations.

Reviews in Partial Differential Equations, 1980-86, as Printed in Mathematical Reviews
Journal of analysis and its application

Linear and Quasi-linear Evolution Equations in Hilbert Spaces

Lebesgue and Sobolev Spaces with Variable Exponents
This useful reference provides recent results as well as entirely new material on control problems for partial differential equations.

Evolution Equations, Semigroups and Functional Analysis

Discrete and Continuous Dynamical Systems

Inverse Problem Theory and Methods for Model Parameter Estimation
This monograph reports the advances that have been made in the area by the author and many other mathematicians; it is an important source of ideas for the researchers interested in the subject. --Zentralblatt MATH Although advanced, this book is a very good introduction to the subject, and the reading of the abstract part, which is elegant, is pleasant. this monograph will be of valuable interest for those who aim to learn in the very rapidly growing subject of infinite-dimensional dissipative dynamical systems. --Mathematical Reviews This book is directed at researchers in nonlinear ordinary and partial differential equations and at those who apply these topics to other fields of science. About one third of the book focuses on the existence and properties of the flow on the global attractor for a discrete or continuous dynamical system. The author presents a detailed discussion of abstract properties and examples of asymptotically smooth maps and semigroups. He also covers some of the continuity properties of the global attractor under perturbation, its capacity and Hausdorff dimension, and the stability of the flow on the global attractor under perturbation. The remainder of the book deals with particular equations occurring in applications and especially emphasizes delay equations, reaction-diffusion equations, and the damped wave equations. In each of the examples presented, the author shows how to verify the existence of a global attractor, and, for several examples, he discusses some properties of the flow on the global attractor.

Evolution Equations of von Karman Type

AGARD Advisory Report
This volume contains an overview of the state of turbulence research with some bias towards work done in Europe. It represents an almost complete collection of the invited and contributed papers delivered at the Seventh European Turbulence Conference, sponsored by EUROMECH and ERCOFTAC and organized by the Observatoire de la Cote d'Azur. High-Reynolds number experiments combined with techniques of imaging, non-intrusive probing, processing and simulation provide high-quality data which put significant constraints on possible theories. For the first time, it has been shown, for a class of passive scalar problems, why dimensional analysis sometimes gives the wrong answers and how anomalous intermittency corrections can be calculated from first principles. The volume is thus geared towards specialists in the area of flow turbulence who could not attend the conference as well as anybody interested in this rapidly-moving field.

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