Entropy Generation On Mhd Viscoelastic Nanofluid Over A

Introduction to nanofluids--their properties, synthesis, characterization, and applications Nanofluids are attracting a great deal of interest with their enormous potential to provide enhanced performance properties, particularly with respect to heat transfer. In response, this text takes you on a complete journey into the science and technology of nanofluids. The authors cover both the chemical and physical methods for synthesizing nanofluids, explaining the techniques for creating a stable suspension of nanoparticles. You get an overview of the existing models and experimental techniques used in studying nanofluids, alongside discussions of the challenges and problems associated with some of these models. Next, the authors set forth and explain the heat transfer applications of nanofluids, including microelectronics, fuel cells, and hybrid-powered engines. You also get an introduction to possible future applications in large-scale cooling and biomedicine. This book is the work of leading pioneers in the field, one of whom holds the first U.S. patent for nanofluids. They have combined their own first-hand knowledge with a thorough review of the literature. Among the

*key topics are: * Synthesis of nanofluids, including dispersion techniques and characterization methods * Thermal conductivity and thermo-physical properties * Theoretical models and experimental techniques * Heat transfer applications in microelectronics, fuel cells, and vehicle engines This text is written for researchers in any branch of science and technology, without any prerequisite.It therefore includes some basic information describing conduction, convection, and boiling of nanofluids for those readers who may not have adequate background in these areas. Regardless of your background, you'll learn to develop nanofluids not only as coolants, but also for a host ofnew applications on the horizon.*

This book is intended to provide a deep understanding on the advanced treatments of thermal properties of materials through experimental, theoretical, and computational techniques. This area of interest is being taught in most universities and institutions at the graduate and postgraduate levels. Moreover, the increasing modern technical and social interest in energy has made the study of thermal properties more significant and exciting in the recent years. This book shares with the international community a sense of global motivation and collaboration on the subject of thermal conductivity and its wide spread applications in modern technologies. This book presents new results

from leading laboratories and researchers on topics including materials, thermal insulation, modeling, steady and transient measurements, and thermal expansion. The materials of interest range from nanometers to meters, bringing together ideas and results from across the research field. Applications of Heat, Mass and Fluid Boundary Layers brings together the latest research on boundary layers where there has been remarkable advancements in recent years. This book highlights relevant concepts and solutions to energy issues and environmental sustainability by combining fundamental theory on boundary layers with real-world industrial applications from, among others, the thermal, nuclear and chemical industries. The book's editors and their team of expert contributors discuss many core themes, including advanced heat transfer fluids and boundary layer analysis, physics of fluid motion and viscous flow, thermodynamics and transport phenomena, alongside key methods of analysis such as the Merk-Chao-Fagbenle method. This book's multidisciplinary coverage will give engineers, scientists, researchers and graduate students in the areas of heat, mass, fluid flow and transfer a thorough understanding of the technicalities, methods and applications of boundary layers, with a unified approach to energy, climate change and a sustainable future. Presents up-to-date research on boundary layers with very practical

applications across a diverse mix of industries Includes mathematical analysis to provide detailed explanation and clarity Provides solutions to global energy issues and environmental sustainability This updated edition of a widely admired text provides a user-friendly introduction to the field that requires only routine mathematics. The book starts with the elements of fluid mechanics and heat transfer, and covers a wide range of applications from fibrous insulation and catalytic reactors to geological strata, nuclear waste disposal, geothermal reservoirs, and the storage of heat-generating materials. As the standard reference in the field, this book will be essential to researchers and practicing engineers, while remaining an accessible introduction for graduate students and others entering the field. The new edition features 2700 new references covering a number of rapidly expanding fields, including the heat transfer properties of nanofluids and applications involving local thermal non-equilibrium and microfluidic effects. Entropy Generation Minimization Viscous Fluids, Porous Media, and Nanofluids The Method of Thermodynamic Optimization of Finite-Size Systems and Finite-Time Processes Techno-Societal 2020 Select Proceedings of NHTFF 2018 Applications of Heat, Mass and Fluid Boundary Layers

The book presents high-quality papers presented at 3rd International Conference on Applications of Fluid Dynamics (ICAFD 2016) organized by Department of Applied Mathematics, ISM Dhanbad, Jharkhand, India in association with Fluid Mechanics Group, University of Botswana, Botswana. The main theme of the Conference is "Sustainable Development in Africa and Asia in context of Fluid Dynamics and Modeling Approaches". The book is divided into seven sections covering all applications of fluid dynamics and their allied areas such as fluid dynamics, nanofluid, heat and mass transfer, numerical simulations and investigations of fluid dynamics, magnetohydrodynamics flow, solute transport modeling and water jet, and miscellaneous. The book is a good reference material for scientists and professionals working in the field of fluid dynamics.

Applications of Nanofluid for Heat Transfer Enhancement explores recent progress in computational fluid dynamic and nonlinear science and its applications to nanofluid flow and heat

**transfer. The opening chapters explain
governing equations and then move on to
discussions of free and forced
convection heat transfers of
nanofluids. Next, the effect of
nanofluid in the presence of an
electric field, magnetic field, and
thermal radiation are investigated,
with final sections devoted to
nanofluid flow in porous media and
application of nanofluid for
solidification. The models discussed in
the book have applications in various
fields, including mathematics, physics,
information science, biology, medicine,
engineering, nanotechnology, and
materials science. Presents the latest
information on nanofluid free and force
convection heat transfer, of nanofluid
in the presence of thermal radiation,
and nanofluid in the presence of an
electric field Provides an
understanding of the fundamentals in
new numerical and analytical methods
Includes codes for each modeling method
discussed, along with advice on how to
best apply them
This book gathers outstanding research
papers presented at the International**

Conference on Intelligent Vision and Computing (ICIVC 2021), held online during October 03-04, 2021. ICIVC 2021 is organised by Sur University, Oman. The book presents novel contributions in intelligent vision and computing and serves as reference material for beginners and advanced research. The topics covered are intelligent systems, intelligent data analytics and computing, intelligent vision and applications collective intelligence, soft computing, optimization, cloud computing, machine learning, intelligent software, robotics, data science, data security, big data analytics, and signal natural language processing.

Spectral methods are well-suited to solve problems modeled by time-dependent partial differential equations: they are fast, efficient and accurate and widely used by mathematicians and practitioners. This class-tested 2007 introduction, the first on the subject, is ideal for graduate courses, or self-study. The authors describe the basic theory of spectral methods, allowing the reader

to understand the techniques through numerous examples as well as more rigorous developments. They provide a detailed treatment of methods based on Fourier expansions and orthogonal polynomials (including discussions of stability, boundary conditions, filtering, and the extension from the linear to the nonlinear situation). Computational solution techniques for integration in time are dealt with by Runge-Kutta type methods. Several chapters are devoted to material not previously covered in book form, including stability theory for polynomial methods, techniques for problems with discontinuous solutions, round-off errors and the formulation of spectral methods on general grids. These will be especially helpful for practitioners.
Micro and Nanofluid Convection with Magnetic Field Effects for Heat and Mass Transfer Applications using MATLAB®
Engineering Applications
Recent Trends in Coatings and Thin Film-Modeling and Application
Advances in the Homotopy Analysis

Method

Proceedings of the International Conference on Intelligent Vision and Computing (ICIVC 2021)

Quasilinearization and Nonlinear Boundary-value Problems

Fluid interfaces are promising candidates for confining different types of materials, e.g., polymers, surfactants, colloids, and even small molecules, to be used in designing new functional materials with reduced dimensionality. The development of such materials requires a deepening of the physicochemical bases underlying the formation of layers at fluid interfaces as well as on the characterization of their structures and properties. This is of particular importance because the constraints associated with the assembly of materials at the interface lead to the emergence of equilibrium and features of dynamics in the interfacial systems, which are far removed from those conventionally found in traditional materials. This Special Issue is devoted to studies on the fundamental and applied aspects of fluid interfaces, and attempts to provide a comprehensive perspective on the current status of the research field.

The volume contains original research papers as the Proceedings of the International Conference on Advances in Mathematics and Computing,

held at Veer Surendra Sai University of Technology, Odisha, India, on 7-8 February, 2020. It focuses on new trends in applied analysis, computational mathematics and related areas. It also includes certain new models, image analysis technique, fluid flow problems, etc. as applications of mathematical analysis and computational mathematics. The volume should bring forward new and emerging topics of mathematics and computing having potential applications and uses in other areas of sciences. It can serve as a valuable resource for graduate students, researchers and educators interested in mathematical tools and techniques for solving various problems arising in science and engineering.

This volume is the first of two containing selected papers from the International Conference on Advances in Mathematical Sciences (ICAMS), held at the Vellore Institute of Technology in December 2017. This meeting brought together researchers from around the world to share their work, with the aim of promoting collaboration as a means of solving various problems in modern science and engineering. The authors of each chapter present a research problem, techniques suitable for solving it, and a discussion of the results obtained. These volumes will be of interest to both theoretical- and application-oriented individuals in academia and industry. Papers in

Volume I are dedicated to active and open areas of research in algebra, analysis, operations research, and statistics, and those of Volume II consider differential equations, fluid mechanics, and graph theory.
This book explains how, when and why the pseudospectral approach works.
Proceedings of IEMIS 2020, Volume 1
Micropolar Fluids
Recent Developments of Nanofluids
Heat Transfer Enhancement with Nanofluids
Spectral Methods for Time-Dependent Problems
Preparation, Characterization and Applications
Micro and Nanofluid Convection with Magnetic Field Effects for Heat and Mass Transfer Applications using MATLAB® examines the performance of micro and nanofluids with various physical effects such as magnetic field, slip effects, radiation and heat sources. Heat and mass transfer enhancement techniques are widely used in many applications in the heating and cooling or freezing process to make possible a reduction in weight and size or enhance performance during heat and mass exchanges. The book covers the two categories of flow techniques, active and passive. It discusses various considerations in the engineering sciences in the melting process, polymer industry and in metallurgy. To be more precise, it may be pointed out that many metal surgical developments involve the cooling of continuous strips or filaments by drawing them through a quiescent fluid, and in that process of drawing, these strips are sometimes stretched. In all these cases, the properties of the final product depend, to a great extent, on the rate of cooling by drawing such strips in an electrically conducting fluid subject to a magnetic field and thermal radiation. Provides information about the governing equations for all three

types of flow geometries Explains micro polar fluid flow modeling Offers detailed coverage of boundary value problems using MATLAB®

Since most of the problems arising in science and engineering are nonlinear, they are inherently difficult to solve. Traditional analytical approximations are valid only for weakly nonlinear problems and often fail when used for problems with strong nonlinearity. "Nonlinear Flow Phenomena and Homotopy Analysis: Fluid Flow and Heat Transfer" presents the current theoretical developments of the analytical method of homotopy analysis. This book not only addresses the theoretical framework for the method, but also gives a number of examples of nonlinear problems that have been solved by means of the homotopy analysis method. The particular focus lies on fluid flow problems governed by nonlinear differential equations. This book is intended for researchers in applied mathematics, physics, mechanics and engineering. Both Kuppalapalle Vajravelu and Robert A. Van Gorder work at the University of Central Florida, USA.

This book aims to include various significant research topics of mathematical fluid mechanics having relevance or applications in engineering and applied sciences, covering the tools and techniques used for developing mathematical methods and modelling related to real-life situations.

This Special Issue contains articles include, but not limited to, empirical, analytical, or design-oriented approaches to the following topics: Monitoring of carrying capacity and mechanisms for managing tourist flows in rural areas; Systems and tools to measure the social, economic, and environmental sustainability of rural tourism; Integration between public tourism policies and private strategies in the promotion and implementation of sustainable practices; Policies for promoting public participation in the planning and development of sustainable rural tourism; The impacts of tourism on traditional

agricultural activities; Identity enhancement of the territory and its productions; "Good practices" in the implementation of rural tourism sustainability.
Methods of Mathematical Modelling
Emerging Technologies in Data Mining and Information Security
Applied Mathematics and Scientific Computing
The Optimal Homotopy Asymptotic Method
Theory and Applications
Rotating Flow

Hybrid Nanofluids: Preparation, Characterization and Applications presents the history of hybrid nanofluids, preparation techniques, thermoelectrical properties, rheological behaviors, optical properties, theoretical modeling and correlations, and the effect of all these factors on potential applications, such as solar energy, electronics cooling, heat exchangers, machining, and refrigeration. Future challenges and future work scope have also been included. The information from this book enables readers to discover novel techniques, resolve existing research limitations, and create novel hybrid nanofluids which can be implemented for heat transfer applications. Describes the characterization, thermophysical and electrical properties of nanofluids Assesses parameter selection and

property measurement techniques for the calibration of thermal performance Provides information on theoretical models and correlations for predicting hybrid nanofluids properties from experimental properties Thermodynamics is one of the most exciting branches of physical chemistry which has greatly contributed to the modern science. Being concentrated on a wide range of applications of thermodynamics, this book gathers a series of contributions by the finest scientists in the world, gathered in an orderly manner. It can be used in post-graduate courses for students and as a reference book, as it is written in a language pleasing to the reader. It can also serve as a reference material for researchers to whom the thermodynamics is one of the area of interest. Application of Control Volume Based Finite Element Method (CVFEM) for Nanofluid Flow and Heat Transfer discusses this powerful numerical method that uses the advantages of both finite volume and finite element methods for the simulation of multi-physics

problems in complex geometries, along with its applications in heat transfer and nanofluid flow. The book applies these methods to solve various applications of nanofluid in heat transfer enhancement. Topics covered include magnetohydrodynamic flow, electrohydrodynamic flow and heat transfer, melting heat transfer, and nanofluid flow in porous media, all of which are demonstrated with case studies. This is an important research reference that will help readers understand the principles and applications of this novel method for the analysis of nanofluid behavior in a range of external forces. Explains governing equations for nanofluid as working fluid Includes several CVFEM codes for use in nanofluid flow analysis Shows how external forces such as electric fields and magnetic field effects nanofluid flow This book, divided in two volumes, originates from Techno-Societal 2020: the 3rd International Conference on Advanced Technologies for Societal Applications, Maharashtra, India, that brings together faculty members of various engineering colleges to solve

**Indian regional relevant problems under
the guidance of eminent researchers
from various reputed organizations. The
focus of this volume is on technologies
that help develop and improve society, in
particular on issues such as advanced
and sustainable technologies for
manufacturing processes, environment,
livelihood, rural employment,
agriculture, energy, transport,
sanitation, water, education. This
conference aims to help innovators to
share their best practices or products
developed to solve specific local
problems which in turn may help the
other researchers to take inspiration to
solve problems in their region. On the
other hand, technologies proposed by
expert researchers may find applications
in different regions. This offers a
multidisciplinary platform for
researchers from a broad range of
disciplines of Science, Engineering and
Technology for reporting innovations at
different levels.
Thermodynamics
Proceedings of ICAFD 2016
Recent Trends in Computational Fluid
Dynamics, 2nd Edition**

Symmetry and Fluid Mechanics Impact of Thermal Conductivity on Energy Technologies

Rotating flow is critically important across a wide range of scientific, engineering and product applications, providing design and modeling capability for diverse products such as jet engines, pumps and vacuum cleaners, as well as geophysical flows. Developed over the course of 20 years' research into rotating fluids and associated heat transfer at the University of Sussex Thermo-Fluid Mechanics Research Centre (TFMRC), Rotating Flow is an indispensable reference and resource for all those working within the gas turbine and rotating machinery industries. Traditional fluid and flow dynamics titles offer the essential background but generally include very sparse coverage of rotating flows—which is where this book comes in. Beginning with an accessible introduction to rotating flow, recognized expert Peter Childs takes you through fundamental equations, vorticity and vortices, rotating disc flow, flow around rotating cylinders and flow in rotating cavities, with an introduction to atmospheric and oceanic circulations included to help deepen understanding. Whilst competing resources are weighed down with complex mathematics, this book focuses on the essential equations and provides full workings to take readers step-by-step through the theory so they can concentrate on the practical applications. A detailed yet accessible introduction to rotating flows, illustrating the differences between flows where rotation is significant and highlighting the non-intuitive nature of rotating flow

*fields Written by world-leading authority on rotating flow,
Peter Childs, making this a unique and authoritative work
Covers the essential theory behind engineering
applications such as rotating discs, cylinders, and
cavities, with natural phenomena such as atmospheric
and oceanic flows used to explain underlying principles
Provides a rigorous, fully worked mathematical account
of rotating flows whilst also including numerous practical
examples in daily life to highlight the relevance and
prevalence of different flow types Concise summaries of
the results of important research and lists of references
included to direct readers to significant further resources
This book features research papers presented at the
International Conference on Emerging Technologies in
Data Mining and Information Security (IEMIS 2020) held
at the University of Engineering & Management, Kolkata,
India, during July 2020. The book is organized in three
volumes and includes high-quality research work by
academicians and industrial experts in the field of
computing and communication, including full-length
papers, research-in-progress papers and case studies
related to all the areas of data mining, machine learning,
Internet of things (IoT) and information security.
Thin film processes are significantly incorporated in
manufacturing display panels, secondary batteries,
fuel/solar cells, catalytic films, membranes, adhesives,
and other commodity films. This Special Issue on "Thin
Film Processes" of Processes listed recent progress on
thin-film processes, covering theoretical considerations,
experimental observations, and computational
techniques. Articles in this Issue consider comprehensive*

studies on thin film processes and related materials. This book contains original research papers presented at the International Conference on Mathematical Modelling and Scientific Computing, held at the Indian Institute of Technology Indore, India, on 19–21 July 2018. Organized into 30 chapters, the book presents the recent progress and the most advanced innovations, trends, and real-world challenges encountered and solutions embraced in the applications of mathematics and scientific computing. The book will be of interests to a wide variety of researchers, students and the practicing engineers working in diverse areas of science and engineering, ranging from applied and computational mathematics, vibration problem, computer science, and numerical optimization to physics, chemistry, biology, electrical, civil, mechanical, chemical, seismology, aerospace, and medical sciences. The aim of the conference is to bring together leading academicians, scientists, researchers, engineers, and industry partners from all over the globe to exchange and share their experiences and research results on various aspects of applied mathematics and scientific computation, like, differential equation, modeling, simulation, dynamical systems, numerical analysis, matrix theory, inverse problems, and solid and fluid mechanics, computational engineering.
Application of Control Volume Based Finite Element Method (CVFEM) for Nanofluid Flow and Heat Transfer
ICMMSC 2018, Indore, India, July 19–21
Nonlinear Flow Phenomena and Homotopy Analysis
International Conference on Advances in Mathematical Sciences, Vellore, India, December 2017 - Volume II

Fluid Flow and Heat Transfer
Science and Technology

Since the 1980s, attention has increased in the research of fluid mechanics due to its wide application in industry and phycology. Major advances have occurred in the modeling of key topics such Newtonian and non-Newtonian fluids, nanoparticles, thermal management, and physiological fluid phenomena in biological systems, which have been published in this Special Issue on symmetry and fluid mechanics for Symmetry. Although, this book is not a formal textbook, it will be useful for university teachers, research students, and industrial researchers and for overcoming the difficulties that occur when considering the nonlinear governing equations. For such types of equations, obtaining an analytic or even a numerical solution is often more difficult. This book addresses this challenging job by outlining the latest techniques. In addition, the findings of the simulation are logically realistic and meet the standard of sufficient scientific value. Publisher's note: This is a 2nd edition due to an article retraction.

Unlike other analytic techniques, the Homotopy Analysis Method (HAM) is independent of small/large physical parameters. Besides, it provides great freedom to choose equation type and solution expression of related linear high-order approximation equations. The HAM provides a simple way to guarantee the convergence of solution series. Such uniqueness differentiates the HAM from all other analytic approximation methods. In addition, the HAM can be applied to solve some challenging problems with high nonlinearity. This book, edited by the pioneer and founder of the HAM, describes the current advances of this powerful analytic approximation method for highly nonlinear problems. Coming from different countries and fields of research, the authors of

each chapter are top experts in the HAM and its applications.
Contents:Chance and Challenge: A Brief Review of
Homotopy Analysis Method (S-J Liao)Predictor Homotopy
Analysis Method (PHAM) (S Abbasbandy and E
Shivanian)Spectral Homotopy Analysis Method for Nonlinear
Boundary Value Problems (S Motsa and P Sibanda)Stability
of Auxiliary Linear Operator and Convergence-Control
Parameter (R A Van Gorder)A Convergence Condition of the
Homotopy Analysis Method (M Turkyilmazoglu)Homotopy
Analysis Method for Some Boundary Layer Flows of
Nanofluids (T Hayat and M Mustafa)Homotopy Analysis
Method for Fractional Swift–Hohenberg Equation (S Das and
K Vishal)HAM-Based Package NOPH for Periodic
Oscillations of Nonlinear Dynamic Systems (Y-P Liu)HAM-
Based Mathematica Package BVPh 2.O for Nonlinear
Boundary Value Problems (Y-L Zhao and S-J Liao)
Readership: Graduate students and researchers in applied
mathematics, physics, nonlinear mechanics, engineering and
finance. Keywords:Analytic Approxiamtion
Method;Nonlinear;Homotopy;Applied MathematicsKey
Features:The method described in the book can overcome
almost all restrictions of other analytic approximation method
for nonlinear problemsThis book is the first in homotopy
analysis method, covering the newest advances, contributed
by many top experts in different fields
Convective Flow and Heat Transfer from Wavy Surfaces:
Viscous Fluids, Porous Media, and Nanofluids addresses the
wavy irregular surfaces in heat transfer devices. Fluid flow
and heat transfer studies from wavy surfaces have received
attention, since they add complexity and require special
mathematical techniques. This book considers the flow and
heat transfer characteristics from wavy surfaces, providing an
understanding of convective behavioral changes.
Viscous Flow Theory: Laminar flow

Advances in Convective Instabilities and Incompressible Fluid Flow
Fluid Interfaces
Mathematical Fluid Mechanics
Applications of Fluid Dynamics
Convective Flow and Heat Transfer from Wavy Surfaces

Nanofluids are gaining the attention of scientists and researchers around the world. This new category of heat transfer medium improves the thermal conductivity of fluid by suspending small solid particles within it and offers the possibility of increased heat transfer in a variety of applications. Bringing together expert contributions from across the globe, Heat Transfer Enhancement with Nanofluids presents a complete understanding of the application of nanofluids in a range of fields and explains the main techniques used in the analysis of nanofuids flow and heat transfer. Providing a rigorous framework to help readers develop devices employing nanofluids, the book addresses basic topics that include the analysis and measurements of thermophysical properties, convection, and heat exchanger performance. It explores the issues of convective instabilities, nanofluids in porous media, and entropy generation in nanofluids. The book also contains the latest advancements, innovations, methodologies, and research on the subject. Presented in 16 chapters, the text: Discusses the possible mechanisms of thermal conduction

*enhancement Reviews the results of a theoretical analysis determining the anomalous enhancement of heat transfer in nanofluid flow Assesses different approaches modeling the thermal conductivity enhancement of nanofluids Focuses on experimental methodologies used to determine the thermophysical properties of nanofluids Analyzes forced convection heat transfer in nanofluids in both laminar and turbulent convection Highlights the application of nanofluids in heat exchangers and microchannels Discusses the utilization of nanofluids in porous media Introduces the boiling of nanofluids Treats pool and flow boiling by analyzing the effect of nanoparticles on these complex phenomena Indicates future research directions to further develop this area of knowledge, and more Intended as a reference for researchers and engineers working in the field, Heat Transfer Enhancement with Nanofluids presents advanced topics that detail the strengths, weaknesses, and potential future developments in nanofluids heat transfer.
Over the past two decades, there has been increased attention in the research of nanofluid due to its widely expanded domain in many industrial and technological applications. Major advances in the modeling of key topics such as nanofluid, MHD, heat transfer, convection, porous media, Newtonian/non-Newtonian fluids have been made and finally published in the*

special issue on recent developments in nanofluids for Applied Sciences. The present attempt is to edit the special issue in a book form. Although, this book is not a formal textbook even than it will definitely be useful for research students and university teachers in overcoming the difficulties occurring in the said topic while dealing with the nonlinear governing equations. On one side the real world problems in mathematics, physics, biomechanics, engineering and other disciplines of sciences are mostly described by the set of nonlinear equations whereas on the other hand, it is often more difficult to get an analytic solution or even a numerical one. This book has successfully handled this challenging job with latest techniques. In addition the findings of the simulation are logically realistic and meet the standard of sufficient scientific value.
This book comprises selected papers from the International Conference on Numerical Heat Transfer and Fluid Flow (NHTFF 2018), and presents the latest developments in computational methods in heat and mass transfer. It also discusses numerical methods such as finite element, finite difference, and finite volume applied to fluid flow problems. Providing a good balance between computational methods and analytical results applied to a wide variety of problems in heat transfer, transport and fluid mechanics, the book is a valuable

resource for students and researchers working in the field of heat transfer and fluid dynamics. This book features original research articles on the topic of mathematical modelling and fractional differential equations. The contributions, written by leading researchers in the field, consist of chapters on classical and modern dynamical systems modelled by fractional differential equations in physics, engineering, signal processing, fluid mechanics, and bioengineering, manufacturing, systems engineering, and project management. The book offers theory and practical applications for the solutions of real-life problems and will be of interest to graduate level students, educators, researchers, and scientists interested in mathematical modelling and its diverse applications. Features Presents several recent developments in the theory and applications of fractional calculus Includes chapters on different analytical and numerical methods dedicated to several mathematical equations Develops methods for the mathematical models which are governed by fractional differential equations Provides methods for models in physics, engineering, signal processing, fluid mechanics, and bioengineering Discusses real-world problems, theory, and applications Mathematical Modelling and Scientific Computing with Applications Numerical Heat Transfer and Fluid Flow

New Trends in Applied Analysis and Computational Mathematics
A Practical Guide to Pseudospectral Methods
Thin Film Processes
Applications of Nanofluid for Heat Transfer Enhancement

This book emphasizes in detail the applicability of the Optimal Homotopy Asymptotic Method to various engineering problems. It is a continuation of the book

"Nonlinear Dynamical Systems in Engineering: Some Approximate Approaches", published at Springer in 2011 and it contains a great amount of practical models from various fields of engineering such as classical and fluid mechanics, thermodynamics, nonlinear oscillations, electrical machines and so on. The main structure of the book consists of 5 chapters. The first chapter is introductory while the second chapter is devoted to a short history of the development of homotopy methods, including the basic ideas of the Optimal Homotopy Asymptotic Method. The last three chapters, from Chapter 3 to Chapter 5, are introducing three distinct alternatives of the Optimal Homotopy Asymptotic Method with illustrative applications to nonlinear dynamical systems. The third chapter deals with the first alternative of our approach with two iterations. Five applications are presented from fluid mechanics and nonlinear oscillations. The Chapter 4 presents the Optimal Homotopy Asymptotic Method with a single iteration and solving the linear equation on the first approximation. Here are treated 32 models from different fields of engineering

such as fluid mechanics, thermodynamics, nonlinear damped and undamped oscillations, electrical machines and even from physics and biology. The last chapter is devoted to the Optimal Homotopy Asymptotic Method with a single iteration but without solving the equation in the first approximation.

Micropolar fluids are fluids with microstructure. They belong to a class of fluids with nonsymmetric stress tensor that we shall call polar fluids, and include, as a special case, the well-established Navier-Stokes model of classical fluids that we shall call ordinary fluids. Physically, micropolar fluids may represent fluids consisting of rigid, randomly oriented (or spherical) particles suspended in a viscous medium, where the deformation of fluid particles is ignored. The model of micropolar fluids introduced in [65] by C. A. Eringen is worth studying as a very well balanced one. First, it is a well-founded and significant generalization of the classical Navier-Stokes model, covering, both in theory and applications, many more phenomena than the classical one. Moreover, it is elegant and not too complicated, in other words, man ageable to both mathematicians who study its theory and physicists and engineers who apply it. The main aim of this book is to present the theory of micropolar fluids, in particular its mathematical theory, to a wide range of readers. The book also presents two applications of micropolar fluids, one in the theory of lubrication and the other in the theory of porous media, as well as several exact solutions of particular problems and a numerical method. We took pains to make the presentation both clear and

uniform.

This book presents the diverse and rapidly expanding field of Entropy Generation Minimization (EGM), the method of thermodynamic optimization of real devices. The underlying principles of the EGM method - also referred to as "thermodynamic optimization," "thermodynamic design," and "finite time thermodynamics" - are thoroughly discussed, and the method's applications to real devices are clearly illustrated. The EGM field has experienced tremendous growth during the 1980s and 1990s. This book places EGM's growth in perspective by reviewing both sides of the field - engineering and physics. Special emphasis is given to chronology and to the relationship between the more recent work and the pioneering work that outlined the method and the field. Entropy Generation Minimization combines the fundamental principles of thermodynamics, heat transfer, and fluid mechanics. EGM applies these principles to the modeling and optimization of real systems and processes that are characterized by finite size and finite time constraints, and are limited by heat and mass transfer and fluid flow irreversibilities. Entropy Generation Minimization provides a straightforward presentation of the principles of the EGM method, and features examples that elucidate concepts and identify recent EGM advances in engineering and physics. Modern advances include the optimization of storage by melting and solidification; heat exchanger design; power from hot-dry-rock deposits; the on & off operation of defrosting refrigerators and power plants with fouled heat exchangers; the production of ice and other

solids; the maximization of power output in simple power plant models with heat transfer irreversibilities; the minimization of refrigerator power input in simple models; and the optimal collection and use of solar energy. From the reviews: "The book has a broad and general coverage of both the mathematics and the numerical methods well suited for graduate students." Applied Mechanics Reviews #1 "This is a very well written book. The topics are developed with separate headings making the matter easily understandable. Computer programs are also included for many problems together with a separate chapter dealing with the application of computer programs to heat transfer problems. This enhances the utility of the book." Zentralblatt für Mathematik #1
Proceedings of the 3rd International Conference on Advanced Technologies for Societal Applications—Volume 2
Energy and Sustainability V
Physical and Computational Aspects of Convective Heat Transfer
Nanofluids
Fractional Differential Equations
Hybrid Nanofluids
Energy and Sustainability V is the proceedings of the 5th International Conference on Energy and Sustainability, held by the Wessex Institute of Technology. The modern world is highly dependent on the exploitation of fossil fuels. More recently, resources depletion and severe environmental effects deriving from the continuous use of these fuels has resulted in an increasing amount of interest in renewable energy resources and the search for

sustainable energy policies. The changes required to progress from an economy mainly based on hydrocarbons to one taking advantage of sustainable energy resources are massive and require considerable scientific research as well as engineering systems. The effect also involves collaboration between different disciplines in order to arrive at optimum solutions, including buildings, energy networks, convenience systems, new energy storage solutions, waste to energy technologies, and many others. This book covers topics related to sustainability in energy and power production, storage, distribution and management. These include: Smart grids; Smart metering; Green ICT; Green buildings; Energy storage; Renewable energy resources; Plug-in Hybrid Vehicles (PHEV); Biofuels (solid, liquid, gas); Waste to energy; CO_2 capturing and management; Energy and transportation; Environmental risk; Energy policies; Greener power plant technologies; Hydrogen recovery techniques; Sustainable energy production. The edited volume includes papers in the fields of fuzzy mathematical analysis and advances in computational mathematics. The fields of fuzzy mathematical analysis and advances in computational mathematics can provide valuable solutions to complex problems. They have been applied in multiple areas such as high dimensional data analysis, medical diagnosis, computer vision, hand-written character recognition, pattern recognition, machine intelligence, weather forecasting, network optimization, VLSI design, etc. The volume covers ongoing research in fuzzy and computational mathematical analysis and brings forward its recent applications to important real-world problems in various fields. The book includes selected high-quality papers from the International Conference on Fuzzy Mathematical Analysis and Advances in Computational Mathematics (FMAACM 2020). Proceedings of the International Conference on Advances in Mathematics and Computing (ICAMC 2020) Systems in Equilibrium and Non-Equilibrium Convection in Porous Media

Fuzzy Mathematical Analysis and Advances in Computational Mathematics