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Constructal Law and the Unifying Principle of Design Constructal Human Dynamics, Security and Sustainability Design with Constructal Theory Constructal Theory of Social Dynamics Critique of Constructal Theory Constructal Human Dynamics, Security and Sustainability Design with Constructal Theory Fin-Shape Thermal Optimization Using Bejan's Constuctal Theory Statistical, Mapping and Digital Approaches in Healthcare Porous and Complex Flow Structures in Modern Technologies Heat Transfer Handbook Heat and Mass Transfer Intensification and Shape Optimization Thermohydrodynamic Programming and Constructal Design in Microsystems Fractals Tree-Shaped Fluid Flow and Heat Transfer Advances in Heat Transfer Convection Heat Transfer Thermodynamics of Fluids Under Flow Multi-Agent Based Simulation XVII Thermodynamic Approaches in Engineering Systems Thermal Management for LED Applications The Nature of Motive Force Advances in Electric Propulsion Energy Optimization in Process Systems Energy Optimization in Process Systems and Fuel Cells Shape and Structure, from Engineering to Nature Thermodynamic Interactions Computational Modeling in Biomedical Engineering and Medical Physics Developments in Heat Transfer Biomimetic Design Method for Innovation and Sustainability Applied Mechanics Reviews Single and Two-Phase Flows on Chemical and Biomedical Engineering Achieving Building Comfort by Natural Means Proceedings of the 8th Biennial Conference on Engineering Systems Design and Analysis--2006: Fatigue and fracture. Heat transfer. Internal combustion engines. Manufacturing. Technology and society Structural Integrity and Fatigue Failure Analysis Convection in Porous Media Scientific Analysis of Cultural Heritage Objects Convection in Porous Media Design Optimization of Renewable Energy Systems Using Advanced Optimization Algorithms Engineering Principles in Everyday Life for Non-Engineers

Constructal Law and the Unifying Principle of Design

2012-12-04

design happens everywhere whether in animate objects e g dendritic lung structures bacterial colonies and corals inanimate patterns river basins beach slope and dendritic crystals social dynamics pedestrian traffic flows or engineered systems heat dissipation in electronic circuitry this design in nature often takes on remarkably similar patterns which can be explained under one unifying constructal law this book explores the unifying power of the constructal law and its applications in all domains of design generation and evolution ranging from biology and geophysics to globalization energy sustainability and security the constructal law accounts for the universal tendency of flow systems to morph into evolving configurations that provide greater and easier access over time the constructal law resolves the many and contradictory ad hoc statements of optimality end design and destiny in nature such as minimum and maximum entropy production and minimum and maximum flow resistance and also explains the designs that are observed and copied in biomimetics constructal law and the unifying principle of design covers the fundamentals of constructal theory and design as well as presenting a variety of state of the art applications experts from the biological physical and social sciences demonstrate the unification of all design phenomena in nature and apply this knowledge to novel designs in modern engineering such as vascularization for self healing and self cooling materials for aircraft and tree fins and cavities for heat transfer enhancement

Constructal Human Dynamics, Security and Sustainability

2009

globalization security infrastructure and energy sustainability can be designed based on a scientific principle this book approaches these objectives based on constructal theory which means to design such projects as global flow architectures that are alive with movement of personnel equipment information and education

Design with Constructal Theory

2008-09-09

questions and answers explore various aspects of astronomy including the solar system stars planets moons asteroids and comets full color illustrations

Constructal Theory of Social Dynamics

2007-10-26

constructal theory of social dynamics brings together for the first time social scientists and engineers who present predictive theory of social organization as a conglomerate of mating flows that morph in time to flow more easily the book offers a new way to look at social phenomena as part of natural phenomena and examines a new domain of application of engineering such as thermodynamic optimization thermoeconomics and design as science

Critique of Constructal Theory

2019-09-12

constructal theory has been extensively used to analyze and optimize many different shapes and structures in both living and non living systems it is generally considered to be a law that could govern the evolutions of shapes and structures in biology physics technology and social organization accordingly it seems that the constructal method is suitable for designing and analyzing all kinds of shapes and structures in the world however in most cases the details for its applications were not carefully checked meaning that it was often incorrectly applied and that many unreasonable or inaccurate results were provided this book systematically reviews and checks the applications of constructal theory in street design economics heat transfer optimization flow systems and explanations of natural structures and social phenomena every detail of the models methods optimizations applications results and conclusions is analysed with careful consideration of theoretical derivations and typical examples accordingly the problems and mistakes in the applications of the theory are directly pointed out and discussed in detail the abuse and limitation of the constructal approach are also discussed in many cases it is shown that the theory has significant flaws and is even not applicable in certain circumstances as constructal theory is widely used in the analysis and design of shapes and structures this book will be essential for scientists researchers engineers teachers postgraduates and undergraduates in the fields of structure analysis design and optimization in physics biology flow dynamics heat transfer and thermodynamics

Constructal Human Dynamics, Security and Sustainability

2009-02-26

globalization security infrastructure and energy sustainability can be designed based on a scientific principle in this book these objectives are approached based on constructal theory which means to design such projects as global flow architectures that are alive with movement of personnel equipment information education etc constructal human dynamics security and sustainability highlights the progress made during the nato advanced research workshop held in Évora portugal in may 2008 this workshop brought together social scientists with physicists engineers and biologists together they addressed main topics such as human dynamics viewed as natural phenomena of design generation flow networks for distribution and collection large scale construction projects e g airports waste storage logistics decontamination energy supply routes distributed energy systems water resources management environmental security sustainability and globalization the chapters selected for this book represent the interdisciplinary approach and team atmosphere that emerged in Évora

Design with Constructal Theory

2008-09-09

design course on the universal principle of configurations in nature and engineering the constructal law design with constructal theory offers a revolutionary new approach based on physics for understanding and predicting the designs that arise in nature and engineering from the tree and the forest to the cooling of electronics urban design decontamination and vascular smart materials this book shows how you can use the method of constructal theory to design human made systems in order to reduce trial and error and increase the system performance first developed in the late 1990s constructal theory holds that flow architecture arises from the natural evolutionary tendency to generate greater flow access in time and in flow configurations that are free to morph it unites flow systems with solid mechanical structures which are viewed as systems for the flow of stresses constructal theory unites nature with engineering and helps us generate novel designs across the board from high density packages to vascular materials with new functionalities self healing self cooling and from tree shaped heat exchangers to svelte fluid flow and solid structures design with constructal theory starts with basic principles and then shows how these principles are applied to understanding and designing increasingly complex systems problems and exercises at the end of each chapter give you an opportunity to use constructal theory to solve actual design problems this book is based on a design course developed by the two authors for upper level undergraduates and graduate students at duke university and other universities all over the world with the authors expert guidance students and professionals in mechanical civil environmental chemical aerospace and biomedical engineering will understand natural systems and then practice design as science by relying on constructal strategies to pursue and discover novel and effective designs

Fin-Shape Thermal Optimization Using Bejan's Constuctal Theory

2022-05-31

the book contains research results obtained by applying bejan s constructal theory to the study and therefore the optimization of fins focusing on t shaped and y shaped ones heat transfer from finned surfaces is an example of combined heat transfer natural or forced convection on the external parts of the fin and conducting along the fin fin s heat exchange is rather complex because of variation of both temperature along the fin and convective heat transfer coefficient furthermore possible presence of more fins invested by the same fluid flow has to be considered classical fin theory tried to reduce the coupled heat transfer problem to a one dimensional problem by defining an average temperature of the fin and writing equations using this parameter however it was shown that this approach cannot be used because of the effects of two dimensional heat transfer especially in the presence of short fins cfd codes offer the possibility to consider bi dimensional and more generally three dimensional effects and then a more real approach to the physic phenomena of finned surface s heat exchange a commercial cfd code was used to analyse the case of heat exchange in presence of t shaped fins following an approach suggested by bejan s constructal theory the comparative results showed a significant agreement with previous research taken as a reference and this result allows for the application of this approach to a wider range of systems t shaped optimized fin geometry is the starting point for further research starting from the optimal results t shape optimized fins we show the trend of the assessment parameter the dimensionless conductance in function of the angle a between the two horizontal arms of the fin a value for a 90

Statistical, Mapping and Digital Approaches in Healthcare

2018-11-19

statistical mapping and digital approaches in healthcare addresses all health territories starting from the analysis of

geographical data health data population data health data systems and environmental data to new health areas health 3 0 i e digital health territories specific tools are used to question environmental changes such as health statistics mapping mathematical models optimization models and serious games uniquely combines the approaches of mathematicians geographers and physician to the analysis of health territories presents views that are based on an interdisciplinary framework proposing a new look on health ideal for both clinicians and policymakers

Porous and Complex Flow Structures in Modern Technologies

2013-03-09

porous and complex flow structures in modern technologies represents a new approach to the field considering the fundamentals of porous media in terms of the key roles played by these materials in modern technology intended as a text for advanced undergraduates and as a reference for practicing engineers the book uses the physics of flows in porous materials to tie together a wide variety of important issues from such fields as biomedical engineering energy conversion civil engineering electronics chemical engineering and environmental engineering thus for example flows of water and oil through porous ground play a central role in energy exploration and recovery oil wells geothermal fluids energy conversion effluents from refineries and power plants and environmental engineering leachates from waste repositories similarly the demands of miniaturization in electronics and in biomedical applications are driving research into the flow of heat and fluids through small scale porous media heat exchangers filters gas exchangers filters catalytic converters the drying of stored grains and a myriad of other applications involve flows through porous media by providing a unified theoretical framework that includes not only the traditional homogeneous and isotropic media but also models in which the assumptions of representative elemental volumes or global thermal equilibrium fail the book provides practicing engineers the tools they need to analyze complex situations that arise in practice this volume includes examples solved problems and an extensive glossary of symbols

Heat Transfer Handbook

2003-06-30

chapters contributed by thirty world renown experts covers all aspects of heat transfer including micro scale and heat transfer in electronic equipment an associated site offers computer formulations on thermophysical properties that provide the most up to date values

Heat and Mass Transfer Intensification and Shape Optimization

2013-02-26

is the heat and mass transfer intensification defined as a new paradigm of process engineering or is it just a common and old idea renamed and given the current taste where might intensification occur how to achieve intensification how the shape optimization of thermal and fluidic devices leads to intensified heat and mass transfers to answer these questions heat mass transfer intensification and shape optimization a multi scale approach clarifies the definition of the intensification by highlighting the potential role of the multi scale structures the specific interfacial area the distribution of driving force the modes of energy supply and the temporal aspects of processes a reflection on the methods of process intensification or heat and mass transfer enhancement in multi scale structures is provided including porous media heat exchangers fluid distributors mixers and reactors a multi scale approach to achieve intensification and shape optimization is developed and clearly explained providing readers with a tool box of reflections techniques methods supported by literature reviews heat mass transfer intensification and shape optimization a multi scale approach will be a key guide for students a teaching aid for lecturers and a source of inspiration for future research subjects

Thermohydrodynamic Programming and Constructal Design in Microsystems

2018-10-20

thermohydrodynamic programming and constructal design in microsystems explains the direction of a morphing system configuration that is illustrated by life evolution in nature this is sometimes referred to as the fourth law of thermodynamics and was first applied in thermofluidic engineering with more recent applications in physics and biology the book specifically focuses on synthetic modeling and constructal optimization in the design of microsystemic devices which are of particular interest to researchers and practitioners in the sphere of micro and nanoscale physics a mechanistically deviation from conventional theory the book is an important reference resource for researchers working in the area of micro and nanosystems technology and those who want to learn more about how thermodynamics can be effectively applied at the micro level explains how the application of constructal theory can lead to more effective microsystems design offers an

introduction to the fundamentals and application to different flow and heat mass transport systems bridges the gap between theoretical design and optimization from a practical point of view

Fractals

2017-11-23

this book provides theoretical concepts and applications of fractals and multifractals to a broad range of audiences from various scientific communities such as petroleum chemical civil and environmental engineering atmospheric research and hydrology in the first chapter we introduce fractals and multifractals from physics and math viewpoints we then discuss theory and practical applications in detail in what follows in chapter 2 fragmentation process is modeled using fractals fragmentation is the breaking of aggregates into smaller pieces or fragments a typical phenomenon in nature in chapter 3 the advantages and disadvantages of two and three phase fractal models are discussed in detail these two kinds of approach have been widely applied in the literature to model different characteristics of natural phenomena in chapter 4 two and three phase fractal techniques are used to develop capillary pressure curve models which characterize pore size distribution of porous media percolation theory provides a theoretical framework to model flow and transport in disordered networks and systems therefore following chapter 4 in chapter 5 the fractal basis of percolation theory and its applications in surface and subsurface hydrology are discussed in chapter 6 fracture networks are shown to be modeled using fractal approaches chapter 7 provides different applications of fractals and multifractals to petrophysics and relevant area in petroleum engineering in chapter 8 we introduce the practical advantages of fractals and multifractals in geostatistics at large scales which have broad applications in stochastic hydrology and hydrogeology multifractals have been also widely applied to model atmospheric characteristics such as precipitation temperature and cloud shape in chapter 9 these kinds of properties are addressed using multifractals at watershed scales river networks have been shown to follow fractal behavior therefore the applications of fractals are addressed in chapter 10 time series analysis has been under investigations for several decades in physics hydrology atmospheric research civil engineering and water resources in chapter 11 we therefore provide fractal multifractal multifractal detrended fluctuation analyses which can be used to study temporal characterization of a phenomenon such as flow discharge at a specific location of a river chapter 12 addresses signals and again time series using a novel fractal fourier analysis in chapter 13 we discuss constructal theory which has a perspective opposite to fractal theories and is based on optimizationof diffusive exchange in the case of river drainages for example the constructal approach begins at the divide and generates headwater streams first rather than starting from the fundamental drainage pattern

Tree-Shaped Fluid Flow and Heat Transfer

2018-04-20

this book provides the first comprehensive state of the art research on tree dendritic fluid flow and heat transfer it covers theory numerical simulations and applications it can serve as extra reading for graduate level courses in engineering and biotechnology tree flow networks also known as dendritic flow networks are ubiquitous in nature and engineering applications tree shaped design is prevalent when the tendency of the flow fluid energy matter and information is to move more easily between a volume or area and a point and vice versa from the geophysical trees to animals and plants we can observe numerous systems that exhibit tree architectures river basins and deltas lungs circulatory systems kidneys vascularized tissues roots stems and leaves among others tree design is also prevalent in man made flow systems both in macro and microfluidic devices a vast array of tree shaped design is available and still emerging in chemical engineering electronics cooling bioengineering chemical and bioreactors lab on a chip systems and smart materials with volumetric functionalities such as self healing and self cooling this book also addresses the basic design patterns and solutions for cooling bodies where there is heat generation several shapes of fin as well as assemblies of fins are addressed an up to date review of cavities i e inverted or negative fins for facilitating the flow of heat is also presented heat trees using high thermal conductivity material can be used in the cooling of heat generating bodies and can also be applied to the cooling of electronics

Advances in Heat Transfer

2021-12-01

advances in heat transfer volume 53 in this long running serial highlights new advances in the field with this new volume presenting interesting chapters written by an international board of authors provides the authority and expertise of leading contributors from an international board of authors presents the latest release in the advances in heat transfer series

Convection Heat Transfer

2013-03-28

a new edition of the bestseller on convection heat transfer a revised edition of the industry classic convection heat transfer fourth edition chronicles how the field of heat transfer has grown and prospered over the last two decades this new edition is more accessible while not sacrificing its thorough treatment of the most up to date information on current research and applications in the field one of the foremost leaders in the field adrian bejan has pioneered and taught many of the methods and practices commonly used in the industry today he continues this book s long standing role as an inspiring optimal study tool by providing coverage of how convection affects performance and how convective flows can be configured so that performance is enhanced how convective configurations have been evolving from the flat plates smooth pipes and single dimension fins of the earlier editions to new populations of configurations tapered ducts plates with multiscale features dendritic fins duct and plate assemblies packages for heat transfer density and compactness etc new updated and enhanced examples and problems that reflect the author s research and advances in the field since the last edition a solutions manual complete with hundreds of informative and original illustrations convection heat transfer fourth edition is the most comprehensive and approachable text for students in schools of mechanical engineering

Thermodynamics of Fluids Under Flow

2010-12-02

this is the second edition of the book thermodynamics of fluids under flow which was published in 2000 and has now been corrected expanded and updated this is a companion book to our other title extended irreversible thermodynamics d jou j casas vázquez and g lebon springer 4th edition 2010 and of the textbook understanding non equilibrium thermodynamics g lebon d jou and j casas vázquez springer 2008 the present book is more specialized than its counterpart as it focuses its attention on the non equilibrium thermodynamics of flowing fluids incorporating non trivial thermodynamic contributions of the flow going beyond local equilibrium theories i e including the effects of internal variables and of external forcing due to the flow whereas the book s first edition was much more focused on polymer solutions with brief glimpses into ideal and real gases the present edition covers a much wider variety of systems such as diluted and concentrated polymer solutions polymer blends laminar and turbulent superfluids phonon hydrodynamics and heat transport in nanosystems nuclear collisions far from equilibrium ideal gases and molecular solutions it also deals with a variety of situations emphasizing the non equilibrium flow contribution temperature and entropy in flowing ideal gases shear induced effects on phase transitions in real gases and on polymer solutions stress induced migration and its application to flow chromatography taylor dispersion anomalous diffusion in flowing systems the influence of the flow on chemical reactions and polymer degradation the new edition is not only broader in scope but more educational in character and with more emphasis on applications in keeping with our times it provides many examples of how a deeper theoretical understanding may bring new and more efficient applications forging links between theoretical progress and practical aims this updated version expands on the trusted content of its predecessor making it more interesting and useful for a larger audience

Multi-Agent Based Simulation XVII

2017-10-03

this book constitutes the thoroughly refereed post conference proceedings of the 17th international workshop on multi agent based simulation mabs 2016 held in singapore in may 2016 the workshop was held in conjunction with the 15th international conference on autonomous agents and multi agent systems aamas 2016 the 10 revised full papers included in this volume were carefully selected from 15 submissions the topic of the papers is about modeling and analyzing multi agent systems and applying agent based simulation techniques to real world problems focusing on the confluence of socio technical natural sciences and multi agents systems with a strong application empirical vein special emphasis is given on exploratory agent based simulation as a principled way of undertaking scientific research in the social sciences and on using social theories as an inspiration to new frameworks and developments in multi agent systems

Thermodynamic Approaches in Engineering Systems

2016-05-20

thermodynamic approaches in engineering systems responds to the need for a synthesizing volume that throws light upon the extensive field of thermodynamics from a chemical engineering perspective that applies basic ideas and key results from the field to chemical engineering problems this book outlines and interprets the most valuable achievements in applied non equilibrium thermodynamics obtained within the recent fifty years it synthesizes nontrivial achievements of thermodynamics in important branches of chemical and biochemical engineering readers will gain an update on what has been achieved what new research problems could be stated and what kind of further studies should be developed within specialized research presents clearly structured chapters beginning with an introduction elaboration of the process and results summarized in a conclusion written by a first class expert in the field of advanced methods in thermodynamics provides a synthesis of recent thermodynamic developments in practical systems presents very elaborate literature discussions from the past fifty years

Thermal Management for LED Applications

2013-09-17

thermal management for led applications provides state of the art information on recent developments in thermal management as it relates to leds and led based systems and their applications coverage begins with an overview of the basics of thermal management including thermal design for leds thermal characterization and testing of leds and issues related to failure mechanisms and reliability and performance in harsh environments advances and recent developments in thermal management round out the book with discussions on advances in tims thermal interface materials for led applications advances in forced convection cooling of leds and advances in heat sinks for led assemblies

The Nature of Motive Force

2014-08-23

in this monograph prof pramanick explicates the law of motive force a fundamental law of nature that can be observed and appreciated as an addition to the existing laws of thermodynamics this unmistakable and remarkable tendency of nature is equally applicable to all other branches of studies he first conceptualized the law of motive force in 1989 when he was an undergraduate student here he reports various applications of the law in the area of thermodynamics heat transfer fluid mechanics and solid mechanics and shows how it is possible to solve analytically century old unsolved problems through its application this book offers a comprehensive account of the law and its relation to other laws and principles such as the generalized conservation principle variational formulation fermat s principle bejan s constructal law entropy generation minimization bejan s method of intersecting asymptotes and equipartition principle furthermore the author addresses some interrelated fundamental problems of contemporary interest especially to thermodynamicists by combining analytical methods physical reasoning and the proposed law of motive force this foundational work is a valuable reading for both students and researchers in exact as well as non exact sciences and at the same time a pleasant learning experience for the novice

Advances in Electric Propulsion

2017-05-18

aviation propulsion development continues to rely upon fossil fuels for the vast majority of commercial and military applications until these fuels are depleted or abandoned burning them will continue to jeopardize air quality and provoke increased regulation with those challenges in mind research and development of more efficient and electric propulsion systems will expand fuel cell technology is but one example that addresses such emission and resource challenges and others including negligible acoustic emissions and the potential to leverage current infrastructure models for now these technologies are consigned to smaller aircraft applications but are expected to mature toward use in larger aircraft additionally measures such as electric conventional hybrid configurations will ultimately increase efficiencies and knowledge of electric systems while minimizing industrial costs requirements for greater flight time stealth characteristics and thrust to power ratios adds urgency to the development of efficient propulsion methods for applications such as uavs which looks to technologies such as asymmetrical capacitors to enhance electric propulsion efficiency this book will take the reader through various technologies that will enable a more electric aircraft future as well as design methods and certification requirements of more electric engines

Energy Optimization in Process Systems

2009-05-06

despite the vast research on energy optimization and process integration there has to date been no synthesis linking these together this book fills the gap presenting optimization and integration in energy and process engineering the content is based on the current literature and includes novel approaches developed by the authors various thermal and chemical systems heat and mass exchangers thermal and water networks energy converters recovery units solar collectors and separators are considered thermodynamics kinetics and economics are used to formulate and solve problems with constraints on process rates equipment size environmental parameters and costs comprehensive coverage of dynamic optimization of energy conversion systems and separation units is provided along with suitable computational algorithms for deterministic and stochastic optimization approaches based on nonlinear programming dynamic programming variational calculus hamilton jacobi bellman theory pontryagin s maximum principles and special methods of process integration integration of heat energy and process water within a total site is shown to be a significant factor reducing production costs in particular costs of utilities for the chemical industry this integration involves systematic design and optimization of heat exchangers and water networks hen and wn after presenting basic insight based pinch technology systematic optimization based sequential and simultaneous approaches to design hen and wn are described special consideration is given to the hen

design problem targeting stage in view of its importance at various levels of system design selected advanced methods for hen synthesis and retrofit are presented for wn design a novel approach based on stochastic optimization is described that accounts for both grassroot and revamp design scenarios presents a unique synthesis of energy optimization and process integration that applies scientific information from thermodynamics kinetics and systems theory discusses engineering applications including power generation resource upgrading radiation conversion and chemical transformation in static and dynamic systems clarifies how to identify thermal and chemical constraints and incorporate them into optimization models and solutions

Energy Optimization in Process Systems and Fuel Cells

2013-02-14

energy optimization in process systems and fuel cells second edition covers the optimization and integration of energy systems with a particular focus on fuel cell technology with rising energy prices imminent energy shortages and increasing environmental impacts of energy production energy optimization and systems integration is critically important the book applies thermodynamics kinetics and economics to study the effect of equipment size environmental parameters and economic factors on optimal power production and heat integration author stanislaw sieniutycz highly recognized for his expertise and teaching shows how costs can be substantially reduced particularly in utilities common in the chemical industry this second edition contains substantial revisions with particular focus on the rapid progress in the field of fuel cells related energy theory and recent advances in the optimization and control of fuel cell systems new information on fuel cell theory combined with the theory of flow energy systems broadens the scope and usefulness of the book discusses engineering applications including power generation resource upgrading radiation conversion and chemical transformation in static and dynamic systems contains practical applications of optimization methods that help solve the problems of power maximization and optimal use of energy and resources in chemical mechanical and environmental engineering

Shape and Structure, from Engineering to Nature

2000-10-16

seemingly universal geometric forms unite the flow systems of engineering and nature for example tree shaped flows can be seen in computers lungs dendritic crystals urban street patterns and communication links in this groundbreaking book adrian bejan considers the design and optimization of engineered systems and discovers a deterministic principle of the generation of geometric form in natural systems shape and structure spring from the struggle for better performance in both engineering and nature this idea is the basis of the new constructal theory the objective and constraints principle used in engineering is the same mechanism from which the geometry in natural flow systems emerges from heat exchangers to river channels the book draws many parallels between the engineered and the natural world among the topics covered are mechanical structure thermal structure heat trees ducts and rivers turbulent structure and structure in transportation and economics the numerous illustrations examples and homework problems in every chapter make this an ideal text for engineering design courses its provocative ideas will also appeal to a broad range of readers in engineering natural sciences economics and business

Thermodynamic Interactions

2017-07-01

an exploration into material physiological and territorial atmospheres energy and sustainability is a complex topic that needs to address simultaneously core disciplinary values and ideas that come from other fields of knowledge the interconnection between the environment and its climate its built structures and the human body requires overlying architecture with other disciplines such as meteorology thermodynamics or physiology to engage them in a holistic way the book is structured in three blocks territorial atmospheres material atmospheres and physiological atmospheres which present three distinct and successive realms at which thermodynamic exchanges are taking place territorial atmospheres deals with the thermodynamic interaction between the environment and its built structures material atmospheres focuses on the interaction between a building and the climate it generates and lastly physiological atmospheres centers on the interaction between indoor ambient and the physiologi cal and psychological effects on human beings each of the blocks has a coeditor silvia benedito for territorial atmospheres iñaki Ábalos for material atmospheres and philippe rahm for physiological atmospheres who will work together with the editor defining the context of the book

Computational Modeling in Biomedical Engineering and Medical Physics

2020-09-15

mathematical and numerical modelling of engineering problems in medicine is aimed at unveiling and understanding

multidisciplinary interactions and processes and providing insights useful to clinical care and technology advances for better medical equipment and systems when modelling medical problems the engineer is confronted with multidisciplinary problems of electromagnetism heat and mass transfer and structural mechanics with possibly different time and space scales which may raise concerns in formulating consistent solvable mathematical models computational medical engineering presents a number of engineering for medicine problems that may be encountered in medical physics procedures diagnosis and monitoring techniques including electrical activity of the heart hemodynamic activity monitoring magnetic drug targeting bioheat models and thermography rf and microwave hyperthermia ablation emf dosimetry and bioimpedance methods the authors discuss the core approach methodology to pose and solve different problems of medical engineering including essentials of mathematical modelling e g criteria for well posed problems physics scaling homogenization techniques constructal law criteria in morphing shape and structure of systems with internal flows computational domain construction cad and or reconstruction techniques based on medical images numerical modelling issues and validation techniques used to ascertain numerical simulation results in addition new ideas and venues to investigate and understand finer scale models and merge them into continuous media medical physics are provided as case studies presents the fundamentals of mathematical and numerical modeling of engineering problems in medicine discusses many of the most common modelling scenarios for biomedical engineering including electrical activity of the heart hemodynamic activity monitoring magnetic drug targeting bioheat models and thermography rf and microwave hyperthermia ablation emf dosimetry and bioimpedance methods includes discussion of the core approach methodology to pose and solve different problems of medical engineering including essentials of mathematical modelling physics scaling constructal law criteria in morphing shape and structure of systems with internal flows computational domain construction numerical modelling issues and validation techniques used to ascertain numerical simulation results

Developments in Heat Transfer

2011-09-15

this book comprises heat transfer fundamental concepts and modes specifically conduction convection and radiation bioheat entransy theory development micro heat transfer high temperature applications turbulent shear flows mass transfer heat pipes design optimization medical therapies fiber optics heat transfer in surfactant solutions landmine detection heat exchangers radiant floor packed bed thermal storage systems inverse space marching method heat transfer in short slot ducts freezing an drying mechanisms variable property effects in heat transfer heat transfer in electronics and process industries fission track thermochronology combustion heat transfer in liquid metal flows human comfort in underground mining heat transfer on electrical discharge machining and mixing convection the experimental and theoretical investigations assessment and enhancement techniques illustrated here aspire to be useful for many researchers scientists engineers and graduate students

Biomimetic Design Method for Innovation and Sustainability

2016-07-01

presenting a novel biomimetic design method for transferring design solutions from nature to technology this book focuses on structure function patterns in nature and advanced modeling tools derived from triz the theory of inventive problem solving the book includes an extensive literature review on biomimicry as an engine of both innovation and sustainability and discusses in detail the biomimetic design process current biomimetic design methods and tools the structural biomimetic design method for innovation and sustainability put forward in this text encompasses 1 the research method and rationale used to develop and validate this new design method 2 the suggested design algorithm and tools including the find structure database structure function patterns and ideality patterns and 3 analyses of four case studies describing how to use the proposed method this book offers an essential resource for designers who wish to use nature as a source of inspiration and knowledge innovators and sustainability experts and scientists and researchers amongst others

Applied Mechanics Reviews

1998

single and two phase flows are ubiquitous in most natural process and engineering systems examples of systems or process include packed bed reactors either single phase or multiphase absorber and adsorber separation columns filter beds plate heat exchangers flow of viscoelastic fluids in polymer systems or the enhanced recovery of oil among others in each case the flow plays a central role in determining the system or process behavior and performance a better understanding of the underlying physical phenomena and the ability to describe the phenomena properly are both crucial to improving design operation and control processes involving the flow of fluids ensuring that they will be more efficient and cost effective expanding disciplines such as microfluidics and the simulation of complex flow physical systems such as blood flow in physiological networks also rely heavily on accurate predictions of fluid flow recent advances either in computational and experimental techniques are improving the existing knowledge of single and multiphase flows in engineering and physical

systems of interest this ebook is a review on the state of the art and recent advances in critical areas of fluid mechanics and transport phenomena with respect to chemical and biomedical engineering applications

Single and Two-Phase Flows on Chemical and Biomedical Engineering

2012-07-30

achieving building comfort by natural means explores examples of green building designs and methods that are currently being used around the world to achieve human comfort in buildings the operation of buildings accounts for more than 40 of total energy use and is a major source of carbon emissions it is imperative that this consumption be substantially decreased and that energy needed for building comfort is obtained from renewable and environmentally friendly sources this book brings together a global group of contributors who look at factors such as location climate building materials energy management ventilation thermal environmental conditions shading lighting acoustics and more that are critical for achieving buildings that are more sustainable thermal comfort and climatic potential of ventilative cooling in italian climates is available open access under a creative commons attribution 4 0 international license via link springer com

Achieving Building Comfort by Natural Means

2022-10-29

this book contains full papers presented at the first virtual conference on mechanical fatigue vcmf 2020 which was organised by the university of porto feup portugal the wroclaw university of science and technology poland university of electronic science and technology of china china siberian federal university russia and the esis tc12 technical committee european structural integrity society esis between 9 and 11 of september 2020 this conference was intended to be a forum of discussion of new research concepts equipment technology materials and structures and other scientific advances within the field of mechanical fatigue and fracture the first edition of the vcmf 2020 event has reached more than 60 participants from more than 20 nationalities demonstrating the vitality of this new event

Proceedings of the 8th Biennial Conference on Engineering Systems Design and Analysis--2006: Fatigue and fracture. Heat transfer. Internal combustion engines. Manufacturing. Technology and society

2006

nonprofit organizations are suffering from the continuing economic downturn donations are decreasing while demand for services is growing forcing these organizations to be increasingly efficient and effective with their funds this book introduces the reader to the basic concepts of project management it provides approaches and templates to help nonprofit managers quickly implement practices to help them manage their limited resources both financial and volunteer the book also provides a tool to help the project team determine which practices are most appropriate the book explores how social media and other technology tools can be used to assist in the management of time sensitive projects and shows how project portfolio management can be a tool to assist in communications with boards of directors and other governing entities the project portfolio is a tool that development office managers can easily implement and adopt to facilitate resource assignment finally the book offers three case studies of nonprofit projects that went awry and shows how project management would have assisted

Structural Integrity and Fatigue Failure Analysis

2022-05-04

the characterization of cultural heritage objects becomes increasingly important for conservation restoration dating and authentication purposes the use of scientific methods in archaeometry and conservation science has led to a significant broadening of the field scientific analysis of these objects is a challenging task due to their complex composition artistic and historical values requiring the use of minimally invasive and nondestructive analytical procedures this textbook summarizes scientific methods that are currently used to characterize objects of cultural heritage and archaeological artifacts this book provides a brief description of the structure of matter at the molecular atomic and nuclear levels furthermore it discusses the chemical and physical nature of materials from the molecular to the atomic and nuclear level as determined by the principles of quantum mechanics important aspects of natural and anthropogenic radioactivity that play a critical role for some of the analytical techniques are also emphasized the textbook also provides principals and applications of spectroscopic methods for characterization of cultural heritage objects it describes the technologies with specific examples for utilization of spectroscopic techniques in the characterization of paintings books coins ceramics and other objects analytic approaches that employ isotopes and determination of isotope ratios will be reviewed general principles of imaging

techniques and specific examples for utilization of these methods will also be summarized in the later part of the book a number of scientific techniques for the age determination of cultural heritage material and archaeological artifacts will be presented and discussed with specific examples

Convection in Porous Media

2006-02-23

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

Scientific Analysis of Cultural Heritage Objects

2022-05-31

this book describes applications of jaya and rao algorithms on real case studies concerning different renewable energy sources in the last few decades researchers have focused on renewable energy resources like solar energy bio energy wave energy ocean thermal energy tidal energy geothermal energy and wind energy this has resulted in the development of new techniques and tools that could harvest energy from renewable energy sources many researchers and scientists have focused on developing and optimizing the energy systems to extract and utilize renewable energy more efficiently in this book recently developed jaya and rao rao 1 rao 2 and rao 3 algorithms are introduced for single and multi objective optimization of selected renewable energy systems the results of applications of the different versions of jaya and rao algorithms are compared with the other optimization techniques like ga nsga ii pso mopso abc etc and the performance of the jaya and rao algorithms is highlighted compared to other optimization algorithms in the case of renewable energy systems the book also includes the validation of different versions of the jaya and rao algorithms through the application to complex single and multi objective unconstrained benchmark functions the algorithms and computer codes of different version of jaya and rao algorithms are included in the book that will be very much useful to readers in industry and academic research

Convection in Porous Media

2017-03-15

this book is about the role of some engineering principles in our everyday lives engineers study these principles and use them in the design and analysis of the products and systems with which they work the same principles play basic and influential roles in our everyday lives as well whether the concept of entropy the moments of inertia the natural frequency the coriolis acceleration or the electromotive force the roles and effects of these phenomena are the same in a system designed by an engineer or created by nature this shows that learning about these engineering concepts helps us to understand why certain things happen or behave the way they do and that these concepts are not strange phenomena invented by individuals only for their own use rather they are part of our everyday physical and natural world but are used to our benefit by the engineers and scientists learning about these principles might also help attract more and more qualified and interested high school and college students to the engineering fields each chapter of this book explains one of these principles through examples discussions and at times simple equations

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Engineering Principles in Everyday Life for Non-Engineers

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