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Non-Linear Waves in Dispersive Media Rogue and Shock Waves in Nonlinear Dispersive Media **Electrodynamics of Conducting Dispersive Media Electromagnetic and Optical Pulse Propagation** Electromagnetic and Optical Pulse Propagation **Nonlinear Dispersive Equations Computational Electromagnetics Nonlinear Waves, Solitons and Chaos Handbook of Porous Media The Nonlinear Schrödinger Equation Pollutant Dispersion in Built Environment Transport Phenomena in Porous Media Electromagnetic and Optical Pulse Propagation 2 Applications of Homogenization Theory to the Study of Mineralized Tissue** *Electromagnetic and Optical Pulse Propagation 1* **Composite Media with Weak Spatial Dispersion** *Thermal Use of Shallow Groundwater* **The Finite Element Method Set Wavelet Theory and Harmonic Analysis in Applied Sciences Convective Heat Transfer in Porous Media** Treatment of Cerenkov Radiation from Electric and Magnetic Charges in Dispersive and Dissipative Media *Issues in Mechanical Engineering: 2011 Edition* Computational Fluid Dynamics and Heat Transfer **Modeling and Simulation in Engineering Sciences** Subsurface Sensing Proceedings of the 3rd International Conference on Radiative Properties of Hot Dense Matter III, Williamsburg, Virginia, Oct. 14-18, 1985 *Issues in Materials and Manufacturing Research: 2011 Edition* **Recent Advances in Computational Sciences Selected Water Resources Abstracts Thermo-Fluid Behaviour of Periodic Cellular Metals Non-linear Waves in Dispersive Media Seventh International Conference on Ground Penetrating Radar The Scientific Basis for Communication about Events Involving Radiological Dispersion Devices Recent Trends in Hydrogeology Insights and Innovations in Structural Engineering, Mechanics and Computation Elements of Seismic Dispersion** *Selected Water Resources Abstracts* Modern Technologies in Materials, Mechanics and Intelligent Systems **Fluid Flow and Heat Transfer in Porous Media Manufactured by a Space Holder Method** Issues in Mechanical Engineering: 2013 Edition

This book features state-of-the-art contributions in mathematical, experimental and numerical simulations in engineering sciences. The contributions in this book, which comprise twelve chapters, are organized in six sections spanning mechanical, aerospace, electrical, electronic, computer, materials, geotechnical and chemical engineering. Topics include metal micro-forming, compressible reactive flows, radio frequency circuits, barrier infrared detectors, fiber Bragg and long-period fiber gratings, semiconductor modelling, many-core architecture computers, laser processing of materials, alloy phase decomposition, nanofluids, geo-materials and rheo-kinetics. Contributors are from Europe, China, Mexico, Malaysia and Iran. The chapters feature many sophisticated approaches including Monte Carlo simulation, FLUENT and ABAQUS computational modelling, discrete element modelling and partitioned frequency-time methods. The book will be of interest to researchers and also consultants engaged in many areas of engineering simulation. This book presents a sequential representation of the electrodynamics of conducting media with dispersion. In addition to the

general electrodynamic formalism, specific media such as classical nondegenerate plasma, degenerate metal plasma, magnetoactive anisotropic plasma, atomic hydrogen gas, semiconductors, and molecular crystals are considered. The book draws on such classics as Electrodynamics of plasma and plasma-like media (Silin and Rukhadze) and Principles of Plasma Electrodynamics (Alexandrov, Bogdankevich, and Rukhadze), yet its outlook is thoroughly modern—both in content and presentation, including both classical and quantum approaches. It explores such recent topics as surface waves on thin layers of plasma and non-dispersive media, the permittivity of a monatomic gas with spatial dispersion, and current-driven instabilities in plasma, among many others. Each chapter is equipped with a large number of problems with solutions that have academic and practical importance. This book will appeal to graduate students as well as researchers and other professionals due to its straight-forward yet thorough treatment of electrodynamics in conducting dispersive media. The dimmed outlines of phenomenal things all into one another unless we put on the merge focusing-glass of theory, and screw it up some times to one pitch of definition and sometimes to another, so as to see down into different depths through the great millstone of the world James Clerk Maxwell (1831 - 1879) For a long time after the foundation of the modern theory of electromag netism by James Clerk Maxwell in the 19th century, the mathematical ap proach to electromagnetic field problems was for a long time dominated by the analytical investigation of Maxwell's equations. The rapid development of computing facilities during the last century has then necessitated appropriate numerical methods and algorithmic tools for the simulation of electromagnetic phenomena. During the last few decades, a new research area "Computational Electromagnetics" has emerged com prising the mathematical analysis, design, implementation, and application of numerical schemes to simulate all kinds of relevant electromagnetic pro cesses. This area is still rapidly evolving with a wide spectrum of challenging issues featuring, among others, such problems as the proper choice of spatial discretizations (finite differences, finite elements, finite volumes, boundary elements), fast solvers for the discretized equations (multilevel techniques, domain decomposition methods, multipole, panel clustering), and multiscale aspects in microelectronics and micromagnetics. Issues in Materials and Manufacturing Research: 2011 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Materials and Manufacturing Research. The editors have built Issues in Materials and Manufacturing Research: 2011 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Materials and Manufacturing Research in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Materials and Manufacturing Research: 2011 Edition has been produced by the world’s leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/. The thermal use of the shallow subsurface is increasingly being promoted and implemented as one of many promising measures for saving energy. A series of questions arises concerning the design and management of underground and groundwater heat extraction systems, such as the sharing of the thermal resource and the assessment of its long-term potential. For the proper design of thermal systems it is necessary to assess their impact on underground and groundwater temperatures. Thermal Use of Shallow Groundwater introduces the theoretical fundamentals of heat transport in groundwater systems, and discusses the essential thermal properties. It presents a complete overview of analytical and numerical subsurface heat transport modeling, providing a series of mathematical tools and simulation models based on analytical and numerical solutions of the heat transport equation. It is illustrated with case studies from Austria, Germany, and Switzerland of urban thermal energy use, and heat storage and cooling. This book gives a complete set of analytical solutions together with MATLAB® computer

codes ready for immediate application or design. It offers a comprehensive overview of the state of the art of analytical and numerical subsurface heat transport modeling for students in civil or environmental engineering, engineering geology, and hydrogeology, and also serves as a reference for industry professionals. This revised and updated second edition of a highly successful book is the only text at this level to embrace a universal approach to three major developments in classical physics; namely nonlinear waves, solitons and chaos. The authors now include new material on biology and laser theory, and go on to discuss important recent developments such as soliton metamorphosis. A comprehensive treatment of basic plasma and fluid configurations and instabilities is followed by a study of the relevant nonlinear structures. Each chapter concludes with a set of problems. This text will be particularly valuable for students taking courses in nonlinear aspects of physics. In general, it will be of value to final year undergraduates and beginning graduate students studying fluid dynamics, plasma physics and applied mathematics. This book focuses on the effects of the material, porosity, pore size and pore shape on flow behaviour and heat transfer in microscale porous media manufactured using a space holder method. It also describes a novel approach to studying flow behaviour in non-transparent materials such as porous metals via flow visualization in transparent media that mimic the porous structure. The book employs a combination of microparticle image velocimetry – a modern, advanced technique – and pressure drop measurement – a more traditional method – that makes the mechanistic study of several phenomena possible. It covers the identification of various flow regimes and their boundaries, velocity profiles on the microscale, the heat transfer coefficient under forced convection, and the correlation between flow behaviour on the pore scale and the convective heat transfer performance of the porous media. Understanding the fundamentals of porous flow, especially on the microscale, is critical for applications of porous media in heat exchangers, catalytic convertors, chemical reactors, filtration and oil extraction. Accordingly, this book offers a valuable resource for all researchers, graduate students and engineers working in the areas of porous flow and porous materials. Research into thermal convection in porous media has substantially increased during recent years due to its numerous practical applications. These problems have attracted the attention of industrialists, engineers and scientists from many very diversified disciplines, such as applied mathematics, chemical, civil, environmental, mechanical and nuclear engineering, geothermal physics and food science. Thus, there is a wealth of information now available on convective processes in porous media and it is therefore appropriate and timely to undertake a new critical evaluation of this contemporary information. Transport Phenomena in Porous Media contains 17 chapters and represents the collective work of 27 of the world's leading experts, from 12 countries, in heat transfer in porous media. The recent intensive research in this area has substantially raised the expectations for numerous new practical applications and this makes the book a most timely addition to the existing literature. It includes recent major developments in both the fundamentals and applications, and provides valuable information to researchers dealing with practical problems in thermal convection in porous media. Each chapter of the book describes recent developments in the highly advanced analytical, numerical and experimental techniques which are currently being employed and discussions of possible future developments are provided. Such reviews not only result in the consolidation of the currently available information, but also facilitate the identification of new industrial applications and research topics which merit further work. Insights and Innovations in Structural Engineering, Mechanics and Computation comprises 360 papers that were presented at the Sixth International Conference on Structural Engineering, Mechanics and Computation (SEMC 2016, Cape Town, South Africa, 5-7 September 2016). The papers reflect the broad scope of the SEMC conferences, and cover a wide range of engineering structures (buildings, bridges, towers, roofs, foundations, offshore structures, tunnels, dams, vessels, vehicles and machinery) and engineering materials (steel, aluminium, concrete, masonry, timber, glass, polymers, composites, laminates, smart materials). Heat transfer and fluid flow

issues are of great significance and this state-of-the-art edited book with reference to new and innovative numerical methods will make a contribution for researchers in academia and research organizations, as well as industrial scientists and college students. The book provides comprehensive chapters on research and developments in emerging topics in computational methods, e.g., the finite volume method, finite element method as well as turbulent flow computational methods. Fundamentals of the numerical methods, comparison of various higher-order schemes for convection-diffusion terms, turbulence modeling, the pressure-velocity coupling, mesh generation and the handling of arbitrary geometries are presented. Results from engineering applications are provided. Chapters have been co-authored by eminent researchers. This book presents a modern theory of so-called weak spatial dispersion (WSD) in composite media of optically small inclusions without natural magnetism and optical nonlinearity. WSD manifests in two important phenomena called bianisotropy and artificial magnetism, whose microscopic origin is thoroughly studied in this book. The theory of this book is applicable to the natural media with WSD, such as chiral materials. However, emphasis is given to artificial media, too, with the idea to engineer needed electromagnetic properties. The text describes a homogenization model of effectively continuous media with multipole electromagnetic response, taking into account the interface effects. Another model is developed for so-called metamaterials in which artificial magnetism can be a resonant phenomenon and may result in the violation of Maxwell’s boundary conditions and other challenges. The book will hopefully improve the understanding of WSD and help readers to correctly describe and characterize metamaterials. This volume presents a detailed, rigorous treatment of the fundamental theory of electromagnetic pulse propagation in causally dispersive media that is applicable to dielectric, conducting, and semiconducting media. Asymptotic methods of approximation based upon saddle point methods are presented in detail. The idea of this book originated in the works presented at the First Latinamerican Conference on Mathematics in Industry and Medicine, held in Buenos Aires, Argentina, from November 27 to December 1, 1995. A variety of topics were discussed at this meeting. A large percentage of the papers focused on Wavelet and Harmonic Analysis. The theory and applications of this topic shown at the Conference were interesting enough to be published. Based on that we selected some works which make the core of this book. Other papers are contributions written by invited experts in the field to complete the presentation. All the works were written after the Conference. The purpose of this book is to present recent results as well as theo retical applied aspects of the subject. We have decided not to include a section devoted to the theoretical foundations of wavelet methods for non specialists. There are excellent introductions already available, for example, Chapter one in Wavelets in Medicine and Biology, edited by A. Aldroubi and M. Unser, 1996, or some of the references cited in the chapter. Electromagnetic & Optical Pulse Propagation presents a detailed, systematic treatment of the time-domain electromagnetics with application to the propagation of transient electromagnetic fields (including ultrawideband signals and ultrashort pulses) in homogeneous, isotropic media which exhibit both temporal frequency dispersion and attenuation. The development is mathematically rigorous with strict adherence to the fundamental physical principle of causality. Approximation methods are based upon mathematically well-defined asymptotic techniques that are based upon the saddle point method. A detailed description is given of the asymptotic expansions used. Meaningful exercises are given throughout the text to help the reader‘s understanding of the material, making the book a useful graduate level text in electromagnetic wave theory for both physics, electrical engineering and materials science programs. Both students and researchers alike will obtain a better understanding of time domain electromagnetics as it applies to electromagnetic radiation and wave propagation theory with applications to ground and foliage penetrating radar, medical imaging, communications, and the health and safety issues associated with ultrawideband pulsed fields. Volume 2 presents a detailed asymptotic description of plane wave pulse propagation in dielectric, conducting, and semiconducting materials as described by the

classical Lorentz model of dielectric resonance, the Rocard-Powles-Debys model of orientational polarization, and the Drude model of metals. The rigorous description of the signal velocity of a pulse in a dispersive material is presented in connection with the question of superluminal pulse propagation. Filling the gap between the mathematical literature and applications to domains, the authors have chosen to address the problem of wave collapse by several methods ranging from rigorous mathematical analysis to formal aymptotic expansions and numerical simulations. This volume presents a detailed, rigorous treatment of the fundamental theory of electromagnetic pulse propagation in causally dispersive media that is applicable to dielectric, conducting, and semiconducting media. Asymptotic methods of approximation based upon saddle point methods are presented in detail. In two volumes, this book presents a detailed, systematic treatment of electromagnetics with application to the propagation of transient electromagnetic fields (including ultrawideband signals and ultrashort pulses) in dispersive attenuative media. The development in this expanded, updated, and reorganized new edition is mathematically rigorous, progressing from classical theory to the asymptotic description of pulsed wave fields in Debye and Lorentz model dielectrics, Drude model conductors, and composite model semiconductors. It will be of use to researchers as a resource on electromagnetic radiation and wave propagation theory with applications to ground and foliage penetrating radar, medical imaging, communications, and safety issues associated with ultrawideband pulsed fields. With meaningful exercises, and an authoritative selection of topics, it can also be used as a textbook to prepare graduate students for research. Volume 2 presents a detailed asymptotic description of plane wave pulse propagation in dielectric, conducting, and semiconducting materials as described by the classical Lorentz model of dielectric resonance, the Rocard-Powles-Debye model of orientational polarization, and the Drude model of metals. The rigorous description of the signal velocity of a pulse in a dispersive material is presented in connection with the question of superluminal pulse propagation. The second edition contains new material on the effects of spatial dispersion on precursor formation, and pulse transmission into a dispersive half space and into multilayered media. Volume 1 covers spectral representations in temporally dispersive media. Issues in Mechanical Engineering / 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Additional Research. The editors have built Issues in Mechanical Engineering: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Additional Research in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Mechanical Engineering: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/. Handbook of Porous Media, Third Edition offers a comprehensive overview of the latest theories on flow, transport, and heat-exchange processes in porous media. It also details sophisticated porous media models which can be used to improve the accuracy of modeling in a variety of practical applications. Featuring contributions from leading experts in their respective fields, this book: Presents the general characteristics and modeling of porous media, such as multiscale modeling of porous media, two-phase flow, compressible porous media, and dispersion in porous media Addresses the fundamental topics of transport in porous media, including theoretical models of transport, membrane transport phenomena, modeling transport properties, and transport in biomedical applications Describes several important aspects of turbulence in porous media, including advances in modeling turbulence phenomena in heterogeneous porous media Explores heat transfer of nanofluids as well as thermal transport in porous media, including forced convection, double diffusive convection, high-heat flux applications, and thermal behavior of poroelastic media Covers geological applications in porous media,

including modeling and experimental challenges related to oil fields, CO2 migration, groundwater flows, and velocity measurements Discusses relevant attributes of experimental work or numerical techniques whenever applicable Paving the way for the establishment of multidisciplinary areas of research, Handbook of Porous Media, Third Edition further enhances cooperation between engineers and scientists by providing a valuable reference for addressing some of the most challenging issues in engineering and the hydrogeological, biological, and biomedical sciences. The sixth editions of these seminal books deliver the most up to date and comprehensive reference yet on the finite element method for all engineers and mathematicians. Renowned for their scope, range and authority, the new editions have been significantly developed in terms of both contents and scope. Each book is now complete in its own right and provides self-contained reference; used together they provide a formidable resource covering the theory and the application of the universally used FEM. Written by the leading professors in their fields, the three books cover the basis of the method, its application to solid mechanics and to fluid dynamics. * This is THE classic finite element method set, by two the subject's leading authors * FEM is a constantly developing subject, and any professional or student of engineering involved in understanding the computational modelling of physical systems will inevitably use the techniques in these books * Fully up-to-date; ideal for teaching and reference Focusing on heat transfer in porous media, this book covers recent advances in nano and macro' scales. Apart from introducing heat flux bifurcation and splitting within porous media, it highlights two-phase flow, nanofluids, wicking, and convection in bi-disperse porous media. New methods in modeling heat and transport in porous media, such as pore-scale analysis and Lattice–Boltzmann methods, are introduced. The book covers related engineering applications, such as enhanced geothermal systems, porous burners, solar systems, transpiration cooling in aerospace, heat transfer enhancement and electronic cooling, drying and soil evaporation, foam heat exchangers, and polymer-electrolyte fuel cells. Volume is indexed by Thomson Reuters CPCI-S (WoS). Collection of selected, peer reviewed papers from the 2014 4th International Conference on Intelligent System and Applied Material (GSAM 2014), August 23-24, 2014, Taiyuan, China. The 462 papers are grouped as follows: Chapter 1: Advanced Material Science and Technologies, Chapter 2: Building Materials, Civil Engineering, Architecture and Construction Technologies, Chapter 3: Biomedical Engineering, Chapter 4: Energy and Power Systems, Electrical and Electronic Engineering, Chapter 5: Designing of Machines, Manufacturing Technologies, Automation and Control in Mechanical Engineering, Chapter 6: Measurements and Monitoring, Chapter 7: Applied Mathematics, Processing of Data and Signal, Data Mining and Computational Procedures, Chapter 8: Theory and Practice of Information Technologies and Communications. Issues in Mechanical Engineering / 2011 Edition is a ScholarlyEditions™ eBook that delivers timely, authoritative, and comprehensive information about Mechanical Engineering. The editors have built Issues in Mechanical Engineering: 2011 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Mechanical Engineering in this eBook to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Mechanical Engineering: 2011 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/. Homogenization is a fairly new, yet deep field of mathematics which is used as a powerful tool for analysis of applied problems which involve multiple scales. Generally, homogenization is utilized as a modeling procedure to describe processes in complex structures. Applications of Homogenization Theory to the Study of Mineralized Tissue functions as an introduction to the theory of homogenization. At the same time, the book explains how to apply the theory to various application problems in biology, physics and engineering. The authors are experts in the field and

collaborated to create this book which is a useful research monograph for applied mathematicians, engineers and geophysicists. As for students and instructors, this book is a well-rounded and comprehensive text on the topic of homogenization for graduate level courses or special mathematics classes. Features: Covers applications in both geophysics and biology. Includes recent results not found in classical books on the topic Focuses on evolutionary kinds of problems; there is little overlap with books dealing with variational methods and T-convergence Includes new results where the G-limits have different structures from the initial operators Demonstrates how spectral decomposition and time-frequency methods have led to improved understanding and use of nonlinear harmonics, near-surface guided waves, layer-induced anisotropy, velocity dispersion and attenuation, interference, and Biot reflection. The discussion includes examples, figures, and literature references for further study. This book provides readers with a solid understanding of the capabilities and limitations of the techniques used for buried object detection. Presenting theory along with applications and the existing technology, it covers the most recent developments in hardware and software technologies of sensor systems with a focus on primary sensors such as Ground Penetrating Radar (GPR) and auxiliary sensors such as Nuclear Quadruple Resonance (NQR). It is essential reading for students, practitioners, specialists, and academicians involved in the design and implementation of buried object detection sensors. Non-Linear Waves in Dispersive Media introduces the theory behind such topic as the gravitational waves on water surfaces. Some limiting cases of the theory, wherein proof of an asymptotic class is necessary and generated, are also provided. The first section of the book discusses the notion of linear approximation. This discussion is followed by some samples of dispersive media. Examples of stationary waves are also examined. The book proceeds with a discussion of waves of envelopes. The concept behind this subject is from the application of the methods of geometrical optics to non-linear theory. A section on non-linear waves with slowly varying parameters is given at the end of the book, along with a discussion of the evolution of electro-acoustic waves in plasma with negative dielectric permittivity. The gravitational waves on fluid surfaces are presented completely. The text will provide valuable information for physicists, mechanical engineers, students, and researchers in the field of optics, acoustics, and hydrodynamics. Nonlinear Dispersive Equations are partial differential equations that naturally arise in physical settings where dispersion dominates dissipation, notably hydrodynamics, nonlinear optics, plasma physics and Bose-Einstein condensates. The topic has traditionally been approached in different ways, from the perspective of modeling of physical phenomena, to that of the theory of partial differential equations, or as part of the theory of integrable systems. This monograph offers a thorough introduction to the topic, uniting the modeling, PDE and integrable systems approaches for the first time in book form. The presentation focuses on three "universal" families of physically relevant equations endowed with a completely integrable member: the Benjamin-Ono, Davey-Stewartson, and Kadomtsev-Petviashvili equations. These asymptotic models are rigorously derived and qualitative properties such as soliton resolution are studied in detail in both integrable and non-integrable models. Numerical simulations are presented throughout to illustrate interesting phenomena. By presenting and comparing results from different fields, the book aims to stimulate scientific interactions and attract new students and researchers to the topic. To facilitate this, the chapters can be read largely independently of each other and the prerequisites have been limited to introductory courses in PDE theory. Thermo-Fluid Behaviour of Periodic Cellular Metals introduces the study of coupled thermo-fluid behaviour of cellular metals with periodic structure in response to thermal loads, which is an interdisciplinary research area that requires a concurrent-engineering approach. The book, for the first time, systematically adopts experimental, numerical, and analytical approaches, presents the fluid flow and heat transfer in periodic cellular metals under forced convection conditions, aiming to establish structure-property relationships for tailoring material structures to achieve properties and performance levels that are customized for defined multifunctional applications. The book, as a textbook and reference book,

is intended for both academic and industrial people, including graduate students, researchers and engineers. Dr. Tian Jian Lu is a professor at the School of Aerospace, Xi'an Jiaotong University, Xi'an, China. Dr. Feng Xu is a professor at the Key Laboratory of Biomedical Information Engineering of Ministry of Education, School of Life Science and Technology, Xi'an Jiaotong University. Dr. Ting Wen is now an engineer at Shell Global Solutions Inc. Dr. Lu and Dr. Xu are also affiliated with Biomedical Engineering and Biomechanics Center, Xi'an Jiaotong University. This self-contained set of lectures addresses a gap in the literature by providing a systematic link between the theoretical foundations of the subject matter and cutting-edge applications in both geophysical fluid dynamics and nonlinear optics. Rogue and shock waves are phenomena that may occur in the propagation of waves in any nonlinear dispersive medium. Accordingly, they have been observed in disparate settings – as ocean waves, in nonlinear optics, in Bose-Einstein condensates, and in plasmas. Rogue and dispersive shock waves are both characterized by the development of extremes: for the former, the wave amplitude becomes unusually large, while for the latter, gradients reach extreme values. Both aspects strongly influence the statistical properties of the wave propagation and are thus considered together here in terms of their underlying theoretical treatment. This book offers a self-contained graduate-level text intended as both an introduction and reference guide for a new generation of scientists working on rogue and shock wave phenomena across a broad range of fields in applied physics and geophysics. This book presents state-of-the-art lectures delivered by international academic and industrial experts in the field of computational science and its education, covering a wide spectrum from theory to practice. Topics include new developments in finite element method (FEM), finite volume method and Spline theory, such as Moving Mesh Methods, Galerkin and Discontinuous Galerkin Schemes, Shape Gradient Methods, Mixed FEMs, Superconvergence techniques and Fourier spectral approximations with applications in multidimensional fluid dynamics; Maxwell equations in discrepancy media; and phase-field equations. It also discusses some interesting topics related to Stokes equations, Schr□dinger equations, wavelet analysis and approximation theory. Contemporary teaching issues in curriculum reform also form an integral part of the book.This book will therefore be of significant interest and value to all graduates, research scientists and practitioners facing complex computational problems. Administrators and policymakers will find it is an addition to their mathematics curriculum reform libraries. This book discusses energy transfer, fluid flow and pollution in built environments. It provides a comprehensive overview of the highly detailed fundamental theories as well as the technologies used and the application of heat and mass transfer and fluid flow in built environments, with a focus on the mathematical models and computational and experimental methods. It is a valuable resource for researchers in the fields of buildings and environment, heat transfer and global warming.

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