Nptel Course Physical Applications Of Stochastic Processes

This book features papers focusing on the implementation of new and future technologies, which were presented at the International Conference on New Technologies, Development, and Application, held at the Academy of Science and Arts of Bosnia and Herzegovina in Sarajevo on June 24–26, 2021. It covers a wide range of future technologies and technical disciplines, including complex systems such as Industry 4.0; patents in industry 4.0; robotics; mechatronics systems; automation; manufacturing; cyber-physical and autonomous systems; sensors; networks; control, energy, renewable energy sources; automotive and biological systems; vehicular networking and connected vehicles; effectiveness and logistics systems; smart grids; nonlinear systems; power, social and economic systems; education; and IoT. The book New Technologies, Development and Application III is oriented toward Fourth Industrial Revolution "Industry 4.0, "implementation which improves many aspects of human life in all segments and leads to changes in business paradigms and production models. Further, new business methods are emerging and transforming production systems, transport, delivery, and consumption, which need to be monitored and implemented by every company involved in the global market.

A graduate-course text, written for readers familiar with measure-theoretic probability and discrete-time processes, wishing to explore stochastic processes in continuous time. The vehicle chosen for this exposition is Brownian motion, which is presented as the canonical example of both a martingale and a Markov process with continuous paths. In this context, the theory of stochastic integration and stochastic calculus is developed, illustrated by results concerning representations of martingales and change of measure on Wiener space, which in turn permit a presentation of recent advances in financial economics. The book contains a detailed discussion of weak and strong solutions of stochastic differential equations and a study of local time for semimartingales, with special emphasis on the theory of Brownian local time. The whole is backed by a large number of problems and exercises.

Essentials & Applications of Food Engineering provides a comprehensive understanding of food engineering operations and their practical and industrial utility. It presents pertinent case studies, solved numerical problems, and multiple choice questions in each chapter and serves as a ready reference for classroom teaching and exam preparations. The first part of this textbook contains the introductory topics on units and dimensions, material balance, energy balance, and fluid flow. The second part deals with the theory and applications of heat and mass transfer, psychrometry, and reaction kinetics. The subsequent chapters of the book present

the heat and mass transfer operations such as evaporation, drying, refrigeration, freezing, mixing, and separation. The final section focuses on the thermal, non-thermal, and nanotechnology-based novel food processing techniques, 3D food printing, active and intelligent food packaging, and fundamentals of CFD modeling. Features Features 28 case studies to provide a substantial understanding of the practical and industrial applications of various food engineering operations Includes 178 solved numerical problems and 285 multiple choice questions Highlights the application of mass balance in food product traceability and the importance of viscosity measurement in a variety of food products Provides updated information on novel food processing techniques such as cold plasma, 3D food printing, nanospray drying, electrospraying, and electrospinning The textbook is designed for undergraduate and graduate students pursuing Food Technology and Food Process Engineering courses. This book would also be of interest to course instructors and food industry professionals.
This book addresses the concepts of material selection and analysis, choice of structural form, construction methods, environmental loads, health monitoring, non-destructive testing, and repair methodologies and rehabilitation of ocean structures. It examines various types of ocean and offshore structures, including drilling platforms, processing platforms and vessels, towers, sea walls and surge barriers, and more. It also explores the use of MEMS in offshore structures, with

regard to military and oil exploration applications. Full-color figures as well as numerous solved problems and examples are included to help readers understand the applied concepts.

Ordinary Differential Equations

From Molecules to Species

Essentials and Applications of Food Engineering

Principles and Applications

Applications of NMR Spectroscopy:

Developments in Corrosion Protection

The lecture notes presented here in facsimile were prepared by Enrico Fermi for students taking his course at the University of Chicago in 1954. They are vivid examples of his unique ability to lecture simply and clearly on the most essential aspects of quantum mechanics. At the close of each lecture, Fermi created a single problem for his students. These challenging exercises were not included in Fermi's notes but were preserved in the notes of his students. This second edition includes a set of these assigned problems as compiled by one of his former students, Robert A. Schluter. Enrico Fermi was awarded the Nobel Prize for Physics in 1938.

This textbook is aimed at advanced undergraduate and graduate students interested in learning the fundamental mathematical concepts and tools widely used in different areas of physics. The author draws on a vast teaching experience, and presents a comprehensive and self-contained text which explains how mathematics intertwines with and forms an integral part of physics in numerous instances. Rather than emphasizing rigorous proofs of theorems, specific examples and physical

applications (such as fluid dynamics, electromagnetism, quantum mechanics, etc.) are invoked to illustrate and elaborate upon the relevant mathematical techniques. The early chapters of the book introduce different types of functions, vectors and tensors, vector calculus, and matrices. In the subsequent chapters, more advanced topics like linear spaces, operator algebras, special functions, probability distributions, stochastic processes, analytic functions, Fourier series and integrals, Laplace transforms, Green's functions and integral equations are discussed. The book also features about 400 exercises and solved problems interspersed throughout the text at appropriate junctures, to facilitate the logical flow and to test the key concepts. Overall this book will be a valuable resource for a wide spectrum of students and instructors of mathematical physics.

Among the topics covered are adhesion and tribological properties, friction, crack formation, and lubrication.

Written in a clear, logical and concise manner, this comprehensive resource allows students to quickly understand the key principles, techniques and applications of ordinary differential equations. Important topics including first and second order linear equations, initial value problems and qualitative theory are presented in separate chapters. The concepts of two point boundary value problems, physical models and first order partial differential equations are discussed in detail. The text uses tools of calculus and real analysis to get solutions in explicit form. While discussing first order linear systems, linear algebra techniques are used.

The real-life applications are interspersed throughout the book to invoke reader's interest. The methods and tricks to solve numerous mathematical problems with sufficient derivations and explanation are provided. The proofs of theorems are explained for the benefit of the readers.

Ocean Structures

Semigroups of Linear Operators and Applications to Partial Differential Equations

Microchip Fabrication

Construction, Materials, and Operations

Special Issue on Signal Processing and Security in Distributed Systems

Mathematical Physics

Group Theory for PhysicistsWith ApplicationsCambridge University Press

An up-to-date comprehensive text useful for graduate students and academic researchers in the field of energy transfers in fluid flows. The initial part of the text covers discussion on energy transfer formalism in hydrodynamics and the latter part covers applications including passive scalar, buoyancy driven flows, magnetohydrodynamic (MHD), dynamo, rotating flows and compressible flows. Energy transfers among large-scale modes play a critical role in nonlinear instabilities and pattern formation and is discussed comprehensively in the chapter on buoyancy-driven flows. It derives formulae to compute

Kolmogorov's energy flux, shell-to-shell energy transfers and locality. The book discusses the concept of energy transfer formalism which helps in calculating anisotropic turbulence.

This graduate-level textbook covers the major developments in surface sciences of recent decades, from experimental tricks and basic techniques to the latest experimental methods and theoretical understanding. It is unique in its attempt to treat the physics of surfaces, thin films and interfaces, surface chemistry, thermodynamics, statistical physics and the physics of the solid/electrolyte interface in an integral manner, rather than in separate compartments. It is designed as a handbook for the researcher as well as a study-text for graduate students. Written explanations are supported by 350 graphs and illustrations.

In this book, the author convinces that Sir Arthur Stanley Eddington had things a little bit wrong, as least as far as physics is concerned. He explores the theory of groups and Lie algebras and their representations to use group representations as labor-saving tools.

Notes on Quantum Mechanics

A First Course in Computational Physics

Vibrations and Waves
Fibres to Smart Textiles
Biomaterials
Molecular Dynamics Study of Properties

Stochastic processes are found in probabilistic systems that evolve with time. Discrete stochastic processes change by only integer time steps (for some time scale), or are characterized by discrete occurrences at arbitrary times. Discrete Stochastic Processes helps the reader develop the understanding and intuition necessary to apply stochastic process theory in engineering, science and operations research. The book approaches the subject via many simple examples which build insight into the structure of stochastic processes and the general effect of these phenomena in real systems. The book presents mathematical ideas without recourse to measure theory, using only minimal mathematical analysis. In the proofs and explanations, clarity is favored over formal rigor, and simplicity over generality. Numerous examples are given to show how results fail to hold when all the conditions are not satisfied. Audience: An excellent textbook for a graduate level course in engineering and operations research. Also an invaluable reference for all those requiring a deeper understanding of the subject.

This book presents the theory and applications of Fourier series and integrals, eigenfunction expansions, and related topics, on a level suitable for advanced undergraduates. It includes material on Bessel

functions, orthogonal polynomials, and Laplace transforms, and it concludes with chapters on generalized functions and Green's functions for ordinary and partial differential equations. The book deals almost exclusively with aspects of these subjects that are useful in physics and engineering, and includes a wide variety of applications. On the theoretical side, it uses ideas from modern analysis to develop the concepts and reasoning behind the techniques without getting bogged down in the technicalities of rigorous proofs. A good working knowledge of fluid mechanics and plasma physics is essential for the modern astrophysicist. This graduate textbook provides a clear, pedagogical introduction to these core subjects. Assuming an undergraduate background in physics, this book develops fluid mechanics and plasma physics from first principles. This book is unique because it presents neutral fluids and plasmas in a unified scheme, clearly indicating both their similarities and their differences. Also, both the macroscopic (continuum) and microscopic (particle) theories are developed, establishing the connections between them. Throughout, key examples from astrophysics are used, though no previous knowledge of astronomy is assumed. Exercises are included at the end of chapters to test the reader's understanding. This textbook is aimed primarily at astrophysics graduate students. It will also be of interest to advanced students in physics and applied mathematics seeking a unified view of fluid mechanics and plasma

physics, encompassing both the microscopic and macroscopic theories.

Applications of NMR Spectroscopy, Volume 2, originally published by Bentham and now distributed by Elsevier, presents the latest developments in the field of NMR spectroscopy, including the analysis of plant polyphenols, the role of NMR spectroscopy in neuroradiology, NMR-based sensors, studies on protein and nucleic acid structure and function, and mathematical formations for NMR spectroscopy in structural biology. The fully illustrated chapters contain comprehensive references to the recent literature. The applications presented cover a wide range of the field, such as drug development, medical imaging and diagnostics, food science, mining, petrochemical, process control, materials science, and chemical engineering, making this resource a multi-disciplinary reference with broad applications. The content is ideal for readers who are seeking reviews and updates, as it consolidates scientific articles of a diverse nature into a single volume. Sections are organized based on disciplines, such as food science and medical diagnostics. Each chapter is written by eminent experts in the field. Consolidates the latest developments in NMR spectroscopy into a single volume Authored and edited by world-leading experts in spectroscopy Features comprehensive references to the most recent related literature More than 65 illustrations aid in the retention of key concepts

Introduction to Electromagnetic Theory
eMaintenance
Cellular Solids
Group Theory for Physicists
Foundations of Classical Mechanics
Physics of Surfaces and Interfaces

Physical Biology of the Cell is a textbook for a first course in physical biology or biophysics for undergraduate or graduate students. It maps the huge and complex landscape of cell and molecular biology from the distinct perspective of physical biology. As a key organizing principle, the proximity of topics is based on the physical concepts that

This book contains pedagogical introductions to a selection of the most exciting subjects in current biological physics: sorting DNA on a microchip: a first step towards miniature laboratories on a chip; modeling protein folding, structure, and motion; physics of organelles: mechanical characteristics of molecular motors; dynamics of microtubules; shapes of membranes, vesicles and cells; a physicist's view of brains and neurons; statistics of sensory signal processing; evolutionary biology of molecules; pattern forming bacterial colonies; model ecologies with Darwinian co-evolution. The book is aimed at graduate students and researchers in physics, biology and mathematical modeling who have no prior knowledge of its

Fibres to Smart Textiles: Advances in Manufacturing, Technologies, and Applications offers comprehensive coverage of the fundamentals and advances in the textile and clothing manufacturing sectors. It describes the basics of fibres, yarns, and fabrics and their end use in

the latest developments and applications in the field and addresses environmental impacts from textile processes and how to minimize them. This book serves as a single comprehensive source discussing textile fibres, yarn formation, filament formation techniques, woven fabric formation, knitting technologies, nonwoven manufacturing technologies, braiding technologies, and dyeing, printing, and finishing processes. Testing of textile materials, environmental impacts of textile processes and use of CAD and CAM in designing textile products are also included. The book also discusses applications including textile composites and biocomposites, technical textiles, smart textiles, and nanotextiles. With chapters authored by textile experts, this practical book offers guidance to professionals in textile and clothing manufacturing and shows how to avoid potential pitfalls in product development. Cellular solids include engineering honeycombs and foams (which can now be made from polymers, metals, ceramics, and composites) as well as natural materials, such as wood, cork, and cancellous bone. This new edition of a classic work details current understanding of the structure and mechanical behavior of cellular materials, and the ways in which they can be exploited in engineering design. Gibson and Ashby have brought the book completely up to date, including new work on processing of metallic and ceramic foams and on the mechanical, electrical and acoustic properties of cellular solids. Data for commercially available foams are presented on material property charts; two new case studies show how the charts are used for selection of foams in engineering design. Over 15O references appearing in the literature since the publication of the first edition are cited. It will be of interest to graduate

students and researchers in materials science and engineering.
Structural Health Monitoring With Application To Offshore Structures
With Applications
Energy Transfers in Fluid Flows

Quantum Optomechanics
from Isospin To Unified Theories
Undoubtedly the applications of polymers are rapidly evolving. Technology is continually changing and quickly advancing as polymers are needed to solve a variety of day-to-day challenges leading to improvements in quality of life. The Encyclopedia of Polymer Applications presents state-of-the-art research and development on the applications of polymers. This groundbreaking work provides important overviews to help stimulate further advancements in all areas of polymers. This comprehensive multi-volume reference includes articles contributed from a diverse and global team of renowned researchers. It offers a broad-based perspective on a multitude of topics in a variety of applications, as well as detailed research information, figures, tables, illustrations, and references. The encyclopedia provides introductions, classifications, properties, selection, types, technologies, shelf-life, recycling, testing and applications for each of the entries where applicable. It features critical content for both novices and experts

including, engineers, scientists (polymer scientists, materials scientists, biomedical engineers, macromolecular chemists), researchers, and students, as well as interested readers in academia, industry, and research institutions.

The LNCS journal Transactions on Computational Science reflects recent developments in the field of Computational Science, conceiving the field not as a mere ancillary science but rather as an innovative approach supporting many other scientific disciplines. The journal focuses on original high-quality research in the realm of computational science in parallel and distributed environments, encompassing the facilitating theoretical foundations and the applications of large-scale computations and massive data processing. It addresses researchers and practitioners in areas ranging from aerospace to biochemistry, from electronics to geosciences, from mathematics to software architecture, presenting verifiable computational methods, findings, and solutions, and enabling industrial users to apply techniques of leading-edge, large-scale, high performance computational methods. This, the 35th issue of the Transactions on Computational Science, focusses on signal processing and security in distributed systems. The topics covered include classification of visual attention levels using microsaccades; analysis of textual content using Eyegaze; automatic car-

accident detection and passenger counting; face recognition; secure data fusion in IoT; business compliance using goal models; and microfluidic executions.

Group theory helps readers in understanding the energy spectrum and the degeneracy of systems possessing discrete symmetry and continuous symmetry. The fundamental concepts of group theory and its applications are presented with the help of solved problems and exercises. The text covers two essential aspects of group theory, namely discrete groups and Lie groups. Important concepts including permutation groups, point groups and irreducible representation related to discrete groups are discussed with the aid of solved problems. Topics such as the matrix exponential, the circle group, tensor products, angular momentum algebra and the Lorentz group are explained to help readers in understanding the quark model and theory composites. Real-life applications including molecular vibration, level splitting perturbation, crystal field splitting and the orthogonal group are also covered. Application-oriented solved problems and exercises are interspersed throughout the text to reinforce understanding of the key concepts.

This contribution book collects five among reviews and original articles from eminent experts working in the interdisciplinary area of biomaterial synthesis and application. From their

direct and recent experience, the readers can access the novel and ongoing potentialities of different synthetic and engineered biomaterials. Contributions reflect the fundamental studies, with a particular attention to the physico-chemical mechanical characterization of biomaterials, along with biocompatibility studies and potential clinical use. After an introductory chapter on the question of storage stability for biomaterial-based devices and products and for polymeric nanomedicines, a first review deals with the use and commercial sources of hydroxyapatite in tissue engineering and other biomedical applications. A study follows on optical fiber laser marking on the properties of stainless steel in implant manufacturing. Two other reviews, respectively, focused on the approaches to prevent or treat the effects of calcification that occurs in vivo on biomaterial-based implants and on the encapsulation of pancreatic islet cells for the treatment of type I diabetes will be presented. Finally, an overview on the physical bases and application in biomaterial science of the spray-drying process will close the volume. This setting will allow to achieve a general view of how classical and novel biomaterials can be applied, along with the methodologies necessary to design, develop, and characterize them, without the restrictions necessarily imposed by industrial or profit concerns. Readers will be apprised about the

methodologies used to develop biomaterials possessing the physical and biological properties needed for specific medical and clinical applications.
Functions of a Complex Variable, Operational Calculus, and Stability Theory
Physics
Lie Algebras In Particle Physics
Theoretical Aspects
The Physics of Fluids and Plasmas
Physics of Buoyant Flows

Since the characterization of generators of C0 semigroups was established in the 1940s, semigroups of linear operators and its neighboring areas have developed into an abstract theory that has become a necessary discipline in functional analysis and differential equations. This book presents that theory and its basic applications, and the last two chapters give a connected account of the applications to partial differential equations.
The M.I.T. Introductory Physics Series is the result of a program of careful study, planning, and development that began in 1960. The Education Research Center at the Massachusetts Institute of Technology (formerly the Science Teaching Center) was established to study the process of instruction, aids thereto, and the learning process itself, with special reference to science teaching at the university level. Generous support from a number of foundations

provided the means for assembling and maintaining an experienced staff to co-operate with members of the Institute's Physics Department in the examination, improvement, and development of physics curriculum materials for students planning careers in the sciences. After careful analysis of objectives and the problems involved, preliminary versions of textbooks were prepared, tested through classroom use at M.I.T. and other institutions, re-evaluated, rewritten, and tried again. Only then were the final manuscripts undertaken. The fundamental mathematical tools needed to understand machine learning include linear algebra, analytic geometry, matrix decompositions, vector calculus, optimization, probability and statistics. These topics are traditionally taught in disparate courses, making it hard for data science or computer science students, or professionals, to efficiently learn the mathematics. This self-contained textbook bridges the gap between mathematical and machine learning texts, introducing the mathematical concepts with a minimum of prerequisites. It uses these concepts to derive four central machine learning methods: linear regression, principal component analysis, Gaussian mixture models and support vector machines. For students and others with a mathematical background, these derivations provide a starting point to machine learning texts. For those learning the mathematics for

the first time, the methods help build intuition and practical experience with applying mathematical concepts. Every chapter includes worked examples and exercises to test understanding. Programming tutorials are offered on the book's web site.
One of the first thing that comes to your mind after hearing the term "corrosion" is corrosion of a metal. Corrosion is a basically harmful phenomenon, but it can be useful in some cases. For instance, environment's pollution with corrosion products and damage to the performance of a system are among its harmful effects, whereas electric energy generation in a battery and cathodic protection of many structures are among its advantages. However, these advantages are almost nothing as compared to the costs and effects imposed by its detrimental influences. The enormous costs of this phenomenon can be better understand through studying the published statistics on direct and indirect corrosion damages on economy of governments. The direct cost of corrosion is near 3 % of the gross domestic product (GDP) of USA. Considering this huge cost, it is necessary to develop and expand the corrosion science and its protection technologies.
Structure and Properties
Biointerface Engineering: Prospects in Medical Diagnostics and Drug Delivery
Advanced Deep Learning Applications in Big Data Analytics

Fourier Analysis and Its Applications
Essential Electronic Tools for Efficiency
Metallic Glass-Based Nanocomposites
Computers and computation are extremely important components of physics and should be integral parts of a physicist's education. Furthermore, computational physics is reshaping the way calculations are made in all areas of physics. Intended for the physics and engineering students who have completed the introductory physics course, A First Course in Computational Physics, Second Edition covers the different types of computational problems using MATLAB with exercises developed around problems of physical interest. Topics such as root finding, Newton-Cotes integration, and ordinary differential equations are included and presented in the context of physics problems. A few topics rarely seen at this level such as computerized tomography, are also included. Within each chapter, the student is led from relatively elementary problems and simple numerical approaches through derivations of more complex and sophisticated methods, often culminating in the solution to problems of significant difficulty. The goal is to demonstrate how numerical methods are used to solve the problems that physicists face. Read the review published in Computing in Science & Engineering magazine, March/April 2011 (Vol. 13, No. 2) © 2011 IEEE, Published by the IEEE Computer Society
Physics: Introduction to Electromagnetic Theory has been written for the first-year students of B. Tech Engineering Degree Courses of all Indian Universities following the guideline and syllabus as recommended by AICTE. The book, written in a very simple and lucid way, will be very much helpful to reinforce understanding of different aspects to meet the engineering student's needs. Writing a text-cum manual of this category poses several challenges providing enough

content without sacrificing the essentials, highlighting the key features, presenting in a novel format and building informative assessment. This book on engineering physics will prepare students to apply the knowledge of Electromagnetic Theory to tackle 21st century and onward engineering challenges and address the related questions. Some salient features of the book: · Expose basic science to the engineering students to the fundamentals of physics and to enable them to get an insight of the subject · To develop knowledge on critical questions solved and supplementary problems covering all types of medium and advanced level problems in a very logical and systematic manner · Some essential information for the users under the heading "Know more" for clarifying some basic information as well as comprehensive synopsis of formulae for a quick revision of the basic principles · Constructive manner of presentation so that an Engineering degree students can prepare to work in different sectors or in national laboratories at the very forefront of technology Interest in big data has swelled within the scholarly community as has increased attention to the internet of things (IoT). Algorithms are constructed in order to parse and analyze all this data to facilitate the exchange of information. However, big data has suffered from problems in connectivity, scalability, and privacy since its birth. The application of deep learning algorithms has helped process those challenges and remains a major issue in today's digital world. Advanced Deep Learning Applications in Big Data Analytics is a pivotal reference source that aims to develop new architecture and applications of deep learning algorithms in big data and the IoT. Highlighting a wide range of topics such as artificial intelligence, cloud computing, and neural networks, this book is ideally designed for engineers, data analysts, data scientists, IT specialists, programmers, marketers, entrepreneurs, researchers, academicians, and students.

Structural Health Monitoring (SHM) deals with assessment, evaluation and technical diagnosis of different structural systems of strategic importance. Extensive knowledge of SHM shall lead to a clear understanding of risk and reliability assessment of structures, which is currently mandatory for structures of strategic importance like bridges, offshore structures, etc.This comprehensive compendium features explanations and salient illustrations of SHM with applications to civil engineering structures, in general and offshore structures, in particular. The book is unique with respect to its contents, experimental case studies in lab scale and text presentation style. A detailed subject matter of this nature is currently scarce in the literature market.The must-have volume is a useful reference text for senior undergraduate and postgraduate students, professionals, academics and researchers in civil engineering, ocean engineering, mechanical engineering, and structural engineering.

Physical Biology of the Cell

Discrete Stochastic Processes

Brownian Motion and Stochastic Calculus

Physics of Biological Systems

Multiscale and Spectral Perspectives

Encyclopedia of Polymer Applications, 3 Volume Set

This book provides detailed information on the surface and surface chemistry of various biointerfaces for the understanding and development of biosensors, biocompatible devices, and drug delivery systems. It highlights the role of interfacial phenomena towards the behaviour of biomolecules on different surfaces and their significance in recent applications. The book also addresses various surface engineering techniques for the modification of biomaterials that are implemented for improving biocompatibility. It provides an updated

scientific concept of various interactions of biological systems with surfaces/modified surfaces at the molecular and cellular level. The chapters include various in-vitro, in-vivo, ex-vivo models to illustrate various aspects of Biointerface Engineering. Finally, the book elucidates troubleshooting strategies and future prospects of Biointerface Engineering in Medical Diagnostics and Drug Delivery.

Gravity pervades the whole universe; hence buoyancy drives fluids everywhere including those in the atmospheres and interiors of planets and stars. Prime examples of such flows are mantle convection, atmospheric flows, solar convection, dynamo process, heat exchangers, airships and hot air balloons. In this book we present fundamentals and applications of thermal convection and stratified flows. Buoyancy brings in extremely rich phenomena including waves and instabilities, patterns, chaos, and turbulence. In this book we present these topics in a systematic manner. First we present a unified treatment of linear theory that yields waves and thermal instability for stably and unstably-stratified flows respectively. We extend this analysis to include rotation and magnetic field. We also describe nonlinear saturation and pattern formation in Rayleigh-Bénard convection. The second half of the book is dedicated to buoyancy-driven turbulence, both in stably-stratified flow and in thermal convection. We describe the spectral theory including energy flux and show that the thermally-driven turbulence is similar to hydrodynamic turbulence. We also describe large-scale quantities like Reynolds and Nusselt numbers, flow anisotropy, and the

dynamics of flow structures, namely flow reversals. Thus, this book presents all the major aspects of the buoyancy-driven flows in a coherent manner that would appeal to advanced graduate students and researchers. eMaintenance: Essential Electronic Tools for Efficiency enables the reader to improve efficiency of operations, maintenance staff, infrastructure managers and system integrators, by accessing a real time computerized system from data to decision. In recent years, the exciting possibilities of eMaintenance have become increasingly recognized as a source of productivity improvement in industry. The seamless linking of systems and equipment to control centres for real time reconfiguring is improving efficiency, reliability, and sustainability in a variety of settings. The book provides an introduction to collecting and processing data from machinery, explains the methods of overcoming the challenges of data collection and processing, and presents tools for data driven condition monitoring and decision making. This is a groundbreaking handbook for those interested in the possibilities of running a plant as a smart asset. Provides an introduction to collecting and processing data from machinery Explains how to use sensor-based tools to increase efficiency of diagnosis, prognosis, and decision-making in maintenance Describes methods for overcoming the challenges of data collection and processing Metallic Glass-Based Nanocomposites: Molecular Dynamics Study of Properties provides readers with an overview of the most commonly used tools for MD simulation of metallic glass composites and provides all

the basic steps necessary for simulating any material on Materials Studio. After reading this book, readers will be able to model their own problems on this tool for predicting the properties of metallic glass composites. This book provides an introduction to metallic glasses with definitions and classifications, provides detailed explanations of various types of composites, reinforcements and matrices, and explores the basic mechanisms of reinforcement-MG interaction during mechanical loading. It explains various models for calculating the thermal conductivity of metallic glass composites and provides examples of molecular dynamics simulations. Aimed at students and researchers, this book caters to the needs of those working in the field of molecular dynamics (MD) simulation of metallic glass composites.

New Technologies, Development and Application IV

Mathematics for Machine Learning

Introduction to Surface Chemistry and Catalysis

Transactions on Computational Science XXXV

Advances in Manufacturing, Technologies, and Applications

From Instabilities to Turbulence

Written by leading experimentalist Warwick P. Bowen and prominent theoretician Gerard J. Milburn, Quantum Optomechanics discusses modern developments in this novel field from experimental and theoretical standpoints. The authors share their insight on a range of important topics, including optomechanical cooling

and entanglement; quantum limits on measurement precision and how to overcome them via back-action evading measurements; feedback control; single photon and nonlinear optomechanics; optomechanical synchronization; coupling of optomechanical systems to microwave circuits and two-level systems, such as atoms and superconducting qubits; and optomechanical tests of gravitational decoherence. The book first introduces the basic physics of quantum harmonic oscillators and their interactions with their environment. It next discusses the radiation pressure interaction between light and matter, deriving common Hamiltonians used in quantum optomechanics. It then focuses on the linearized regime of quantum optomechanics before exploring scenarios where the simple linearized picture of quantum optomechanics no longer holds. The authors move on to hybrid optomechanical systems in which the canonical quantum optomechanical system is coupled to another quantum object. They explain how an alternative form of a hybrid optomechanical system leads to the phenomenon of synchronization. They also consider the impact of quantum optomechanics on tests of gravitational

physics.

This book collects chapters dealing with some of the theoretical aspects needed to properly discuss the dynamics of complex engineering systems. The book illustrates advanced theoretical development and new techniques designed to better solve problems within the nonlinear dynamical systems. Topics covered in this volume include advances on fixed point results on partial metric spaces, localization of the spectral expansions associated with the partial differential operators, irregularity in graphs and inverse problems, Hyers-Ulam and Hyers-Ulam-Rassias stability for integro-differential equations, fixed point results for mixed multivalued mappings of Feng-Liu type on Mb-metric spaces, and the limit q-Bernstein operators, analytical investigation on the fractional diffusion absorption equation.
Problems and Exercises
Mathematical Methods in Engineering
An Introduction for Astrophysicists
Physics and Chemistry - New Edition
Applications and Problems