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Thermofluids, while a relatively modern term, is applied to the well-established field of thermal sciences, which is comprised of various intertwined disciplines. Thus mass, momentum, and heat transfer constitute the fundamentals of th- mofluids. This book discusses thermofluids in the context of thermodynamics, single- and two-phase flow, as well as heat transfer associated with single- and two-phase flows. Traditionally, the field of thermal sciences is taught in univer- ties by requiring students to study engineering thermodynamics, fluid mechanics, and heat transfer, in that order. In graduate school, these topics are discussed at more advanced levels. In recent years, however, there have been attempts to in- grate these topics through a unified approach. This approach makes sense as thermal design of widely varied systems ranging from hair dryers to semicond- tor chips to jet engines to nuclear power plants is based on the conservation eq- tions of mass, momentum, angular momentum, energy, and the second law of thermodynamics. While integrating these topics has recently gained popularity, it is hardly a new approach. For example, Bird, Stewart, and Lightfoot in Transport Phenomena, Rohsenow and Choi in Heat, Mass, and Momentum Transfer, El- Wakil, in Nuclear Heat Transport, and Todreas and Kazimi in Nuclear Systems have pursued a similar approach. These books, however, have been designed for advanced graduate level courses. More recently, undergraduate books using an - tegral approach are appearing.

Improve Your Grasp of Fluid Mechanics in the Human Circulatory System_and Develop Better Medical Devices Applied Biofluid Mechanics features a solid grasp of the role of fluid mechanics in the human circulatory system that will help in the research and design of new medical instruments, equipment, and procedures. Filled with 100 detailed illustrations, the book examines cardiovascular anatomy and physiology, pulmonary anatomy and physiology, hematology, histology and function of blood vessels, heart valve mechanics and prosthetic heart valves, stents, pulsatile flow in large arteries, flow and pressure measurement, modeling, and dimensional analysis.

This textbook is concerned with the mathematical modelling of biological and physiological phenomena for mathematically sophisticated students. A range of topics are discussed: diffusion population dynamics, autonomous differential equations and the stability of ecosystems, biogeography, pharmokinetics, biofluid mechanics, cardiac mechanics, the spectral analysis of heart sounds using FFT techniques. The last chapter deals with a wide variety of commonly used medical devices. This book is based on courses taught by the author over many years and the material is well class tested. The reader is aided by many exercises that examine key points and extend the presentation in the body of the text. All students of mathematical biology will find this book to be a highly useful resource.

The emerging paradigm of incorporating images and biomechanical properties of soft tissues has proven to be an integral part of the advancement of several medical applications, including image guided radiotherapy and surgery, brachytherapy, and diagnostics. This expansion has resulted in a growing community of medical, science, and engineering professionals applying mechanical principles to address medical concerns. This book is tailored to cover a range of mechanical principles, properties, and applications of soft tissues that have previously been addressed in various journals and "anatomical site-specific" books. Biomechanics of Soft Tissues follows a different approach by offering a simplified overview of widely used mechanical models and measuring techniques of soft tissue parameters. This is followed by an investigation of different medical applications, including: biomechanical aspects of cancerous tumor progressions, radiotherapy treatment, and image guided ultrasound guided interventions. Written by leading scholars and professionals in the field, Biomechanics of Soft Tissues combines engineering and medical expertise, thereby producing an excellent source of information for professionals interested in the theoretical and technological advancements related to soft tissues. The book provides medical professionals with an insight on various modeling approaches, testing techniques, and mechanical characteristics that are frequently used by engineers. Conversely, the presented medical applications provide engineers with a glimpse of amazing medical practices and encourage them to expand their roles in the medical field. Provides a simplified overview of mechanics of soft tissues. Highlights different techniques to measure tissues properties for engineering and medical applications. Contains novel ideas to address roles of mechanics in disease progression and treatment. Presents innovative applications of biomechanics in medical procedures.

A presentation of the most elementary form of pulsatile flow as an important prerequisite for the study of other flow applications in biological systems. The book provides in a single source a complete treatment of the fluid dynamics of flow with the required mathematics and emphasis on the basis mechanics. The style and level of this book make it accessible to students and researchers in biophysics, biology, medicine, bioengineering and applied mathematics working in theoretical and clinical work on the cardiovascular system, as well as in the design of new instrumentation, medical imaging systems, and artificial organs. With problems and exercises.

The objective of this book is to illustrate in specific detail how cardiovascular mechanics stands as a common pillar supporting such different clinical successes as drugs for high blood pressure, prosthetic heart valves and coronary artery bypass grafting, among others. This information is conveyed through a comprehensive treatment of the overarching principles and theories that are behind mechanobiological processes, aortic and arterial mechanics, atherosclerosis, blood and microcirculation, hear valve mechanics, as well as medical devices and drugs. Examines all major theoretical and practical aspects of mechanical forces related to the cardiovascular system. Discusses a unique coverage of mechanical changes related to an aging cardiovascular system. Provides an overview of experimental methods in cardiovascular mechanics. Written by world-class researchers from Canada, the US and EU. Extensive references are provided at the end of each chapter to enhance further study. Michel R. Labrosse is the founder of the Cardiovascular Mechanics Laboratory at the University of Ottawa, where he is a full professor within the Department of Mechanical Engineering. He has been an active researcher in academia along with being heavily associated with the University of Ottawa Heart Institute. He has authored or co-authored over 90 refereed communications, and supervised or co-supervised over 40 graduate students and post-docs.

Condensing 40 years of teaching experience, this unique textbook will provide students with an unrivalled understanding of the fundamentals of fluid mechanics, and enable them to place that understanding firmly within a biological context. Each chapter introduces, explains, and expands a core concept in biofluid mechanics, establishing a firm theoretical framework for students to build upon in further study. Practical biofluid applications, clinical correlations, and worked examples throughout the book provide real-world scenarios to help students quickly master key theoretical topics. Examples are drawn from biology, medicine, and biotechnology with applications to normal function, disease, and devices, accompanied by over 500 figures to reinforce student understanding. Featuring over 120 multicomponent end-of-chapter problems, flexible teaching pathways to enable tailor-made course structures, and extensive Matlab and Maple code examples, this is the definitive textbook for advanced undergraduate and graduate students studying a biologically-grounded course in fluid mechanics.

Up-To-Date Coverage of Biofluid Mechanics and Applications in Medical Devices This thoroughly revised textbook shows how fluid mechanics works in the human circulatory system and offers cutting-edge applications in the development and design of medical instruments, equipment, and procedures. Applied Biofluid Mechanics, Second Edition, examines cardiovascular anatomy and physiology, hematology, blood vessel histology and function, heart valve mechanics and prosthetic valves, stents, pulsatile flow in large arteries, measurements, dimensional analysis, and more. This edition contains updated information on pulsatile flow modeling and a brand-new chapter that explains renal biofluids. The book also features online materials for both students and instructors, including a solutions manual. • Review of biofluid mechanics concepts • Cardiovascular structure and function • Pulmonary anatomy and physiology and respiration • Hematology and blood rheology • Anatomy and physiology of blood vessels • Mechanics of heart valves • Pulsatile flow in large arteries • Flow and pressure measurement • Modeling • Lumped parameter mathematical models • Renal biofluids

Designed for senior undergraduate or first-year graduate students in biomedical engineering, Biofluid Mechanics: The Human Circulation, Second Edition teaches students how fluid mechanics is applied to the study of the human circulatory system. Reflecting changes in the field since the publication of its predecessor, this second edition has been extensively revised and updated. New to the Second Edition Improved figures and additional examples More problems at the end of each chapter A chapter on the computational fluid dynamic analysis of the human circulation, which reflects the rapidly increasing use of computational simulations in research and clinical arenas Drawing on each author’s experience teaching courses on cardiovascular fluid mechanics, the book begins with introductory material on fluid and solid mechanics as well as a review of cardiovascular physiology pertinent to the topics covered in subsequent chapters. The authors then discuss fluid mechanics in the human circulation, primarily applied to blood flow at the arterial level. They also cover vascular implants and measurements in the cardiovascular system.

Written in a clear and simple style, this textbook on fluid mechanics gives equal emphasis to both geophysical and engineering fluid mechanics. For physicists, it contains chapters on geophysical fluid mechanics and gravity waves; for engineers, it has chapters on aerodynamics and compressible flow. Of common interest are chapters on governing equations, laminar flows, boundary layers, instability, and turbulence. This book also presents topics of recent interest, such as deterministic chaos, and double-diffusive instability. n Gives equal treatment to topics in both engineering and geophysical fluid dynamics n Suitable as an intermediate or graduate course textbook for students in their senior year or above n Treats topics of recent interest such as deterministic chaos, double diffusive instability and soliton n Extensively illustrated n Contains fully worked examples in each chapter as well as end-of-chapter problems n An instructor's manual is available

Biofluid Mechanics: An Introduction to Fluid Mechanics, Macrocirculation, and Microcirculation shows how fluid mechanics principles can be applied not only to blood circulation, but also to air flow through the lungs, joint lubrication, intraocular fluid movement, renal transport among other specialty circulations. This new second edition increases the breadth and depth of the original by expanding chapters to cover additional biofluid mechanics principles, disease criteria, and medical management of disease, with supporting discussions of the relevance and importance of current research. Calculations related both to the disease and the material covered in the chapter are also now provided.

Both broad and deep in coverage, Rubenstein shows that fluid mechanics principles can be applied not only to blood circulation, but also to air flow through the lungs, joint lubrication, intraocular fluid movement and renal transport. Each section initiates discussion with governing equations, derives the state equations and then shows examples of their usage. Clinical applications, extensive worked examples, and numerous end of chapter problems clearly show the applications of fluid mechanics to biomedical engineering situations. A section on experimental techniques provides a springboard for future research efforts in the subject area. Uses language and math that is appropriate and conducive for undergraduate learning, containing many worked examples and end of chapter problems All engineering concepts and equations are developed within a biological context Covers topics in the traditional biofluids curriculum, as well as addressing other systems in the body that can be described by biofluid mechanics principles, such as air flow through the lungs, joint lubrication, intraocular fluid movement, and renal transport Clinical applications are discussed throughout the book, providing practical applications for the concepts discussed.

The Finite Element Method: Its Basis and Fundamentals offers a complete introduction to the basis of the finite element method, covering fundamental theory and worked examples in the detail required for readers to apply the knowledge to their own engineering problems and understand more advanced applications. This edition sees a significant rearrangement of the book's content to enable clearer development of the finite element method, with major new chapters and sections added to cover: Weak forms Variational forms Multi-dimensional field problems Automatic mesh generation Plate bending and shells Developments in meshless techniques Focusing on the core knowledge, mathematical and analytical tools needed for successful application, The Finite Element Method: Its Basis and Fundamentals is the authoritative resource of choice for graduate level students, researchers and professional engineers involved in finite element-based engineering analysis. A proven keystone reference in the library of any engineer needing to understand and apply the finite element method in design and development. Founded by an influential pioneer in the field and updated in this seventh edition by an author team incorporating academic authority and industrial simulation experience. Features reworked and reordered contents for clearer development of the theory, plus new chapters and sections on mesh generation, plate bending, shells, weak forms and variational forms.

This book provides a guiding thread between the distant fields of fluid mechanics and clinical cardiology. Well rooted in the science of fluid dynamics, it drives the reader across progressively more realistic scenarios up to the complexity of routine medical applications. Based on the author’s 25 years of collaborations with cardiologists, it helps engineers learn communicating with clinicians, yet maintaining the rigor of scientific disciplines. This book starts with a description of the fundamental elements of fluid dynamics in large blood vessels. This is achieved by introducing a rigorous physical background accompanied by examples applied to the circulation, and by presenting classic and recent results related to the application of fluid dynamics to the cardiovascular physiology. It then explores more advanced topics for a physics-based understanding of phenomena effectively encountered in clinical cardiology. It stands as an ideal learning resource for physicists and engineers working in cardiovascular fluid dynamics, industry engineers working on biomedical/cardiovascular technology, and students in bio-fluid dynamics. Written with a concise style, this textbook is accessible to a broad readership, including students, physical scientists and engineers, offering an entry point into this multi-disciplinary field. It includes key concepts exemplified by illustrations using cutting-edge imaging, references to modelling and measurement technologies, and includes unique original insights.

Biofluid mechanics is the study of a certain class of biological problems from a fluid mechanics point of view. Biofluid mechanics does not involve any new development of the general principles of fluid mechanics but it does involve some new applications of the method of fluid mechanics. Complex movements of fluids in the biological system demand for their analysis professional fluid mechanics skills.

Measurement in Fluid Mechanics is an introductory, up-to-date, general reference in experimental fluid mechanics, describing both classical and state-of-the-art methods for flow visualization and for measuring flow rate, pressure, velocity, temperature, concentration, and wall shear stress. Particularly suitable as a textbook for graduate and advanced undergraduate courses. Measurement in Fluid Mechanics is also a valuable tool for practicing engineers and applied scientists. This book is written by a single author, in a consistent and straightforward style, with plenty of clear illustrations, an extensive bibliography, and over 100 suggested exercises. Measurement in Fluid Mechanics also features extensive background materials in system response, measurement uncertainty, signal analysis, optics, fluid mechanical apparatus, and laboratory practices, which shield the reader from having to consult with a large number of primary references. Whether for instructional or reference purposes, this book is a valuable tool for the study of fluid mechanics. Stavros Tavoularis has received a Dipl. Eng. from the National Technical University of Athens, Greece, an M.Sc. from Virginia Polytechnic Institute and State University and a Ph.D. from The Johns Hopkins University. He has been a professor in the Department of Mechanical Engineering at the University of Ottawa since 1980, where he has served terms as the Department Chair and Director of the Ottawa-Carleton Institute for Mechanical and Aerospace Engineering. His research interests include turbulence structure, turbulent diffusion, vortical flows, aerodynamics, biofluid dynamics, nuclear reactor thermal hydraulics and the development of experimental methods. Professor Tavoularis is a Fellow of the Engineering Institute of Canada, a Fellow of the Canadian Society for Mechanical Engineering and a recipient of the George S. Glinski Award for Excellence in Research. Contents: Part I. General concepts: 1. Flow properties and basic principles; 2. Measuring systems; 3. Measurement uncertainty; 4. Signal conditioning, discretization, and analysis; 5. Background for optical experimentation; 6. Fluid mechanical apparatus; 7. Towards a sound experiment; Part II. Measurement techniques: 8. Measurement of flow pressure; 9. Measurement of flow rate; 10. Flow visualization techniques; 11. Measurement of local flow velocity; 12. Measurement of temperature; 13. Measurement of composition; 14. Measurement of wall shear stress; 15. Outlook.

Part medicine, part biology, and part engineering, biomedicine and bioengineering are by their nature hybrid disciplines. To make these disciplines work, engineers need to speak "medicine," and clinicians and scientists need to speak "engineering." Building a bridge between these two worlds, Biofluid Mechanics: The Human Circulation integrates fluid and solid mechanics relationships and cardiovascular physiology. The book focuses on blood rheology, steady and unsteady flow models in the arterial circulation, and fluid mechanics through native heart valves. The authors delineate the relationship between fluid mechanics and the development of arterial diseases in the coronary, carotid, and ileo-femoral arteries. They go on to elucidate methods used to evaluate the design of circulatory implants such as artificial heart valves, stents, and vascular grafts. The book covers design requirements for the development of an ideal artificial valve, including a discussion of the currently available mechanical and bioprosthetic valves. It concludes with a detailed description of common fluid mechanical measurements used for diagnosing arterial and valvular diseases as well as research studies that examine the possible interactions between hemodynamics and arterial disease. Drawing on a wide range of material, the authors cover both theory and practical applications. The book breaks down fluid mechanics into key definitions and specific properties and then uses these pieces to construct a solid foundation for analyzing biofluid mechanics in both normal and diseased conditions.

Basic knowledge about fluid mechanics is required in various areas of water resources engineering such as designing hydraulic structures and turbomachinery. The applied fluid mechanics laboratory course is designed to enhance civil engineering students’ understanding and knowledge of experimental methods and the basic principle of fluid mechanics and apply those concepts in practice. The lab manual provides students with an overview of ten different fluid mechanics laboratory experiments and their practical applications. The objective, practical applications, methods, theory, and the equipment required to perform each experiment are presented. The experimental procedure, data collection, and presenting the results are explained in detail. LAB

This book serves as an introduction to the continuum mechanics and mathematical modeling of complex fluids in living systems. The form and function of living systems are intimately tied to the nature of surrounding fluid environments, which commonly exhibit nonlinear and history dependent responses to forces and displacements. With ever-increasing capabilities in the visualization and manipulation of biological systems, research on the fundamental phenomena, models, measurements, and analysis of complex fluids has taken a number of exciting directions. In this book, many of the world’s foremost experts explore key topics such as: Macro- and micro-rheological techniques for measuring the material properties of complex biofluids and the subtleties of data interpretation Experimental observations and rheology of complex biological materials, including mucus, cell membranes, the cytoskeleton, and blood The motility of microorganisms in complex fluids and the dynamics of active suspensions Challenges and solutions in the numerical simulation of biologically relevant complex fluid flows This volume will be accessible to advanced undergraduate and beginning graduate students in engineering, mathematics, biology, and the physical sciences, but will appeal to anyone interested in the intricate and beautiful nature of complex fluids in the context of living systems.

Handbook of Fluid Dynamics offers balanced coverage of the three traditional areas of fluid dynamics-theoretical, computational, and experimental--complete with valuable appendices presenting the mathematics of fluid dynamics, tables of dimensionless numbers, and tables of the properties of gases and vapors. Each chapter introduces a different fluid

The book may be viewed as an introduction to time-harmonic waves in dissipative bodies, notably viscoelastic solids and fluids. The inhomogeneity of the waves, which is due to the fact that planes of constant phase are not parallel to planes of constant amplitude, is shown to be strictly related to the dissipativity of the medium. A preliminary analysis is performed on the propagation of inhomogeneous waves in unbounded media and of reflection and refraction at plane interfaces. Then emphasis is given to those features that are of significance for applications. In essence, they regard surface waves, scattering by (curved) obstacles, wave propagation in layered heterogeneous media, and ray methods. The pertinent mathematical techniques are discussed so as to make the book reasonably self-contained.

This book describes the fundamentals of fluid mechanics phenomena for engineers and others. This book is designed to replace all introductory textbook(s) or instructor's notes for the fluid mechanics in undergraduate classes for engineering/science students but also for technical people. It is hoped that the book could be used as a reference book for people who have at least some basics knowledge of science areas such as calculus, physics, etc. This version is a PDF document. The website [http: //www.potto.org/FM/fluidMechanics.pdf] contains the book broken into sections, and also has LaTeX resources

The Department of Engineering Science and Hechanics at Virginia Polytechnic Institute and State University spon sored the First Mid-Atlantic Conference on Bio-Fluid Mechanics, which was held in Blacksburg, Virginia during the period 9-11 August 1978. Some 40 life-scientists, engineers, physicians and others who share a common interest in the advancement of basic and applied knowledge in bio fluid mechanics gathered at the Donaldson Brown Center for Continuing Education to hear 25 papers presented in seven technical sessions. At the conclusion of the conference, those present decided unanimously that its success warranted having at least one more -- and that it was conceptually a sound idea to plan it on a biennial basis for late spring. Hence, the second Mid-Atlantic Conference on Bio Fluid Mechanics took place at Virginia Tech on May 4-6, 1980. This volume documents the Proceedings of the second conference. It contains full texts of 23 contributed papers, 2 guest lectures and 1 invited seminar. The papers are gr9uped according to subject matter, beginning with 3 in the area of respiration, followed by 1 in kidney dialysis, 1 in reproduction, 1 in joint lubrication, 1 in prosthetic fluidics, 2 in zoology, and ending with 14 in the general field of cardiovascular dynamics. Of the latter, 5 deal with the subject of heart valves, 2 concern themselves with the microcirculation, 6 address vascular system hemodynamics and 1 covers some aspects of blood rheology.

Biofluid Mechanics: An Introduction to Fluid Mechanics, Macrocirculation, and Microcirculation, Third Edition shows how fluid mechanics principles can be applied not only to blood circulation, but also to air flow through the lungs, joint lubrication, intraocular fluid movement, renal transport, and other specialty circulations. This new edition contains new homework problems and worked examples, including MATLAB-based examples. In addition, new content has been added on such relevant topics as Womersley and Oscillatory Flows. With advanced topics in the text now denoted for instructor convenience, this book is particularly suitable for both senior and graduate-level courses in biofluids. Uses language and math that is appropriate and conducive for undergraduate and first-year graduate learning Contains new worked examples and end-of-chapter problems Covers topics in the traditional biofluids curriculum, also addressing other systems in the body Discusses clinical applications throughout the book, providing practical applications for the concepts discussed Includes more advanced topics to help instructors teach an undergraduate course without a loss of continuity in the class

Rapid developments have taken place in biological/biomedical measurement and imaging technologies as well as in computer analysis and information technologies. The increase in data obtained with such technologies invites the reader into a virtual world that represents realistic biological tissue or organ structures in digital form and allows for simulation and what is called “in silico medicine.” This volume is the third in a textbook series and covers both the basics of continuum mechanics of biosolids and biofluids and the theoretical core of computational methods for continuum mechanics analyses. Several biomechanics problems are provided for better understanding of computational modeling and analysis. Topics include the mechanics of solid and fluid bodies, fundamental characteristics of biosolids and biofluids, computational methods in biomechanics analysis/simulation, practical problems in orthopedic biomechanics, dental biomechanics, ophthalmic biomechanics, cardiovascular biomechanics, hemodynamics, cell mechanics, and model-, rule-, and image-based methods in computational biomechanics analysis and simulation. The book is an excellent resource for graduate school-level engineering students and young researchers in bioengineering and biomedicine.

The book presents the state of the art in the interdisciplinary field of fluid mechanics applied to cardiovascular modelling. It is neither a monograph nor a collection of research papers, rather an extended review in the field. It is arranged in 4 scientific chapters each presenting thoroughly the approach of a leading research team; two additional chapters prepared by biomedical scientists present the topic by the applied perspective. A unique feature is a substantial (approx. one fourth of the book) medical introductory part, written by clinical researchers for scientific readers, that would require a large effort to be collected otherwise.

Biofluid Mechanics is a throrough reference to the entire field. Written with engineers and clinicians in mind, this book covers physiology and the engineering aspects of biofluids. Effectively bridging the gap between engineers' and clinicians' knowledge bases, the text provides information on physiology for engineers and information on the engineering side of biofluid mechanics for clinicians. Clinical applications of fluid mechanics principles to fluid flows throughout the body are included in each chapter. All engineering concepts and equations are developed within a biological context, together with computational simulation examples as well. Content covered includes; engineering models of human blood, blood rheology in the circulation system and problems in human organs and their side effects on biomechanics of the cardiovascular system. The information contained in this book on biofluid principles is core to bioengineering and medical sciences. Comprehensive coverage of the entire biofluid mechanics subject provides you with an all in one reference, eliminating the need to collate information from different sources Each chapter covers principles, needs, problems, and solutions in order to help you identify potential problems and employ solutions Provides a novel breakdown of fluid flow by organ system, and a quick and focused reference for clinicians

Designed to meet the needs of undergraduate students, "Introduction to Biomechanics" takes the fresh approach of combining the viewpoints of both a well-respected teacher and a successful student. With an eye toward practicality without loss of depth of instruction, this book seeks to explain the fundamental concepts of biomechanics. With the accompanying web site providing models, sample problems, review questions and more, Introduction to Biomechanics provides students with the full range of instructional material for this complex and dynamic field.

Biofliudics has gained in importance in recent years, forcing engineers to redefine mechanical engineering theories and apply them to biological functions. To date, no book has successfully done this. Biofliud Mechanics in Cardiovascular Systems is one of the first books to take an interdisciplinary approach to the subject. Written by a professor and researcher, this book will combine engineering principles with human biology to deliver a text specifically designed for biomedical engineering professionals and students.

This book is an update and extension of the classic textbook by Ludwig Prandtl, Essentials of Fluid Mechanics. It is based on the 10th German edition with additional material included. Chapters on wing aerodynamics, heat transfer, and layered flows have been revised and extended, and there are new chapters on fluid mechanical instabilities and biomedical fluid mechanics. References to the literature have been kept to a minimum, and the extensive historical citations may be found by referring to previous editions. This book is aimed at science and engineering students who wish to attain an overview of the various branches of fluid mechanics. It will also be useful as a reference for researchers working in the field of fluid mechanics.

Mary D. Frame

This unique resource offers over two hundred well-tested bioengineering problems for teaching and examinations. Solutions are available to instructors online.

"The Application of Biofluid Mechanics: Boundary Effects on Phoretic Motions of Colloidal Spheres" focuses on the phoretic motion behavior of various micron- to nanometer-size particles. The content of this book is divided into two parts: one on the concentration gradient-driven diffusiophoresis and osmophoresis, and one on thermocapillary motion and thermophoretic motion driven by temperature gradient. Diffusiophoresis and osmophoresis are mainly used in biomedical engineering applications, such as drug delivery, purification, and the description of the behavior of the immune system; thermocapillary motion and thermophoretic motion are applied in the field of semiconductors as well as in suspended impurities removal. The book also provides a variety of computer programming source codes compiled using Fortran for researchers' future applications. This book is intended for chemical engineers, biomedical engineers and scientists, biophysicists and fundamental chemotaxis researchers. Dr. Po-Yuan Chen is an Assistant Professor at the Department of Biological Science and Technology, China Medical University, Taichung, Taiwan.

The definitive textbook for advanced students studying a biologically-grounded course in fluid mechanics, combining physical fundamentals with examples and applications drawn from real-world biological systems. Includes over 120 multicomponent end-of-chapter problems, Matlab® and Maple(T-M) code, and flexible pathways for tailor-made courses.

Through ten editions, Fox and McDonald's Introduction to Fluid Mechanics has helped students understand the physical concepts, basic principles, and analysis methods of fluid mechanics. This market-leading textbook provides a balanced, systematic approach to mastering critical concepts with the proven Fox-McDonald solution methodology. In-depth yet accessible chapters present governing equations, clearly state assumptions, and relate mathematical results to corresponding physical behavior. Emphasis is placed on the use of control volumes to support a practical, theoretically-inclusive problem-solving approach to the subject. Each comprehensive chapter includes numerous, easy-to-follow examples that illustrate good solution technique and explain challenging points. A broad range of carefully selected topics describe how to apply the governing equations to various problems, and explain physical concepts to enable students to model real-world fluid flow situations. Topics include flow measurement, dimensional analysis and similitude, flow in pipes, ducts, and open channels, fluid machinery, and more. To enhance student learning, the book incorporates numerous pedagogical features including chapter summaries and learning objectives, end-of-chapter problems, useful equations, and design and open-ended problems that encourage students to apply fluid mechanics principles to the design of devices and systems.

Nano and Bio Heat Transfer and Fluid Flow focuses on the use of nanoparticles for bio application and bio-fluidics from an engineering perspective. It introduces the mechanisms underlying thermal and fluid interaction of nanoparticles with biological systems. This book will help readers translate theory into real world applications, such as drug delivery and lab-on-a-chip. The content covers how transport at the nano-scale differs from the macro-scale, also discussing what complications can arise in a biologic system at the nano-scale. It is ideal for students and early career researchers, engineers conducting experimental work on relevant applications, or those who develop computer models to investigate/design these systems. Content coverage includes biofluid mechanics, transport phenomena, micro/nano fluid flows, and heat transfer. Discusses nanoparticle applications in drug delivery Covers the engineering fundamentals of bio heat transfer and fluid flow Explains how to simulate, analyze, and evaluate the transportation of heat and mass problems in bio-systems