

Biofluid Mechanics The Human Circulation Second Edition

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 Biofluid Mechanics

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Cardiovascular Biomechanics Springer
 Red blood cells in humans—and most other mammals—have a tendency to form aggregates with a characteristic face-to-face morphology, similar to a stack of coins. Known as rouleaux, these aggregates are a normally occurring phenomenon and have a major impact on blood rheology. What is the underlying mechanism that produces this pattern? Does this really happen in blood circulation? And do these rouleaux formations have a useful function? The first book to offer a comprehensive review of the subject, *Red Blood Cell Aggregation* tackles these and other questions related to red blood cell (RBC) aggregates. The book covers basic, clinical, and physiological aspects of this important biophysical phenomenon and integrates these areas with concepts in bioengineering. It brings together state-of-the-art research on the determinants, mechanisms, and measurement

and effects of RBC aggregation as well as on variations and comparative aspects. After an introductory overview, the book outlines factors and conditions that affect RBC aggregation. It presents the two hypotheses—the bridging model and the depletion model—that provide potential mechanisms for the adhesive forces that lead to the regular packing of the cells in rouleaux formations. The book also reviews the methods used to quantify RBC aggregation in vitro, focusing on their importance in clinical practice. Chapters discuss the effect of RBC aggregation on the in vitro rheology of blood as well as on tube flow. The book also looks at what happens in the circulation when red blood cells aggregate and examines variations due to physiological and pathophysiological challenges. The concluding chapter explores the formation of red blood cell aggregates in other mammals. Written by leading researchers in the field, this is an invaluable resource for basic science, medical, and clinical researchers; graduate students; and clinicians interested in mammalian red blood cells.

Biofluid Mechanics (Second Edition) Springer Nature
Introductory Biomechanics is a new, integrated text written specifically for engineering students. It provides a broad overview of this important branch of the rapidly growing field of bioengineering. A wide selection of topics is presented, ranging from the mechanics of single cells to the dynamics of human movement. No prior biological knowledge is assumed and in each chapter, the relevant anatomy and physiology are first described. The biological system is then analyzed from a mechanical viewpoint by reducing it to its essential elements, using the laws of mechanics and then tying mechanical insights back to biological function. This integrated approach provides students with a deeper understanding of both the mechanics and the biology than from qualitative study alone. The text is supported by a wealth of illustrations, tables and examples, a large selection of suitable problems and hundreds of current references, making it an essential textbook for any biomechanics course.

Mechanics of Human Joints Academic Press

This book provides a balanced presentation of the fundamental principles of cardiovascular biomechanics research, as well as its valuable clinical applications. Pursuing an integrated approach at the interface of the life sciences, physics and engineering, it also includes extensive images to explain the concepts discussed. With a focus on explaining the underlying principles, this book examines the physiology and mechanics of circulation, mechanobiology and the biomechanics of different components of the cardiovascular system, in-vivo techniques, in-vitro techniques, and the medical applications of this research. Written for undergraduate and postgraduate students and including sample problems at the end of each chapter, this interdisciplinary text provides an essential introduction to the topic. It is also an ideal reference text for researchers and clinical practitioners, and will benefit a wide range of students and researchers including engineers, physicists, biologists and clinicians who are interested in the area of cardiovascular biomechanics.

Fluid Mechanics BoD - Books on Demand

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.

Biomechanics of Soft Tissues CRC Press

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

Biofluid Mechanics CRC Press

Many of the topics in inviscid fluid dynamics are not only vitally important mechanisms in everyday life but they are also readily observable without any need for instrumentation. It is therefore stimulating when the mathematics that emerges when these phenomena are modelled is novel and suggestive of alternative methodologies. This book provides senior undergraduates who are already familiar with inviscid fluid dynamics with some of the basic facts about the modelling and analysis of viscous flows. It clearly presents the salient physical ideas and the mathematical ramifications with exercises designed to be an integral part of the text. By showing the basic theoretical framework which has developed as a result of the study of viscous flows, the book should be ideal reading for students of applied mathematics who should then be able to delve further into the subject and be well placed to exploit mathematical ideas throughout the whole of applied science.

Biomechanics CRC Press

Biofluid Mechanics is a thorough 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

Fundamentals of Biomedical Transport Processes Springer Science & Business Media

Mary D. Frame

Blood Flow Models Springer

Addresses external biofluid dynamics concerning animal locomotion and internal biofluid dynamics concerning heat and mass transport.

Red Blood Cell Aggregation McGraw Hill Professional

This reference work brings together the biology, mechanics, neurophysiology and pathophysiology of diseased joints, illustrates available physiologically-based treatments for osteoarthritis and explains how and when to use them.; Highlighting the most up-to-date biomechanical principles, *Mechanics of Human Joints*: discusses the functional anatomy of joints; relates the neurophysiology of joints to ligamentous reconstruction; elucidates the pathophysiology of osteoarthritis; summarizes the latest information on muscle physiology and electromyography; examines the effect of vibration and impulsive loading on joint pathology; and explicates the principles of prosthetic joint replacement.

Viscous Flow CRC Press

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.

Cardiovascular Mechanics Academic Press

THEORY AND PRACTICE OF MODELING AND SIMULATING HUMAN PHYSIOLOGY Written by a coinventor of the Human Patient Simulator (HPS) and past president of the Society in Europe for Simulation Applied to Medicine (SESAM), *Modeling and Simulation in Biomedical Engineering: Applications in Cardiorespiratory Physiology* is a compact and consistent introduction to this expanding field. The book divides the modeling and simulation process into five manageable steps--requirements, conceptual models, mathematical models, software implementation, and simulation results and validation. A framework and a basic set of deterministic, continuous-time models for the cardiorespiratory system are provided. This timely resource also addresses advanced topics, including sensitivity analysis and setting model requirements as part of an encompassing simulation and simulator design. Practical examples provide you with the skills to evaluate and adapt existing physiologic models or create new ones for specific applications. Coverage includes: Signals and systems Model requirements Conceptual models Mathematical models Software implementation Simulation results and model validation Cardiorespiratory system model Circulation Respiration Physiologic control Sensitivity analysis of a cardiovascular model Design of model-driven acute care training simulators "Uniquely qualified to author such a text, van Meurs is one of the original developers of CAE Healthcare's Human Patient Simulator (HPS). ...His understanding of mathematics, human physiology, pharmacology, control systems, and systems engineering, combined with a conversational writing style, results in a readable text. ...The ample illustrations and tables also break up the text and make reading the book easier on the eyes. ...concise yet in conversational style, with real-life examples. This book is highly recommended for coursework in physiologic modeling and for all who are interested in simulator design and development. The book pulls all these topics together under one cover and is an important contribution to biomedical literature." --IEEE Pulse, January 2014 "This book is written by a professional engineer who is unique in that he seems to have a natural understanding of 3 key areas as follows: the hardware involved with simulators, human physiology, and mathematical modeling. Willem van Meurs is one of the inventors of the model-driven human patient

simulator (HPS), and so, he is very qualified to write this book. The book is written in a clear way, using the first person throughout, in a conversational manner, with a style that involves posing questions and answering them in subsequent text. ...The book starts with a very useful introduction and background chapter, setting out the scene for the rest of the book. ...I have used his book in enhancing my own talks and understanding human patient simulation and can strongly recommend it." -- Simulation in Healthcare December, 2012 Reviewed by Mark A. Tooley, Ph.D., Department of Medical Physics and Bioengineering, Royal United Hospital, Combe Park, Bath, UK.

Biofluid Dynamics Springer

Suitable for both a first or second course in fluid mechanics at the graduate or advanced undergraduate level, this book presents the study of how fluids behave and interact under various forces and in various applied situations - whether in the liquid or gaseous state or both.

Fluid Mechanics Cambridge University Press

This book discusses geometric and mathematical models that can be used to study fluid and structural mechanics in the cardiovascular system. Where traditional research methodologies in the human cardiovascular system are challenging due to its invasive nature, several recent advances in medical imaging and computational fluid and solid mechanics modelling now provide new and exciting research opportunities. This emerging field of study is multi-disciplinary, involving numerical methods, computational science, fluid and structural mechanics, and biomedical engineering. Certainly any new student or researcher in this field may feel overwhelmed by the wide range of disciplines that need to be understood. This unique book is one of the first to bring together knowledge from multiple disciplines, providing a starting point to each of the individual disciplines involved, attempting to ease the steep learning curve. This book presents elementary knowledge on the physiology of the cardiovascular system; basic knowledge and techniques on reconstructing geometric models from medical imaging; mathematics that describe fluid and structural mechanics, and corresponding numerical/computational methods to solve its equations and problems. Many practical examples and case studies are presented to reinforce best practice guidelines for setting high quality computational models and simulations. These examples contain a large number of images for visualization, to explain cardiovascular physiological functions and disease. The reader is then exposed to some of the latest research activities through a summary of breakthrough research models, findings, and techniques. The book's approach is aimed at students and researchers entering this field from engineering, applied mathematics, biotechnology or medicine, wishing to engage in this emerging and exciting field of computational hemodynamics modelling.

Biofluid Mechanics Academic Press

Biomechanics: Principles and Applications offers a definitive, comprehensive review of this rapidly growing field, including recent advancements made by biomedical engineers to the understanding of fundamental aspects of physiologic function in health, disease, and environmental extremes. The chapters, each by a recognized leader in the field, address

Heat Transfer and Fluid Flow in Biological Processes CRC Press

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 World Scientific

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 ex

Introductory Biomechanics Cambridge University Press

Biofluidics 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. *Biofluid 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.

Biofluid Mechanics CRC Press

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.

Computational Hemodynamics - Theory, Modelling and Applications Springer

Heat Transfer and Fluid Flow in Biological Processes covers emerging areas in fluid flow and heat transfer relevant to biosystems and medical technology. This book uses an interdisciplinary approach to provide a comprehensive prospective on biofluid mechanics and heat transfer advances and includes reviews of the most recent methods in modeling of flows in biological media, such as CFD. Written by internationally recognized researchers in the field, each chapter provides a strong introductory section that is useful to both readers currently in the field and readers interested in learning more about these areas. *Heat Transfer and Fluid Flow in Biological Processes* is an indispensable reference for professors, graduate students, professionals, and clinical researchers in the fields of biology, biomedical engineering, chemistry and medicine working on applications of fluid flow, heat transfer, and transport phenomena in biomedical technology. - Provides a wide range of biological and clinical applications of fluid flow and heat transfer in biomedical technology - Covers topics such as electrokinetic transport, electroporation of cells and tissue dialysis, inert solute transport (insulin), thermal ablation of cancerous tissue, respiratory therapies, and associated medical technologies - Reviews the most recent advances in modeling techniques

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