[MOBI] Cardiovascular Soft Tissue Mechanics

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Cardiovascular Soft Tissue Mechanics - Stephen C. Cowin - 2007-05-08
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Biomechanical Systems - Cornelius T. Leondes - 2019-03-28
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The imaging of moving organs such as the heart, in particular, is a real challenge because of its movement. This book presents current and emerging methods developed for the acquisition of images of moving organs in the five main medical imaging modalities: conventional X-rays, computed tomography (CT), magnetic resonance imaging (MRI), nuclear imaging and ultrasound. The availability of dynamic image sequences allows for the qualitative and quantitative assessment of an organ’s dynamics, which is often linked to pathologies.

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mechanics and more advanced background related to differential geometry, configurational mechanics, mechanics of growth, thermodynamics of open systems and homogenization methods is given in separate chapters. Numerical aspects are treated in detail, and simulations are presented to illustrate models. This book is intended for graduate students and researchers in biomechanics interested in the latest research developments, as well as those who wish to gain insight into the field of biomechanics. Provides a clear exposition of multiscale methods for fibrous media based on discrete homogenization and the consideration of generalized continua constitutive models for bone Presents recent theoretical and numerical advances for bone remodeling and growth Includes the necessary theoretical background that is exposed in a clear and self-contained manner Covers continuum mechanics and more advanced background related to differential geometry, configurational mechanics, mechanics of growth, thermodynamics of open systems and homogenization methods

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Continuum Mechanics - Volume I - José Merodio - 2011-11-30
The main objective of continuum mechanics is to predict the response of a body that is under the action of external and/or internal influences, i.e. to capture and describe different mechanisms associated with the motion of a body that is under the action of loading. A body in continuum mechanics is

considered to be matter continuously distributed in space. Hence, no attention is given to the microscopic (atomic) structure of real materials although non-classical generalized theories of continuum mechanics are able to deal with the mesoscopic structure of matter (i.e. defects, cracks, dispersive lengths,). Matter occupies space in time and the response of a body in continuum mechanics is restricted to the Newtonian space-time of classical mechanics in this volume. Einstein's theory of relativity is not considered. In the classical sense, loading is considered as any action that changes the motion of the body. This includes, for instance, a change in temperature or a force applied. By introducing the concept of configurational forces a load may also be considered as a force that drives a change in the material space, for example the opening of a crack. Continuum mechanics refers to field descriptions of phenomena that are usually modeled by partial differential equations and, from a mathematical point of view, require non-standard knowledge of non-simple technicalities. One purpose in this volume has been to present the different subjects in a self-contained way for a general audience. The organization of the volume is as follows. Mathematically, to predict the response of a body it is necessary to formulate boundary value problems governed by balance laws. The theme of the volume, that is an overview of the subject, has been written with this idea in mind for beginners in the topic. Chapter 1 is an introduction to continuum mechanics based on a one-dimensional framework in which, simultaneously, a more detailed organization of the chapters of this volume is given. A one-dimensional approach to continuum mechanics in some aspects maybe misleading since the analysis is oversimplified. Nevertheless, it allows us to introduce the subject through the early basic steps of the continuum analysis for a general audience. Chapters 3, 4 and 5 are devoted to the mathematical setting of continuum analysis: kinematics, balance laws and thermodynamics, respectively. Chapters 6 and 7 are devoted to constitutive equations. Chapters 8 and 9 deal with different issues in the context of linear elastostatics and linear elastodynamics and waves, respectively, for solids. Linear Elasticity is a classical and central theory of continuum mechanics. Chapter 10 deals with fluids while chapter 11 analyzes the coupled theory of thermoelasticity. Chapter 12 deals with nonlinear elasticity and its role in the continuum framework. Chapters 13 and 14 are dedicated to different applications of solid and fluid mechanics, respectively. The rest of the chapters involve some advanced topics. Chapter 15 is dedicated to turbulence, one of the main challenges in fluid mechanics. Chapter 16 deals with electro-magneto active materials (a coupled theory). Chapter 17 deals with specific ideas of soft matter and chapter 18 deals with configurational forces. In chapter 19, constitutive equations are introduced in a general (implicit) form. Well-posedness (existence, time of existence, uniqueness, continuity) of the equations of the mechanics of continua is an important topic which involves sophisticated mathematical machinery. Chapter 20 presents different analyses related to these topics. Continuum Mechanics is an interdisciplinary subject that attracts the attention of engineers, mathematicians, physicists, etc., working in many different disciplines from a purely scientific environment to industrial applications including biology, materials science, engineering, and many other subjects.

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Biomechanics - Donald R. Peterson - 2007-09-25
Traditionally, applications of biomechanics will model system-level aspects of the human body. As a result, the majority of technological progress to date appears in system-level device development. More recently, biomechanical initiatives are investigating biological sub-systems such as tissues, cells, and molecules. Fueled by advances in experimental methods and instrumentation, these initiatives, in turn, directly drive the development of biological nano- and microtechnologies. A complete, concise reference, Biomechanics integrates coverage of system and sub-system models, to enhance overall understanding of human function and performance and open the way for new discoveries. Drawn from the third edition of the widely acclaimed and bestselling The Biomedical Engineering Handbook, this is a comprehensive, state-of-the-science resource concerning the principles and applications of biomechanics at every level. The book presents substantial updates and revisions from the Handbook’s previous editions, as well as an entirely new chapter introducing current methods and strategies for modeling cellular mechanics. Organized in a systematic manner, the book begins with coverage of musculoskeletal mechanics including hard- and soft tissue and joint mechanics and their applications to human function. Contributions explore several aspects of biofluid mechanics and cover a wide range of circulatory dynamics such as blood vessel and blood cell mechanics and transport. Other topics include the mechanical functions and significance of the human ear and the performance characteristics of the human body during exercise and exertion. The book contains more than 140 illustrations, 60 tables, and a variety of useful equations to assist in modeling biomechanical behaviors. Incorporating material across the breadth of the field, Biomechanics is a complete, concise reference for the skilled professional as well as an introduction to the novice or student of biomedical engineering.

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