Mechanics of Cellular Bone Remodeling: Coupled Thermal, Electrical, and Mechanical Field Effects

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Research on bone remodeling has resulted in much new information and has led to improvements in design and biomedical practices. **Mechanics of Cellular Bone Remodeling: Coupled Thermal, Electrical, and Mechanical Field Effects** presents a unified exploration of *recent advances, giving readers a sound understanding* of bone remodeling and its mathematical representation.

Beginning with a description of the basic concept of bone remodeling from a mathematical point of view, the book details the development of each of the techniques and ideas. From there it progresses to the derivation and construction of multifield and cellular bone remodeling and shows how they arise naturally in response to external multifield loads. Topics include:

- Fundamental concepts and basic formulations for bone remodeling
- Applications of formulations to multifield internal bone remodeling of inhomogeneous long cylindrical bone
- Theory and solution of multifield surface bone remodeling
- A hypothetical regulation mechanism on growth factors for bone modeling and remodeling under multifield loading
- The RANK–RANKL–OPG pathway and formulation for analyzing the bone remodeling process
- A model of bone cell population dynamics for cortical bone remodeling under mechanical and pulsed electromagnetic stimulus
- Recent developments in experiments with bone materials

Readers will benefit from the thorough coverage of general principles for each topic, followed by detailed mathematical derivations and worked examples, as well as tables and figures where appropriate. The book not only serves as a reliable reference but is also destined to attract interested readers and researchers to a

field that offers fascinating and technologically important challenges.

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