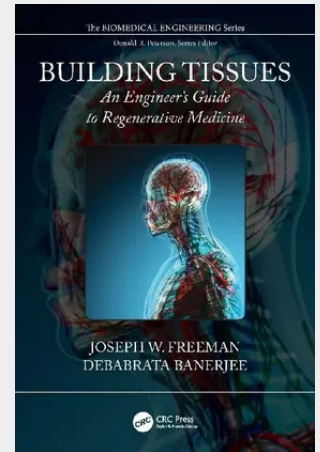


Building Tissues

An Engineer's Guide to Regenerative Medicine

Tissue engineering uniquely applies concepts and techniques from biology and engineering in order to heal or produce new tissues after disease or traumatic injury. A successful tissue engineer must have knowledge of cellular biology, cell signaling, extracellular matrix development, and tissue structure and integrate it with the application of stresses and strains, mass transfer, mechanical properties, and heat transfer. In order to train the next generation of successful tissue engineers, this text gives the reader a background in both the engineering and biology associated with tissue engineering. In reading this text, students will learn about these two different areas of study and how they can be integrated with one another to understand tissues in the human body and solve biomedical problems. - Students will be introduced to definitions of engineering concepts, the practical use of stress-strain relationships, material strength, mass transfer, and heat transfer. - Through examples and problems, students will apply engineering equations to medical and biomedical situations including actual tissue engineering problems. - Students will be introduced to a variety of cell and tissue types and be given the background information necessary to apply the use of cells to the growth and development of new tissues. - Students will learn how to select the proper material for the replacement of a particular tissue and why it is important to know about the mechanical properties and degradability of a material prior to implantation. - Students will learn how the application of force, material selection, and changes in temperature can positively or negatively affect cell behavior and tissue development. - Tissue structure will be described and students will learn about the direct relationship between the structure of a tissue and its properties.



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