

Preface

This book is dedicated to my parents, who are no longer in this mortal world, but whose love and care inspired me to break newer grounds and introduce the study of, and research in, biomedical engineering at Jadavpur University at the postgraduate level in the School of Bioscience and Engineering.

Biomedical engineering is the study of the human machine in health and disease. The human organ system is vast, and this text is intended to discuss the basics of the normal systems preciously. Due to aging, diseases, or trauma, body parts may need to be replaced appropriately with surgical intervention using manmade materials.

The human body has all the characteristics of a wonderful machine, but it is much more than a machine. The movement of the body generates forces in various work situations and also internally at various joints, muscles, and ligaments. It is essential to figure out the forces' moments, pressure, and so forth, which are usually dealt with in biomechanics. The mechanical characterizations of the hard and soft tissues are presented systematically using the principles of solid mechanics. The viscoelastic properties of the tissue, unlike many engineering materials, are also discussed.

The design science and methodology are essential from the concept to the realization of the blueprint of the component required to be replaced. Then that blueprint begins its transformation into a product. That is the manufacturing aspect of the prosthesis. We have discussed that in Chap. 24. Young readers need to visit some factories that have casting, forging, and sophisticated facilities for machining using computerized numerically controlled machineries. The market is open, and implants and artificial endoprostheses constitute a huge worldwide market. India's contribution is too little and may be improved to a great extent. This is discussed in Chap. 23.

This book will also serve as a text for students of mechanical engineering and biomedical engineering. The pedagogy is simple enough for those who are learning the subject for the first time.

Many materials were collected from the Internet and are open source for use in this text. I acknowledge with grateful thanks those great peers, researchers spread all over the world. Some of their excellent illustrations and great ideas on Wikipedia were used for the development of this subject area, and I acknowledge them with heartfelt thanks.

I also acknowledge with grateful thanks Prof. S. Guha, Chair Professor of Bio-Engineering at IIT, Kharagpur, for providing input for artificial heart design and Prof. C. P. Sharma of Srichitra Institute of Medical Sciences for his encouragement.

I also express my heartfelt thanks to my previous Ph.D. scholars, who now have faculty positions at different IITs, BESU, and colleges in India and the United States for their technical and intellectual input since we started working in this exciting area in 1980 in the U.S. Thanks are due to all my beloved technical staff of the School of Bioscience and Engineering, which was built through years of painstaking hard labor.

I had the opportunities to work in medical school in USA and in India and interact with professionals which helped me to visualise the requirement for this book.

I also thank my wife and daughter for their forbearance and understanding during the long hours of my absence from home, even during holidays, while I was preparing the text. Thanks are due to Saibal Mandal for his careful preparation of the typescript several times.

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