Book Review

Biomedical Device Technology Principles and Design, (3rd Edition)
Anthony Y.K. Chan
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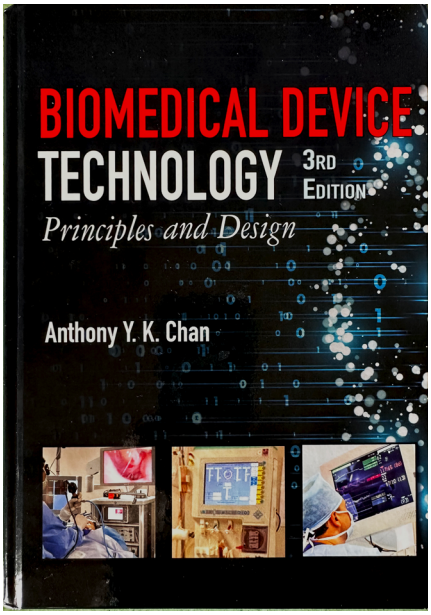
In our continuous efforts to encourage sharing of knowledge and publication of engineering and scientific work related to the clinical engineering field, we were invited to review this newly published book. We hope that you will find it helpful to your career and at the same time promote the submission of other books for review by our community experts who serve the benefit of all our readers.

Biomedical Device Technology Principles and Design, (3rd Edition), by Anthony Y.K. Chan, ISBN 978-0-398-09392-1 (hard copy), ISBN 978-0-398-09393-8 (ebook), Charles C Thomas, Publisher, LTD., Published February 2023. Price $79.95US. Biomedical Device Technology: Principles and Design: 9780398093921: Medicine & Health Science Books @ Amazon.com (last visited on April 26, 2023).



This book review is a combined summary of three practitioners from the Clinical Engineering global community. An academician, a national health technology and quality manager, and an international consultant. For this purpose, Charles C Thomas Publisher, LTD., provided copies of the books to the reviewers. The author - Dr. Anthony Chan is a well-qualified Professional Engineer, a Chartered Engineer, and a Certified Clinical Engineer. He holds a Ph.D. in Biomedical Engineering and a Certificate in Health Services Management. During his career, he has presented and published in both domestic and international congresses, on safety, risk management and technology management. In the Preface section of the book, the author writes that "This book focuses on applications, functions and principles of medical devices... and uses specific designs and constructions to illustrate the concepts where appropriate."

The primary function of this book is to describe the basic working principles of medical devices used for diagnostic and therapeutic in the healthcare area, though imaging equipment is not included. For a better understanding of the equipment working principles, the author presents a brief but sufficient description of the physiologic parameters and transducers used for the measurements of these parameters for each of the devices described in the book. Some mathematical concepts are introduced to help the understanding of the capturing and processing system used by these devices.

In addition to the Preface, the book is organized into four parts consisting of 38 chapters, four appendices, an interesting set of review questions, and an index for a

total of 901 pages. Part I – Presents a miscellaneous set of basic concepts about; how to classify medical devices, biopotentials, physiological signals, safety, biocompatibility, human factors, and several other subjects. In fact, the author's intention is to lay the foundation and prepare the reader for what is going to be presented in the following chapters of the book. It also includes an introductory explanation of the mathematical concepts related to error measurements, signal processing, and analysis. Such concepts can help the reader to have a better general understanding of the scientific instrumentation foundation involved in medical devices.

Part II – Presents a wide variety of transducers used by medical devices. It is divided into eight chapters dedicated to explaining several specific types of transducers. Each chapter presents a quite didactic explanation of the operating principles of: pressure and force transducers; temperature transducers; position and motion transducers; flow transducers; optical transducers; electrochemical transducers; and biopotential electrodes. Each chapter provides an educative concept about transducers that are not only used in medicine but in a wide range of measuring instruments used from maritime exploration to kitchen devices.

Part III – Has three chapters that bring the concept of building blocks of medical devices and explain the basics and most common electronic circuit used to capture and process the electrical signals sensed by the transducer and the associated instrumentation amplifier. This part also discusses issues related to electrical shock hazards, including macro and micro shocks, grounded and isolated power systems, and methods to reduce electrical hazards.

Part IV – Presents a total of 24 medical devices, generally explaining their applications, basic building blocks, different applications for the device, and common problems and hazards. It is not an extensive but sufficient description for the reader to understand the device well. An added feature is that in addition, each device has a specific description of issues that helps the reader to better understand its working principles. This section also presents a dedicated set of bibliographic references for each piece of equipment. Like previous sections of the book, most of the references noted material up to 2016 from when the 2nd edition was published. As the author writes in the Preface "…medical devices have a life span of about 5 to 7 years." which suggests that more recent references will add to the readers' knowledge.

The book also contains four appendices where the first presents a primer on Fourier analysis, the second an overview of Telemetry development, the third is about medical gas supply systems, and the fourth offers an explanation of the concepts of surgical asepsis and device infection control.

Complementing the book, the author elaborated with a list of review questions, one set for each of the chapters previously presented. In general, it is a very useful foundation of design and principles of devices that are used within and outside the healthcare environment and is useful for the training of clinical and biomedical engineers. Some important technological areas, such as digital health or mechanical ventilation are omitted. COVID-19 pandemic instrumentation like CPAP and oxygen concentrators are limited or missing.

We like the structure of the book content and note that the book delivers fair depth and scope well-suited for academic programs. However, the book could be strengthened by offering more recent references than those already included in the 2nd Edition, and more recent applications of pandemic-related devices.