

READING ROOM

A Useful Resource For Biomedes



Biomedical Device Technology: Principles and Design

Author: Anthony Y. K. Chan

Publisher: Charles C. Thomas

ISBN: 978-0-398-07699-3
(hard bound)

Publication date: 2008

Pages: 594

Price: \$115

About the Reviewer



Matthew F. Baretich, CCE, PE, PhD, is president of Baretich Engineering, Inc., in Fort Collins, CO. E-mail: mfb@baretich.com.

This new book by Anthony Y. K. Chan provides valuable information about the design and principles of operation for a wide variety of medical devices. It can serve as an introductory text for students and as a reference for practicing clinical engineers and biomedical equipment technicians.

Audience: *Biomedical Device Technology* is “written for engineers and technologists who are interested in understanding the principles, design and applications of medical device technology” and “also intended to be used as a textbook or reference for biomedical device technology courses in universities and colleges.”

The author is program head of the Biomedical Engineering Technology Program at the British Columbia Institute of Technology and has an appointment in the University of British Columbia. He has also practiced clinical engineering in Canadian hospitals and is a licensed professional engineer and a certified clinical engineer. The combination of academic and hospital experience gives the author a unique perspective from which to address this topic.

Features: After some introductory material, and before some useful appendices, the book is divided into three major sections. The first section covers “Biomedical Transducers.” This is all about turning physical phenomena into electronic signals for processing within biomedical devices. Sensors for pressure, force, temperature, motion, and flow are addressed, as are optical, electrochemical, and biopotential transducers. Each topic is covered at a fairly basic level, using text and diagrams to present the key concepts.

Curiously, in this section and throughout the book, no references or bibliography are provided. In the classroom, this may not be

problematic because additional resources can be made available as needed. However, I found the lack of suggestions for further reading to be a significant limitation. Of course, it’s easy enough these days to do online searches of the literature, but I missed having the author’s guidance toward the best material. Happily, personal communication with the author reveals that the next edition is likely to include more material along these lines.

The next section addresses “Fundamental Building Blocks of Medical Instrumentation.” This includes biopotential amplifiers that increase the transducer outputs to a level that can be more easily processed. In this second section, I had hoped to find more discussion about digital signal processing and other computer-related topics. Nowadays, as we are all acutely aware, many medical devices are essentially digital computers with specialized inputs (the transducers discussed above) and specialized outputs, such as waveform displays and other means of presenting information to and interacting with device users. And, as digital computers, they are often networked together, receiving and sending information to other devices. I would have liked to find an introductory discussion of this convergence of medical technology and information technology.

The third and largest section of the book, “Medical Devices,” is a series of chapters on specific types of medical equipment. These two dozen chapters cover an array of devices for diagnosis, therapy, life support, and monitoring.

Each device type gets a dozen or so pages of text and figures. That’s enough to give the reader a basic understanding about how the devices work. Of particular value is the author’s highlighting of underlying principles and key design

issues. One of the major challenges for a book of this type is keeping up with changes in technology. As a result, such books will always be a step or two behind the state of the art. But a book that is well written, as this one is, will give the reader a solid foundation on which to build his or her understanding of the latest advances.

Assessment: So how well does the book meet the needs of its intended audiences? As a classroom text, it provides a wealth of basic information across a wide range of medical devices. In the absence of references within the book itself, it will be essential to supply students with a strong array of supplemental resources.

For practicing clinical engineers and biomedical equipment technicians, the lack of references limits the book's value. It can be used to refresh one's memory about basic concepts, but we're on our own if we want to know more. Nevertheless, it's a useful "quick reference" resource for practitioners and could be very helpful, for example, to people studying for a certification exam.

I am not a professional educator, but with the confidence of the ignorant I will take this

opportunity to suggest something that has come to mind many times during my years of clinical engineering practice. As would be expected, textbooks on medical devices describe how those devices work. But I'd also like to see textbooks describe how those devices fail. Each type of device has characteristic failure modes and distinctive ways in which it can fall short of its intended function.

Knowing about how things go wrong can improve the design of devices, enhance our ability to repair them when they fail, inform our efforts to mitigate the impact of failures on patients and staff, and guide our investigation of incidents that, despite our best efforts, have caused harm. It's important in our profession to know how things work and how they don't.

Chan has produced an excellent introductory text that covers a wide range of medical devices. It has the potential to become even more valuable by including recommendations for further reading. I'm looking forward to adding the second edition to my book shelf alongside this strong first edition. ■

Top Selling AAMI Standards...What Did You Miss?

1 ANSI/AAMI ST79:2010 and A1:2010, *Comprehensive guide to steam sterilization and sterility assurance in health care facilities (Consolidated Text)*
Order Code: ST79 or ST79-PDF

2 ANSI/AAMI/ISO 13485:2003/(R)2009, *Medical devices - Quality management systems - Requirements for regulatory purposes*
Order Code: 13485 or 13485-PDF

3 ANSI/AAMI/IEC 80001-1:2010, *Application of risk management for IT Networks incorporating medical devices - Part 1: Roles, responsibilities and activities*
Order Code: 8000101 or 8000101-PDF

4 AAMI TIR12:2010, *Designing, testing and labeling reusable medical devices for reprocessing in health care facilities: A guide for medical device manufacturers*
Order Code: TIR12 or TIR12-PDF

5 AAMI TIR30:2003, *A compendium of processes, materials, test methods, and acceptance criteria for cleaning reusable medical devices*
Order Code: TIR30 or TIR30-PDF

6 ANSI/AAMI ST58:2005/(R)2010, *Chemical sterilization and high-level disinfection in health care facilities*
Order Code: ST58 or ST58-PDF

7 ANSI/AAMI HE75:2009, *Human factors engineering - Design of medical devices*
Order Code: HE75 or HE75-CD

8 ANSI/AAMI/ISO 14155:2011, *Clinical investigation of medical devices for human subjects*
Order Code: 14155 or 14155-PDF

9 ANSI/AAMI/ISO 14971:2007, *Medical devices—Application of risk management to medical devices*
Order Code: 14971 or 14971-PDF

10 AAMI TIR42:2010, *Evaluation of particulates associated with vascular medical devices*
Order Code: TIR42 or TIR42-PDF

SOURCE CODE: PB



Call +1-877-249-8226 or visit <http://marketplace.aami.org>