Book Review

Medical Device Technologies: A Systems Based Overview Using Engineering Standards, 2nd ed.

By Gail Baura, Academic Press, 2020, ISBN: 9780128119846, xxxi + 620 pages, $125

As indicated and implied by the title, this text covers medical device technologies using a practical (engineering) systems approach to medical devices. The author, by virtue of her academic and industrial experiences, is professionally and experientially qualified to present this material to the readers. Medical imaging systems are excluded (per the author), as many programs offer a separate course in this area.

The text contains 20 chapters of medical device system reviews, followed by 11 chapters of suggested relevant laboratory experiments.

Each of the 20 chapters has roughly the same structural coverage of material. Each covers device clinical need and history, relevant engineering technology, standards, and requirements (FDA, AAMI, etc.), and relevant physiological system overview (and models) as needed. Each of the 20 chapters begins with a discussion of the objectives for the chapter, followed by the body of the text, a summary, acknowledgment of contributing reviewers, a series of homework exercises, and a list of references. Eighteen of the chapters are medical device (mechanical and/or electrical in nature), and two cover combination products.

Chapter 1 gives an overview of diagnosis and therapy devices, discussing sensing, and data acquisition. Seven following chapters overview cardiac and circulatory system related devices: electrocardiographs (2), pacemakers (3), external (4) and implantable cardioverter defibrillators (5), heart valves (6), blood pressure monitors (7), and catheters, stents, and grafts (8). Other system–device chapter listings covered follow: renal system: hemodialysis delivery system (9); respiratory: mechanical ventilators (10); pulmonary/circulatory/cardiac: pulse oximeters (11); metabolic: thermometers (12); brain/nervous: electroencephalographs (13) and deep brain stimulators (14); auditory: cochlear implants (15); nervous system: functional electrical systems (16); visual: intraocular lens implants (17); ambulatory: total hip prostheses (18); circulatory: drug eluting stents (19); and metabolic: artificial pancreas (20).

The final 11 chapters are lab experiments aimed at giving some exposure to some of the earlier material, as well as ensuring the some of the relevant laboratory exposure required by ABET for Biomedical Engineering requirements is covered. Laboratories include ECG electrode verification (21), ECG design (22), ECG filtering (23), pacemaker programming lab (24), echocardiography (25), patient monitoring (26), thermometry (27), energy balance (28), surface characterization (29), entrepreneurship (30), and engineering ethics (31). Access to the correct instrumentation is needed, however, such as for chapters 24 (pacemaker programmer and wand), 25 (ultrasound system), 28 (wattmeter), and 29 (scanning electron microscope).

Placement of a course using this text would be ideally prior to or at the beginning of the senior design experience, and after or in planned conjunction with a systems physiology course. It therefore could be used (dependent on your course sequences) between second-semester sophomore year and first semester senior year.

Available in text or e-book form, this text is highly recommended for consideration for use in undergraduate biomedical education. ■

—Review by Paul H. King
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