Introduction to Biomechatronics (Materials, Circuits and Devices)

Graham Brooker

Introduction to Biomechatronics (Materials, Circuits and Devices)

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This is the age of biomechatronics, a time where mechanics and electronics can interact with human muscle, skeleton, and nervous systems to assist or replace limbs, senses, and even organs damaged by trauma, birth defects, or disease. *Introduction to Biomechatronics* provides biomedical engineering students and professionals with the fundamental mechatronic (mechanics, electronics, robotics) engineering knowledge they need to analyze and design devices that improve lives. The first half of the book provides the engineering background to understand all the components of a biomechatronic system: the human subject, stimulus or actuation, transducers and sensors, signal conditioning elements, recording and display, and feedback elements. It also includes the major functional systems of the body to which biomechatronics can be applied including: biochemical, nervous, cardiovascular, respiratory, and musculoskeletal. The second half discusses five broadly based inventions from a historical perspective and supported by the relevant technical detail and engineering analysis. It begins with the development of hearing prostheses including middle-ear implantable hearing devices and the amazingly successful cochlear implant. This is followed by sensory substitution and visual prostheses that researchers hope will do the same for the blind as the cochlear implant has done for the deaf. The last three chapters are more mechatronic in focus, examining artificial hearts, respiratory aids from the iron lung to the latest CPAP devices, and finally artificial limbs from the first hooks and peg legs to limbs that move and have a sense of touch. *Introduction to Biomechatronics* provides readers with the engineering background to analyze and design biomechatronic devices, and inspires them to greater designs by discussing successful inventions that have done the most to improve our lives.

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