



METADATA

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Abstract

The present book "Instrumentation and Techniques – With an emphasis on Bioengineering" is an attempt to introduce and provide deeper knowledge to the field of Biomedical Instrumentation. This multidisciplinary field includes instruments and measurement systems to acquire information from the human body. A combination of knowledge and technologies is required to study the structural, functional, mechanical, biological, and chemical properties of biosystems. The importance of biomedical measurements and instruments to human health and well-being makes it necessary for scientists to obtain sufficient knowledge of measurement techniques and sensors, electronic, optical, and electromagnetic, to understand Biomedical Instrumentation and its applications. The book covers commonly used biomedical instruments and components. It describes the physical principles underlying their operation, physical limitations, interaction with biosystems, and the extracted information. The method of measuring electrical quantities, their effect on the human body and the basic sensors

for mechanical quantities, temperature and measurement of chemical concentrations are presented. The operation of the ultrasound imaging and the acquired information are analyzed. In addition, the fundamental principles of optics are mentioned, and optical elements and their properties are described. The basic analytical optical instruments for acquiring information as signals or images are presented. More specifically, visible and UV absorption, fluorescence, Fourier transform infrared (FT-IR) and Raman spectroscopies are described and analyzed. The operation of various microscopes such as optical, fluorescence, confocal laser scanning, two-photon and atomic force microscopes are analyzed. The knowledge of the operation of biomedical instruments and devices will enable a scientist to design new, install, maintain, and repair biomedical instruments and provide technical assistance. It will also provide knowledge and skills for making the right decisions regarding the procurement of new instruments, considering their efficiency, effectiveness and safety.

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