Principles of ANALOG ELECTRONICS

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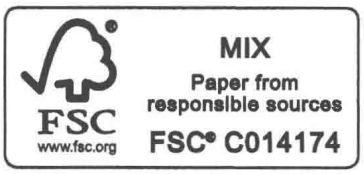

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We live in a world that does not tolerate the slightest grammatical mistake but indulges in the complete ignorance in scientific matters. Could this strange disparity perhaps be caused by the tumultuous scientific developments in the past few decades? Fortunately, there is a silver lining: for one who knows science, he or she potentially has the key to success in his or her hands.

Anyone who really knows electronics can design new ideas.

Preface

Anyone who knows electronics can create new ideas, and this book explores that possibility by focusing on analog electronics. This is because in the real world, signals are mostly analog, spanning continuously varying values, so that circuits interfaced with the physical world have an analog nature, to process analog signals.

The fascinating area of analog "grows" to overlap fundamental areas (fields, circuits, signals and systems, and semiconductors), here morphed into a self-consistent comprehensive book. This approach leads to a text that captures the big picture, while still providing the necessary details, to reduce knowledge fragmentation and to improve learning outcomes.

The presentation is accurate and clear, including appropriate examples and detailed explanations of the behavior of real electronic circuits.

The text is "humanized" not only because the important theorems and laws are treated, but also because we look at the people who fundamentally contributed to those. Curiosities (How did Google get its name? Why is it difficult to locate crickets in a field? Why does the violin bridge have that strange shape?, etc.), observations, and real life application-oriented examples (electrocardiogram instrumentation, active noise-canceling headphones, USB-powered charger, etc.) are provided to contribute to a practical approach.

The first part of the book includes a clear and thorough presentation of the mathematical (Chapter 1), physical (Chapter 2), and chemical concepts (Chapter 3) that are essential to understanding the principles of operation of electronic devices. This may be particularly useful for students with a limited background in basic matters who want to take a serious approach to electronics.

The circuit approach is detailed with models (Chapters 4, 5, 10) and main theorems (Chapter 6).

Passive and active electronic devices are described and analyzed, with specific reference to the fundamental filters (Chapter 7), and to the most common Si-based components such as diodes, BJTs, and MOSFETs (Chapters 4, 8). Semiconductor devices are then used to design electronic circuits, such as rectifiers, power suppliers, clamper and clipper circuits (Chapter 9). The main topologies of amplifiers based on BJTs (Chapter 11), and on MOSFETs (Chapter 12), along with their variants and improvements (Chapters 13, 14), are also discussed. Relevant or curious circuit applications are analyzed as well (Chapter 15).

At the end of each chapter, helpful summaries are provided, with key points, jargon, terms, and exercises with solutions also included.

Practical tables, often missing in many books on electronics, are included here to illustrate the coding schemes necessary to recognize commercial passive and active components.

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Giovanni Saggio earned a masters degree in electronics engineering and a PhD in microelectronics and telecommunication engineering at the University of Rome Tor Vergata.

He was offered one fellowship by Texas Instruments and two fellowships by the Italian National Research Council (CNR). He developed research on nanoelectronics at Glasgow University (Ultra Small Structure Lab), and on electronic devices at Cambridge University (Cavendish Lab), and Oxford University (Rutherford Appleton Lab). He has been a designer, planner, and director of electrical installations and security systems, as well as hydraulic systems.

Professor Saggio is currently a researcher and aggregate professor at the University of Rome Tor Vergata (Italy), where he holds chairs in electronics at the engineering faculty (Departments of Information, Automation, Mathematics, Biomedical Engineering, Master of Sound, and Master of CBRN Protection) and at the medical faculty (Departments of Neurophysiology, Cardiovascular Medicine, Orthopedics, and Audiology).

He has been working on problems concerning electronic noise, SAWs, and electronic sensors, and more recently, his research activity concerns the field of biotechnology.

Professor Saggio has been project leader of research for the Italian Space Agency (ASI), for the avionic service of the Italian Defence Department (Armaereo), and for the Italian Workers' Compensation Authority (INAIL). He is currently a member of Italian Space Biomedicine, and the founder and manager of HITEG (Health Involved Technical Engineering Group).

Professor Saggio has authored or co-authored more than 100 scientific publications for conferences and international journals, four patents, several book chapters, and is the sole author of three books (in Italian): *Basi di Elettronica* (three editions), *Applicazioni di Elettronica di Base*, and *Elettronica Analogica Fondamentale* (UniversItalia ed.).

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