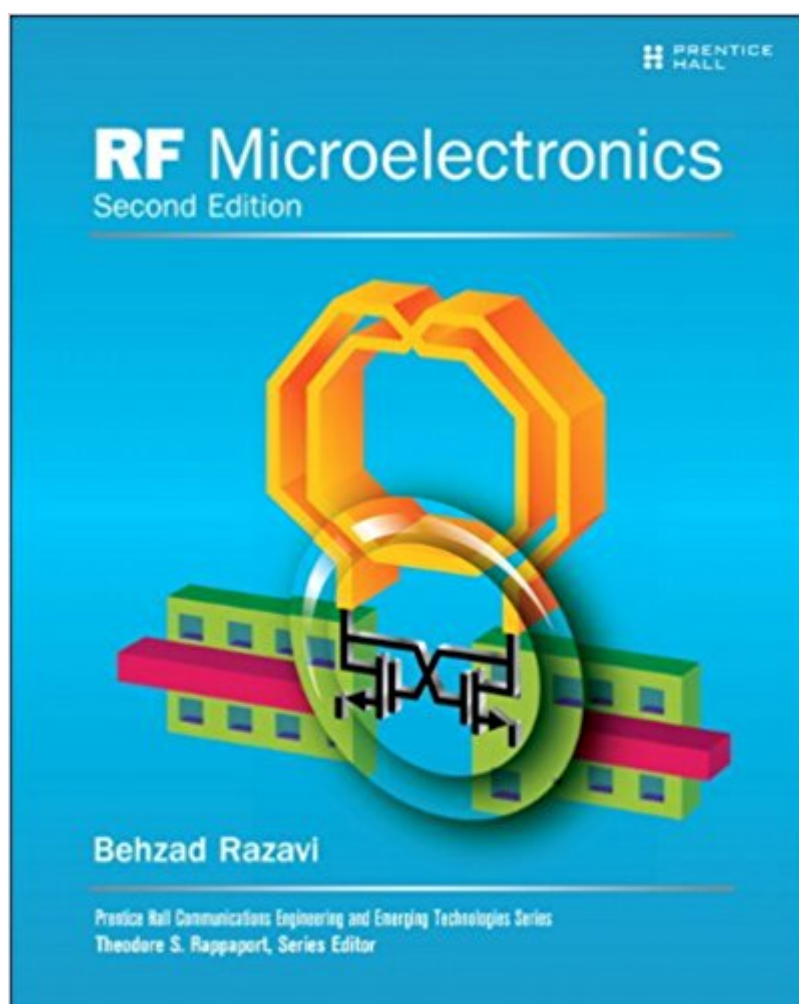


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# RF Microelectronics (2nd Edition) (Prentice Hall Communications Engineering And Emerging Technologies Series From Ted Rappaport)





## Synopsis

The Acclaimed RF Microelectronics Best-Seller, Expanded and Updated for the Newest Architectures, Circuits, and Devices

Wireless communication has become almost as ubiquitous as electricity, but RF design continues to challenge engineers and researchers. In the 15 years since the first edition of this classic text, the demand for higher performance has led to an explosive growth of RF design techniques. In *RF Microelectronics, Second Edition*, Behzad Razavi systematically teaches the fundamentals as well as the state-of-the-art developments in the analysis and design of RF circuits and transceivers. Razavi has written the second edition to reflect today's RF microelectronics, covering key topics in far greater detail. At nearly three times the length of the first edition, the second edition is an indispensable tome for both students and practicing engineers. With his lucid prose, Razavi now offers a stronger tutorial focus along with hundreds of examples and problems. Teaches design as well as analysis with the aid of step-by-step design procedures and a chapter dedicated to the design of a dual-band WiFi transceiver. Describes new design paradigms and analysis techniques for circuits such as low-noise amplifiers, mixers, oscillators, and frequency dividers. This edition's extensive coverage includes brand new chapters on mixers, passive devices, integer-N synthesizers, and fractional-N synthesizers. Razavi's teachings culminate in a new chapter that begins with WiFi's radio specifications and, step by step, designs the transceiver at the transistor level. Coverage includes Core RF principles, including noise and nonlinearity, with ties to analog design, microwave theory, and communication systems. An intuitive treatment of modulation theory and wireless standards from the standpoint of the RF IC designer. Transceiver architectures such as heterodyne, sliding-IF, directconversion, image-reject, and low-IF topologies. Low-noise amplifiers, including cascode common-gate and commonsource topologies, noise-cancelling schemes, and reactance-cancelling configurations. Passive and active mixers, including their gain and noise analysis and new mixer topologies. Voltage-controlled oscillators, phase noise mechanisms, and various VCO topologies dealing with noise-power-tuning trade-offs. All-new coverage of passive devices, such as integrated inductors, MOS varactors, and transformers. A chapter on the analysis and design of phase-locked loops with emphasis on low phase noise and low spur levels. Two chapters on integer-N and fractional-N synthesizers, including the design of frequency dividers. Power amplifier principles and circuit topologies along with transmitter architectures, such as polar modulation and outphasing.

## Book Information

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## Customer Reviews

Behzad Razavi, Professor of Electrical Engineering at UCLA, leads the Communication Circuits Laboratory (CCL). Emphasizing the use of mainstream CMOS technologies, CCL's research seeks and exploits new devices, circuits, and architectures to push the performance envelope. Razavi holds a BSEE from Sharif University of Technology and MSEE and PhDEE degrees from Stanford. He was with ATT Bell Laboratories and HP Labs until 1996. An IEEE Distinguished Lecturer and IEEE Fellow, his books include Design of Analog CMOS Integrated Circuits, Design of Integrated Circuits for Optical Communications, and Fundamentals of Microelectronics.

Well, as I stated in other Dr. Razavi's book reviews, it's my pleasure to own and read every book written by Dr. Razavi. I have been waiting for this new edition for some time, and immediately purchased this 2nd edition from .com once it's published. As an RF/analog engineer, I personally have benefited from all of his masterpieces. Many thanks for the author's great efforts, Dr. Razavi's books have influenced many engineers and students in the RF/analog area. So, how is this 2nd edition? In my opinion, it might be inappropriate to call it "2nd edition" as this is a completely new book with vast improvements from the 1st edition. We have experienced a rapid growth of RF design within last decade, and this book covers most of the fundamentals of RF circuit/system

design techniques to deal with today's challenges. It's understandable that some of the readers are not happy with the 1st edition in their reviews, but this new book is totally different (Dr. Razavi says there's only 10% overlap between two editions in his preface to the 2nd edition, it's absolutely true). Here is what I like most: 1. Dedicated chapters for LNA and mixers; 2. Great coverage on passive devices; 3. Three chapters to cover frequency synthesizers, which cover fundamentals, integer-N and fractional-N synthesizers; 4. Step-by-step tutorial of modern RF transceiver design; 5. In addition to all the new materials on RF systems and circuits, one of the biggest improvements is that the author incorporated hundreds examples/problems in the book. Some help readers understand RF fundamentals, and some are very practical issues facing RF engineers. There are several errors in the book, make an online search you'll be able to find the errata to the 2nd edition. And of course, the coverage of RF design by a single book is limited though it has over 900 pages. Here are some of my recommendations if you are interested in other RF/analog materials, and they are not related to this review:

Analog circuit design:  
Analysis and Design of Analog Integrated Circuits  
Design of Analog CMOS Integrated Circuits  
CMOS Analog Circuit Design (The Oxford Series in Electrical and Computer Engineering)  
CMOS Circuit Design, Layout, and Simulation, 3rd Edition (IEEE Press Series on Microelectronic Systems)  
Analog Integrated Circuit Design

RF Systems and Circuits:  
Radio Receiver Design  
RF and Microwave Transmitter Design (Wiley Series in Microwave and Optical Engineering)  
The Design of CMOS Radio-Frequency Integrated Circuits, Second Edition  
RF System Design of Transceivers for Wireless Communications  
Practical RF System Design

Of course I haven't finished the book. But this does not stop me to rate it 5 stars. The book is well structured, written in a very clearly and informative way. You will get exactly what you see on table of content and much more! For example, I want to learn about VCO, there are tons of books out there and nearly none of them explain why the VCO has structure like that (you can search for the circuit easily); and none of them has real number with real calculation for reference. This book explains why, and how to calculate the component. And in other chapters, it introduces each component in details.

There are only a few books on CMOS RFIC design published, this is the best, most comprehensive and most clearly-written one you can find. Prof. Razavi himself is still actively engaged in RFIC research, so the freshness of the design techniques in this book is guaranteed. It covers every single building block of a complete wireless transceiver: from transistor to passive device, from amplifier to mixer, from oscillator to synthesizer. Besides, this book also spends two chapters talking

about wireless communication principles and wireless transceiver architectures, which are really helpful to those circuit designers who lack knowledge in this regard.

The book covers much more topics than the 1st edition, represented in the contents of key building blocks of wireless transceiver. But Power Amplifier seems the drawbacks of the book which does not provide readers with a systematic way to design especially compared with the contents in T.H.Lee's book. The Transceiver Architecture, LNA, Oscillator, PLL chapter are depicted very well. But the chapter for Mixer is a little bit disorganized which too much emphasis on noise analysis, but the linearity seems ignored. Passive Components, though are introduced in detail, I suppose that B.Razavi may read T.H.Lee's book very carefully, and write this chapter, to be frank, he did not show us how to accurately design passive components like spiral inductor, bondwire, stack inductor etc. However, anyway, this book is still highly recommended which covers many new topics. I am wondering if Asad Abidi could write a book on RF CMOS circuits, that should be the sheer classical tome in this area since his status in this area cannot be surpassed currently. His research papers are really insightful, intuitive and accurate. Hopefully, before he retires, A. Abidi could complete such a book.

This book obviously is not perfect, but it is hard to find a similar book in RF subject that helps you to learn many important concepts in one place. In particular for Analog Designers learning RF design, this is a good starting point. I should say New Edition is hugely different and better from first edition.

Good book for an introductory course in RF electronics and communication system's basic aspects, such as noise, intermodulation, modulators and so on.

I have been so far using the first edition as the top reference in my lectures. The second is much more detailed and covers the most recent advances in RF Microelectronics field. Thanks to B. Razavi for this very valuable and constructive recent work. I will continue using it as our major reference book and will recommend my colleagues to get one issue in order to satisfy their RF dreams. Prof. Dr. Osman PAL-Istanbul Technical University, Faculty of Electronics and Communication

I've only used it for about three weeks. I think it has a good treatment on non-linearity. Haven't caught any errors yet. It's a little more pedagogical than Lee's CMOS RFIC book. It also covers very

different things than Pozar.

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